Environmental Report

Nobles 2 Wind Project

In the Matter of the Application of Nobles 2 Power Partners, LLC for a Certificate of Need for the Nobles 2 Wind Project in Nobles County, Minnesota

Docket No. IP-6964/CN-16-289

Prepared by
Minnesota Department of Commerce
Energy Environmental Review and Analysis
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Responsible Governmental Unit

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Abstract

The Nobles 2 Power, LLC proposes to build and operate a 260 MW wind farm, Nobles 2 Wind Farm, in Nobles County, Minnesota. The total Project area being considered for turbine and associated infrastructure placement is approximately 42,550 acres. Nobles 2 has agreements with land owners for approximately 30,360 acres of private land within the project area; only a fraction, 115 acres, will be utilized for the project. Construction of the project will include wind turbines, access roads, collector and feeder lines, an operations and maintenance facility, and permanent meteorological towers. If approved, Nobles 2 Power, LLC anticipates an in-service date of Q3 or Q4 2019.

The proposed project requires two separate decisions from the Minnesota Public Utilities Commission (Commission) – a certificate of need (CN) and a site permit. The Commission's docket numbers for these decisions are IP-6964/CN-16-289 and WS/17-597.

Department of Commerce, Energy Environmental Review and Analysis (DOC-EERA) staff is responsible for conducting environmental review for CN applications submitted to the Commission. This ER has been prepared to meet the requirements of Minnesota Rule 7849.1100-2100 and is part of the record the Commission considers when deciding to issue a CN.

The ER addresses the issues identified in DOC-EERA's scoping decision of March 29, 2018. It evaluates the potential impacts of the proposed project and alternatives to the proposed Project, as well as possible mitigation measures for these impacts.

Information about the Commission's CN process can be obtained by contacting Charley Bruce, Public Advisor, Minnesota Public Utilities Commission, 121 7th Place E., Suite 350, Saint Paul, MN 55101, (651) 201-2251, consumer.puc@state.mn.us.

Information about this Project can be found on the Department's energy facilities website: https://mn.gov/commerce/energyfacilities/Docket.html?Id=34736, or obtained by contacting Jamie MacAlister, Department of Commerce, Energy Environmental Review and Analysis, 85 7th Place East, Suite 280, St. Paul, Minnesota 55101, (651) 539-1775, jamie.macalister@state.mn.us.

The record for the CN for this Project can be found on the eDockets system at: https://www.eDockets.state.mn.us/EFiling/search.jsp; search on the year "**16"** and number "**289**".

Preparer: Jamie MacAlister

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1 Introduction

On October 13, 2017 Nobles 2 Power Partners filed a Certificate of Need (CN) application with the Minnesota Public Utilities Commission (Commission) for the Nobles 2 Wind Farm (Project)[1]. Tenaska Wind Holdings II, LLC is an affiliate of Tenaska, Inc. Tenaska Wind Holdings II, LLC is proposing to construct a 260 megawatt (MW) large wind energy conversion system (LWECS) in Nobles County, Minnesota.

Project Overview

Nobles 2 Power Partners proposes to construct and operate the 260 MW Nobles 2 Wind Farm.[2] The project includes wind turbines and associated structures and facilities, such as underground electrical collection and communications lines, project substation and interconnection switchyard, an operation and maintenance building (O&M), permanent meteorological tower(s), and gravel access roads. The project substation is where the 34 kV collection lines from the wind turbines are aggregated and stepped up to 115 kV for connection to the utility transmission grid to become usable power for consumers and businesses. At least one, and potentially up to six permanent meteorological tower(s) used to measure climatic data for predicting and optimizing the Project's operation will also be included in the Project area.

Nobles 2 Wind anticipates that the project would consist of 65 to 82 turbines depending on turbine size and configuration, with twelve alternate turbine sites yielding a total nameplate capacity of up to 260 MW.[3] Turbine models with nameplate capacities ranging from 2.0 MW to 4.2 MW are currently being considered.

The Project is located in Nobles County in southwest Minnesota, approximately eleven miles northwest of Worthington, Minnesota (**Map 1a**). The Project is within Leota, Wilmont, Bloom, Lismore, Larkin, and Summit Lake townships as shown on **Map 1b**.[4]

Within the approximately 42,550 acre project area, Nobles II Wind has secured wind rights for approximately 30,356 acres of private land (**Map 2a)**.[5] The Project intends to commence commercial operation in the third or fourth quarter of 2019, dependent upon completion of the interconnection process.[6]

If the Certificate of Need is granted, Nobles 2 Wind will provide wind-generated electricity through a Power Purchase Agreement (PPA) with Minnesota Power.[7] Production is intended to help utilities satisfy

[1] Certificate of Need Application, October 13, 2017 (eDockets 201710-136484-01, 201710-136484-02, 201710-136484-04, 201710-136484-05)
[2] Certificate of Need Application, P. 1
[3] Site Permit Application, October 13, 2017 (eDockets Application 201712-137883-02, Maps 201710-136496-04, Appendix A 201710-136496-01, Appendix B 201710-136496-02, Appendices C-G 201710-136496-03), P. 6
[4] Site Permit Application, P.4
[5] Id, p 5.
[6] Certificate of Need Application, P. 1.
[7] Certificate of Need Application, P. 10.

renewable energy objectives in Minnesota, under Minnesota Statute 216B.1691, and in the surrounding area. Accordingly, alternatives examined in this Environmental Report (ER) are limited to technologies that support renewable energy objectives. These alternatives include: (1) a generic 260 MW LWECS sited elsewhere in Minnesota, (2) a 260 MW Solar Farm, and (3) the "no build" option. Other renewable technologies will also be evaluated.

Organization and Content of this Document
This Environmental Report 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: The No Build Alternative
Section 6: Human and Environmental Impacts
Section 7: Availability and Feasibility of Alternatives
Section 8: Permits

Sections three through seven discuss the proposed project, alternatives, associated impacts and mitigation.

Sources of Information
Information for this report is drawn from multiple sources and cited throughout. The primary source documents used for information about the Project are the Site Permit and CN applications submitted by Nobles 2 Power Partners, LLC. [8, 9] In addition, Nobles 2 responded to a number of EERA data requests during the preparation of this document. Supplemental information is cited and incorporated as applicable.

2 Regulatory Framework

The Project is a Large Wind Energy Conversion System (LWECS) as defined in the Wind Siting Act (Minnesota Statute 216F). If permitted, the project will produce up to 260 MW of power, meeting the definition of a large energy facility per Minnesota Statutes section 216B.2421.

In accordance with Minnesota Statutes section 216B.243, no large energy facility may be sited or constructed in Minnesota without issuance of a CN by the Commission. Accordingly, on October 13, 2017, the Nobles 2 Power Partners, LLC submitted a CN application to the Commission. On January 10, 2018, the Commission issued an order accepting the application as substantially complete.[10] The Department of Commerce Energy Environmental Review and Analysis unit (EERA) is required to prepare an ER for the Certificate of Need based on Minnesota Statute 116D.04 and Certificate of Need Rule 7849.1200.

[8] Application for a Certificate of Need, October 13, 2017 eDockets201710-136484-01, 201710-136484-02, 201710-136484-04, 201710-136484-05
[9] Site Permit Application, October 13, 2017 (eDockets Application 201712-137883-02, Maps 201710-136496-04, Appendix A 201710-136496-01, Appendix B 201710-136496-02, Appendices C-G 201710-136496-03)
[10] See Order accepting application as substantially complete 20181-138632-01

The certificate of need process, including the ER, forms the project record and informs the Public Utilities Commission. This process includes: (1) a scoping meeting and comment period, (2) a "need" analysis by the DOC - Energy Regulation and Planning staff, (3) environmental review by DOC EERA staff and (4) a public hearing conducted by an administrative law judge (ALJ). Commission staff will make a recommendation to the Commission on the CN based on the ALJ's hearing report and the project record.

2.1 Environmental Report

The ER provides a high level analysis of impacts associated with the proposed project and alternatives to the project. If the project is permitted, it will produce renewable energy to meet Minnesota's renewable energy objectives. Accordingly, alternatives examined in the ER are limited to "eligible energy technologies" that support these objectives (Minnesota Statute 216B.1691). These alternatives will include: (1) a generic 260 MW wind generation project sited elsewhere in Minnesota, (2) a 260 MW solar farm, and (3) a "no-build" alternative.

Pursuant to Minnesota Rule 7849.1200, the analysis provided by EERA staff takes the form of an Environmental Report. The ER provides an analysis of potential human and environmental impacts of the Project, as well as alternatives to the Project. To develop the ER, EERA staff is required to conduct at least one public meeting in the proposed Project area. The purpose of the meeting is to advise the public of the Project and to solicit public input into the scope of the ER. A scoping decision is a determination of what needs to be assessed in the ER to fully inform decision-makers and the public about the possible impacts and potential alternatives of the Project.

EERA staff held a public information and scoping meeting on February 28, 2018 in Wilmont, Minnesota. Approximately 75 persons attended the meeting, with five individuals providing oral comments at the meeting. The comment period closed on March 20, 2018. Sixteen written comments were received during the comment period.

2.2 Permitting Authority and Additional Permits

Site Permit
In addition to the Certificate of Need, the proposed Project requires a Site Permit (Minn. Statute 216F.04). The Site Permit is issued by the Commission and is being considered in a separate docket (WS-17-597). A Site Permit authorizes the siting, construction and operation of the Project and cannot be issued before a certificate of need has been issued for the Project (Minn. Statute 216B.243).

Additional Permits
In addition to approvals issued by the Commission, the Project will require permits and approvals from federal agencies, additional state agencies and local governments. These permits are discussed in Section 8.

2.3 Public Participation

Public participation is essential to developing a thorough record for the CN and Site Permit processes. EERA and PUC solicit public in-put in a variety of ways, including: hosting public meetings and hearings,

receiving comments during open comment periods, providing a project web-page with easy access to primary project documents, access to mailing lists to receive project information, providing a public advisor, as well as access to the full project record on e-dockets.[11]

Public participation and state and federal agency input have been sought throughout the CN process. Technical representatives from the state and federal agencies were provided with hard copies and electronic copies of the Site Permit Application for the project, and requested to provide comments and information to be considered in the development of the scope for this ER and items to consider in the development of a preliminary Draft Site Permit.

No system or project alternatives were submitted during the comment period.

A joint (CN and Site Permit dockets) Public Hearing will be conducted by an Administrative Law Judge (ALJ) from the Office of Administrative Hearings (OAH) in the project area. During the Public Hearing the public is invited to attend and provide comments on this ER document, the Draft Site Permit, and whether the Commission should approve the CN and Site Permit for the proposed Project. A public comment period is associated with the Public Hearing and at the Commission meeting when the project is decided.

3 Description of the Proposed Project

The Nobles 2 Power, LLC is proposing to build a 260 MW LWECS. Nobles 2 Power Partners, LLC is responsible for the oversight and management of the Project, along with construction, operations and maintenance. Nobles 2 Power Partners, LLC is a wholly-owned subsidiary of Tenaska Wind Holdings II, LLC an affiliate of Tenaska, Inc. Energy in Omaha, Nebraska.

3.1 Project Description

The project consists of wind turbines and associated structures, including access roads, communication lines, meteorological towers, a staging area, construction laydown area, operation and maintenance (O&M) facility, and electrical collector and feeder lines connecting to the proposed project substation within the site (**MAP 3a**).[12] The physical Point of Interconnection ("POI") is where the electricity generated by the Project enters the transmission grid and is further defined during the interconnection agreement process. The Project's generator interconnection agreement will be negotiated and executed upon completion of the MISO Definitive Planning Process.

Nobles 2 plans to interconnect the Project at the Xcel Nobles-Fenton 115kV transmission line, which is in close proximity to the planned project substation. The project substation is directly adjacent to the expected POI and no additional transmission lines are planned (**MAP 3a)**

The number of turbines under consideration ranges from 65-82, yielding a total nameplate capacity of up to 260 MW. At least 10 of the total number of turbines will be Vestas V110-2.0 MW, which will satisfy the production tax credit (PTC) requirements. Twelve alternate turbine locations have also been identified. Alternate turbine locations may be utilized under a variety of circumstances, such as if a

[11] See Certificate of Need Docket IP-6964/CN-16-289 and Notice of Public Information and Scoping Meeting, e-dockets 20182-140012-02

[12] Site Application, P. 11

primary turbine location cannot be used due to unforeseen constructability issues (e.g. geotechnical) or to avoid environmental impacts.

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. 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 will be installed during foundation work, will be designed for local soil conditions, and will be 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 range from 80 meters to 82 meters, and the rotor diameters range from 110 meters to 136 meters, and a rotor speed between 44-55 mph. 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 four sections manufactured from certified steel plates. All welds are made by automatically controlled power welding machines and ultrasonically inspected during manufacturing per American National Standards Institute specifications. All surfaces are sandblasted and multi-layer coated for protection against corrosion. 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 by anchor bolts to an underground concrete foundation. Geotechnical surveys, turbine tower load specifications, and cost considerations will dictate final design parameters of the foundations. Foundations for similarly sized turbines are generally circular, approximately 65 to 70 ft across at the base, and extend 7 to 10 feet below grade.

Nobles 2 is considering five Vestas turbine models. The turbine models under consideration are described in the Nobles 2 Site Permit Application and the CN Application. The turbine specifications are provided in **Table 1**.

Table 1. Wind Turbine Specifications

Table 1: Wind Turbine Specifications					
Design Features	**Vestas V110-2.0 MW Wind Turbine**	**Vestas V136-3.45 MW Wind Turbine**	**Vestas V136-3.6 MW Wind Turbine**	**Vestas V136-4.0 MW Wind Turbine**	**Vestas V136-4.2 MW Wind Turbine**
Nameplate Capacity	2,000 kW	3,450 kW	3,600 kW	4,000 kW	4,200 kW
Hub Height	262.5 ft (80 m)	269.0 ft (82 m)	269.0 ft (82 m)	269.0 ft (82 m)	269.0 ft (82 m)
Total Height	442.9 ft (135 m)	492.1 feet (150 m)	492.1 feet (150 m)	492.1 feet (150 m)	492.1 feet (150 m)
Rotor Diameter	360.9 ft (110 m)	446.2 ft (136 m)	446.2 ft (136 m)	446.2 ft (136 m)	446.2 ft (136 m)
Design Life	Minimum of 20 years	Minimum of 20 years	Minimum of 20 years	Minimum of 20 years	Minimum of 20 years
Cut in Wind Speed	6.7 mph (3m/s)	6.7 mph (3m/s)	6.7 mph (3m/s)	6.7 mph (3m/s)	6.7 mph (3m/s)
IEC Wind Class	IIIC	IIIA	S / IIIA	IIB / S	S
Cut out Wind Speed	44.7 mph (20m/s)	50.3 mph (22.5m/s)	50.3 mph (22.5m/s)	55.9 mph (25 m/s)	55.9 mph (25 m/s)
Sound at Turbine	107.9 dB(A)	108.2 dB(A)	108.7 dB(A)	103.9 dB(A)	103.9 dB(A)
Power Regulation	All turbine models/variants utilize a microprocessor pitch control system called OptiTip® and the OptiSpeed™ (variable speed) feature. With these features, the wind turbine is able to operate the rotor at variable speed (rpm), helping to maintain output at or near rated power. Unit is also equipped with low voltage ride thru technology for demanding reliability standards				
Generation	2.0 MW per turbine	3.45 MW per turbine	3.6 MW per turbine	4.0 MW per turbine	4.2 MW per turbine
Tower	All turbine types utilize a multi-coated, conical tubular steel with safety ladder with climb assist to the nacelle				
Nacelle bedplate	All turbine types have a 2 part nacelle bedplate - cast iron front part; girder structure rear part				
Main Bearings	All turbine models utilize spherical roller bearings				
Supervisory Control and Data Acquisition (SCADA)	Each turbine is equipped with SCADA controller hardware, software and database storage capability				
FAA Lighting	Standard FAA lighting[13]				
Foundation	Per manufacturer specifications, foundation structural engineer design and site conditions				

In addition to the wind turbines, the project requires additional facilities which are described in **Table 2**[14] and shown on **Map 3a**.

[13] Radar controlled lighting is being considered in the record.
[14] Site Permit Application Pp. 10-11.

Table 2. Additional Facilities

Table 2: Additional Facilities	
Facility Type	**Description**
Access roads to turbines and laydown areas	• Each turbine will be accessible by a low profile gravel road extending from the turbine base 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 • The total preliminary length of permanent access roads for the primary configuration comprised of 64 Vestas V136-3.6 MW turbines and 10 V110-2.0 MW turbines is approximately 21 mile and a total of 24 miles when including access roads to all 12 alternates.
Step-up transformers	• The generator voltage is stepped up to the collector system voltage of 34.5 kV by means of a Generator Step Up transformer (“GSU”), located within each turbine nacelle. • The electricity from each turbine’s GSU is connected to the project substation through the underground collection lines.
34.5 kV collector and feeder lines	• Collector and feeder lines are installed between turbine strings, generally trenched underground to a depth of 36” or greater • The collector lines coming into the substation will combine the electrical output of the wind turbines into two 34.5kV circuits and will be stepped up to the 115kV transmission voltage within the project substation, and then to the POI on the power grid. • Total length of collector lines ranges from 59 miles to 75 miles depending on turbine model configurations. • Collector lines may be run above ground as existing underground utilities, other infrastructure, shallow bedrock, or sensitive environmental conditions require.
Operation and Maintenance Facility	• The O&M Building is planned to be located directly west of the proposed Project substation, in the southwest quadrant of the intersection of Erickson Avenue and 140th Street. • Approximately 4 acres will be needed for construction of the O&M.
Meteorological Towers	• Up to six permanent meteorological towers may be sited. • Permanent meteorological towers will be made of steel and meet FAA and local requirements. • Meteorological tower site selection and number of towers is dependent upon final turbine layout and requirements for proper operation of wind assessment equipment. • Located no closer than 300 feet from the edge of the road rights-of-way and from the site control boundaries (wind\land rights). • Construction area of 400x400 ft with 20x20 ft permanent impact.

Construction Staging and Turbine Laydown Areas	• 10-acre turbine laydown and construction staging area for turbine components during construction • Other temporary staging areas may be needed for parking and unloading of large equipment deliveries.
Project Substation	• Connected to an interconnection switchyard to deliver the generated power on to the grid. • Project substation is directly adjacent to the expected POI and no additional transmission lines are needed. • 4-10 acres will be needed for the project substation.
Site Control and Data Acquisition (SCaDA) system	• Each turbine is equipped with SCADA controller hardware, software and database storage capability • Remotely monitors the conditions of the wind farm and alerts technicians to any irregularities with the wind turbines, circuit breakers, meters, meteorological equipment, etc.

3.2 Project Location

The Project is located in Nobles County in southwestern Minnesota, approximately 11 miles northwest of Worthington, Minnesota (**Maps 1a and 1b)**. **Table 3** lists the Township, Range, and Sections in which the Project area is located.

Table 3. Nobles 2 Wind Project Location

Table 3: Nobles 2 Wind Project Location				
Township	**Range**	**Sections**	**Township Name**	**County**
104N	43W	13, 24-26, 33-36	Leota	Nobles
104N	42W	S2-4, 9-35	Wilmont	Nobles
104N	41W	S2-11, 15, 16, 19-22, 28-35	Bloom	Nobles
103N	43W	S1-3	Lismore	Nobles
103N	42W	S2-6	Larkin	Nobles
103N	41W	S2-6	Summit Lake	Nobles

The total Project area being considered for turbine and associated infrastructure placement is approximately 42,550 acres. Nobles 2 has agreements with land owners for approximately 30,360 acres of private land within the project area as shown on **Map 2a**.

The project is located in a predominately agricultural area of southwestern Minnesota. Ninety two percent of the county is in cultivated crops[15]; approximately 89 percent of the project area is in cultivated crops.[16] The wind turbines and associated facilities are primarily sited on agricultural lands.

The project design/layout incorporates the wind energy conversion facility siting criteria outlined in the Commission's Order Establishing General Wind Permit Standards (Docket No. E, G999/M-07-1102, January 11, 2008 - MPUC General Permit Standards) and the DOC Site Permit Application Guidance. Nobles 2 does not anticipate conflicts with the current Nobles County ordinances and has designed the Project to generally meet or exceed setbacks required by the Commission and Nobles County.

Table 4 and Maps 2b and **3b** demonstrate how the setbacks established by Nobles 2 compare to those setbacks required by the Commission and Nobles County. The Applicant also incorporated avoidance and setback recommendations from the USFWS and the MNDNR. Where setbacks differ for the same feature, the Applicant used the most stringent setback distance.

Table 4. Nobles 2 Wind Project Setback Comparison

Table 4: Nobles 2 Wind Project Setback Comparison			
Resource	**MPUC**	**Nobles County**	**Nobles 2 Project Design**
Non- participating/ Participating Property Lines	3 RD on east-west axis and 5 RD on north-south axis from non-participating property lines[1]	1.25 times the total height[3]	3 RD on east-west axis and 5 RD on north-south axis from non-participating property lines[1]
Residential Dwellings	500 feet (152 meters) and sufficient distance to meet state noise standard.	750 feet (228 meters)	1,600 Feet (488 meters)
Meteorological Towers	250 feet from the edge of road ROW and boundaries of developer's site control	The fall zone, as certified by a professional engineer +10 feet or 1.1 times the total height[2].	1.1 times total height[2]
Other Structures	None specified.	To be considered, 600 feet for meteorological towers	None specified.
Public Roads	250 feet (76 meters)	1x the height, may be reduced for minimum maintenance roads or a road with an Average Daily Traffic	1x total height[4]

[15] Nobles County 2012 Census for Agriculture, https://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Minnesota/cp27105.pdf
[16] Site Application, P. 59.

Table 4: Nobles 2 Wind Project Setback Comparison			
Resource	**MPUC**	**Nobles County**	**Nobles 2 Project Design**
		Count of less than 10. (or equivalent to centerline)	
Recreational Trails	250 feet (76 meters)	None specified	300 Feet
Public Lands	3 RD east-west axis and 5 RD on north-south[1]	600 feet	3 X 5 RD[1]
Wetlands, 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.	600 feet (USFWS Types III, IV, and V).	Avoidance of wetlands and water resources with turbines. Avoid or minimize impacts to water resources to the degree practicable with other project facilities.
Internal Turbine Spacing	3 RD on east-west axis and 5 RD on north south axis[1]	None specified.	3 X 5 RD[1]
Public Conservation Lands Managed as Grasslands	None specified.	600 feet	Avoided (there are no RIM or USFWS lands within the Project area)
Native Prairies	Turbines and associated facilities shall not be placed in native prairies, unless approved in the native prairie protection plan	None specified.	Turbines and associated facilities will not be placed in native prairies unless approved in the native prairie protection plan
Sand & Gravel Operations	Turbines and associated facilities shall not be placed in active sand and gravel operations, unless negotiated with landowner.	None specified.	Project located outside of active gravel mines.
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.	6 miles.

[1] 3 RD for Vestas V136 turbine is 408 meters (1,339 feet); 5RD for Vestas V136 turbine is 680 meters (2,231 feet).
[2] 1.1 times the total height for meteorological tower of 82 meters (269 feet) = 90.2 meters (296 feet) from edge of public right-of-way
[3] 1.25 times height for Vestas V136 turbine = 206 meters (677 feet).
[4] 1 times height for Vestas V136 = 165 meters (541 feet)

3.3 Project Cost and Schedule

The installed capital costs for the proposed project are estimated to be approximately $350-400 million, including wind turbines, associated electrical and communication systems, and access roads. Final costs will depend on site conditions and final turbine selection and layout. Ongoing operations and maintenance costs and administrative costs are estimated to be approximately $ 10 million per year, including royalties to landowners for wind easement rights and property taxes.[17]

Depending on interconnection process completion, permitting, and other development activities the Project is expected to achieve commercial operation by the fourth quarter 2018.

4 Description of Project Alternatives

Minn. Rule 7849.1200 requires the Commission to 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 Nobles 2 Wind Project.

The alternatives considered would generate energy equivalent to that of the proposed project and provide renewable, low, or zero carbon emission energy. 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. Alternatives would also include constructing transmission facilities (to import energy) in lieu of generation. However, the proposed Project would be producing renewable energy for use in Minnesota and the surrounding area. Accordingly, alternatives considered here were selected as they are technologies eligible to be counted toward renewable energy objectives.[18]

Alternatives evaluated include: (1) a 260 MW wind generation plant sited elsewhere in Minnesota, (2) a Solar Farm, and (3) a “no build” alternative.

4.1 260 MW LWECS

An alternative to the proposed Project that would utilize an eligible renewable energy (wind) is a large wind energy conversion system sited elsewhere in Minnesota. Such a Project could be an approximately 260 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 260 MW wind project sited in Minnesota and the proposed Nobles 2 Wind project in Nobles County.

4.2 260 MW Solar Farm

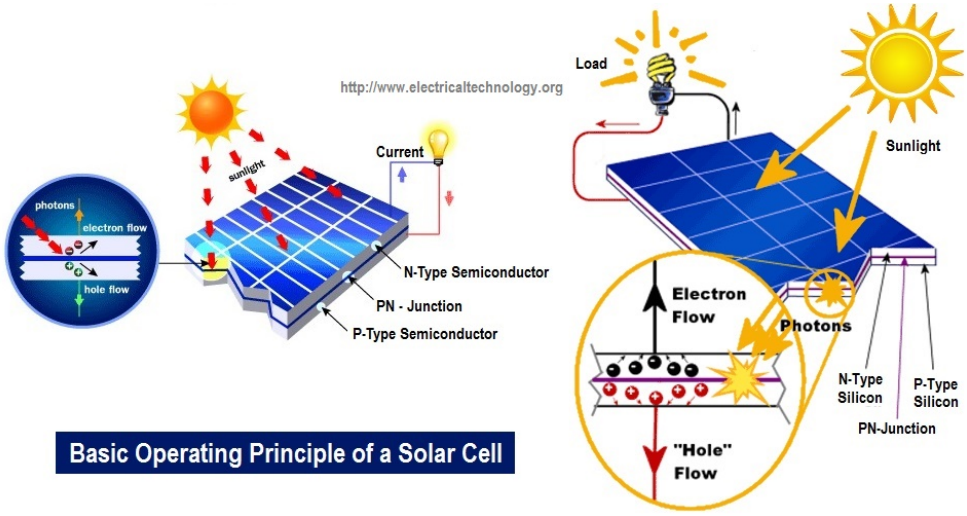
Another alternative renewable energy source to the proposed project is a solar farm of similar electricity generation as the proposed project. A photovoltaic power station, also known as a solar farm, is a large-scale photovoltaic system (PV system) designed for the supply of merchant power into the electricity grid. They are differentiated from most building-mounted and other decentralized solar power applications because they supply power at the utility scale, rather than to a local user or users.

[17] Site Application, P. 96.
[18] Minn. Statute 216B.1691, Subd. 1. Eligible energy technologies include technologies that generate electricity from solar, wind, hydroelectric, hydrogen, or biomass.

The analysis for this alternative relies on data from the largest, single site solar installation in Minnesota, the 100 MW North Star Solar project.[19] While the capacity of the North Star Solar project is less than half of the proposed Nobles 2 Wind project, many of the impacts are similar. Significant differences, such as the amount of acreage required for a 260 MW solar farm versus the acreage required for the 100 MW North Star Solar project are highlighted in the discussion of impacts.

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.

Figure 1. Solar PV Cell



4.3 No Build Alternative

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

5 The No Build Alternative

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.

[19] North Star Solar PV, LLC Project, eDocket No. IP6943/GS-15-33

For the proposed wind 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.

5.1 Renewable Energy Objectives

Minnesota has committed to a renewable energy objective of generating 25 percent of its electricity from eligible renewable sources by the year 2025.[20] Minnesota utilities forecast the need for 5,841 MW of renewable generation by the year 2025 to meet this objective.[21] If Nobles 2 is not built, it could reduce the state's ability to meet renewable energy objectives. 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 **Map 19**.

5.2 Loss of Economic Benefits

If Nobles 2 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 estimated at $1.1 to 1.3 million annually.[22] Nobles 2 will utilize local contractors and suppliers, which will contribute to the local personal income in the area.[23] The proposed Project is expected to generate approximately 230 temporary construction jobs and 15 permanent operation and maintenance jobs.[24] These employment opportunities and associated income would be lost if the project is not built.

5.3 Replacement with a Non-Renewable Resource

Impacts of non-renewable energy sources vary. However, it is possible that if Nobles 2 is not built, the electrical power it would have produced may be replaced with a non-renewable energy resource. Nobles 2 would produce approximately 930,000 - 1,100,000 megawatt-hours annually (MWh/yr) depending on which turbine model is selected. [25] Energy projections will be further analyzed after the final design and layout of the wind project has been completed. However, since no non-renewable proposals are being considered in this case, that comparative analysis is not pursued in this Environmental Review.

5.4 Benefits

Benefits of not building Nobles 2 include avoidance of potential human and environmental impacts associated with the project. These impacts are discussed in Section 6 of this ER.

[20] Minn. Statute 216B.1691
[21] "Minnesota Renewable Energy Integration and Transmission Study," (Presentation) on September 13, 2013, http://mn.gov/commerce/energy/topics/resources/energy-legislation-initiatives/studies-and-reports/minnesota-renewable-energy-integration-transmission-study.jsp
[22] Certificate of Need Application, P. 9.
[23] Id.
[24] Id. P. 50.
[25] Site Permit Application P. 96.

6 Human and Environmental Impacts

Nobles 2 and the project alternatives have the potential for human and environmental impacts, which are discussed below. The alternatives analyzed include: (1) a 260 MW wind energy conversion system sited elsewhere in Minnesota and (2) a Solar Farm. The potential impacts of the no build alternative are discussed in Section 5. Additionally, this section provides mitigation strategies for potential impacts.

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 this ER to examine emissions of the following pollutants: sulfur dioxide (SO_2), nitrogen oxides (NO_x), carbon dioxide (CO_2), mercury (Hg), and particulate matter (PM). These common pollutants (other than mercury) are known as criteria pollutants.[26]

Nobles 2

The proposed project would not emit criteria pollutants during operation. Impacts from construction would be short-term and temporary as a result of construction. Impacts would include dust due to earth moving and emissions from diesel-powered construction equipment. Transmission lines, under certain conditions, produce limited amounts of ozone and nitrogen oxide emissions. Emissions of these pollutants would be minimal.

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. The project area includes multiple construction "sites" for installing individual turbines and access roads. Dust from construction traffic can be controlled using standard construction practices such as watering of exposed surfaces, covering of disturbed areas, and reduced speed limits on site. Once project construction is completed, air and dust emissions related to vehicular traffic would be reduced. Limited emissions would be associated with routine maintenance and repairs.

Generic 260 MW LWECS

A generic 200 MW LWECS would not emit criteria pollutants during operation, and would have ancillary emissions (construction, transmission line) similar to those of the proposed project.

260 MW Solar Farm

The proposed project would not emit criteria pollutants during operation. Temporary short-term air quality impacts would occur during the construction phase of the solar farm project. Once operational, the project would not generate criteria pollutants or carbon dioxide.

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

During construction of the solar farm project, temporary short-term air emissions are expected as a result of vehicle exhaust from the construction equipment and from vehicles traveling to and from facility location. 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.

In addition to emissions from construction equipment, short-term air quality impacts from fugitive dust may result from travel on unpaved roads, some grading at the site and limited amounts of excavation for foundations for inverter boxes, O&M buildings and potentially solar array piers at some locations. 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 (USEPA's AP-42, Sections 13.2 and 11.9). Since fine particulate matter has the potential to travel further into the lungs, it is of greater concern than larger particle size ranges.

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

6.1.2 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.[27]

Nobles 2
The proposed project 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 260 MW LWECS
A generic 260 MW LWECS would have HAP and VOC emissions similar to the Nobles 2, as the generic 260 MW LWECS would utilize the petroleum-based fluids during wind turbine operation.

260 MW Solar Farm
As with LWECS, 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 (gear box oil, hydraulic fluid and gear grease) and upkeep of buildings.

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

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

6.1.3 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. Wind turbines do not produce ozone or ozone precursors. Minnesota Rule 7849.1500, subpart 2 requires that this ER address anticipated ozone formation. Ozone can cause human health risks and can also damage crops, trees and other vegetation.[28]

Nobles 2 Wind
The proposed project would not produce ozone or ozone precursors. Ozone production can occur adjacent to transmission lines under specific conditions. There are no new transmission lines associated with the proposed project therefore there would be no additional ozone formation. As an additional consideration, ozone is not continuously produced by transmission lines, but only under specific conditions. Thus, there will be minimal or no human or environmental impacts, and thus no mitigation related to ozone formation.

Transmission lines have the potential to produce small amounts of ozone and nitrous oxide. These compounds are created by the ionization of air molecules surrounding the conductor. Ozone production from a conductor is proportional to temperature and sunlight and inversely proportional to humidity. Ozone and nitrous oxide are reactive compounds that contribute to smog and can have adverse impacts on human respiratory systems.[29] Accordingly, these compounds are regulated and have permissible concentration limits. The State of Minnesota has an ozone limit of 0.08 parts per million (ppm).[30] The federal ozone limit is 0.07 ppm.[31]

Nobles 2 would not produce ozone or ozone precursors at the operating wind turbines. Ozone production can occur adjacent to transmission lines under specific conditions. The existing Nobles-Fenton 115 kV transmission line associated with the project will likely experience some ozone production.

Generic 260 MW LWECS
A generic 260 MW LWECS would not produce ozone or ozone precursors at the operating wind turbines. The ozone production at the generic 260 MW LWECS would depend on the use of associated transmission lines to deliver power to the grid. The generic 260 MW LWECS could have minimal or no impacts related to ozone formation, similar to the proposed project, if the existing transmission system is available. It is not uncommon for LWECS projects to include a transmission component, in which case it is possible that small amounts of ozone and nitrous oxide could be produced under specific conditions described above.

[28] Ozone Pollution, EPA, https://www.epa.gov/ozone-pollution
[29] https://www.epa.gov/criteria-air-pollutants
[30] Minn. R. 7009.0800, https://www.revisor.mn.gov/rules/?id=7009.0080.
[31] https://www.epa.gov/ozone-pollution/2015-national-ambient-air-quality-standards-naaqs-ozone

260 MW Solar Farm

A 260 MW solar farm would not produce ozone or ozone precursors at the operating of the PV panels. As with LWECS, the ozone production associated with a 260 MW solar farm would depend on the use of associated transmission lines to deliver power to the grid. The generic 2600 MW solar farm would have minimal or no impacts related to ozone formation, similar to the proposed project. Ground level ozone formation and associated impacts are anticipated to be minimal.

Mitigation

Ozone formation could be mitigated by minimizing ozone precursors. See discussion in Sections 6.1.1 and 6.1.2 regarding nitrous oxides (NO_X) and volatile organic compounds (VOC) respectively.

6.2 Water Resources

Water resources have the potential to be impacted by the proposed project and alternatives. Different generation options have different water usage and potential impacts on the water quality and are discussed in this section.

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.

Nobles 2

The proposed project plans to use rural water service for the O&M facility. A well would be used only to the extent rural water service is infeasible to use. Lincoln Pipestone Rural Water (LPRW) has existing water pipelines approximately one mile from the planned location of the O&M facility.[32] To establish service, LPRW will build approximately one mile of new water pipeline.[33] Nobles 2 continues to discuss rural water supplies with LPRW to fully understand the cost of rural water service and to make a final decision on water service for the O&M facility.

If rural water service is not feasible, potable and sanitary water for the operations and maintenance of the O&M facility will be supplied through a new well with onsite septic to serve the facility.[34] The amount of water used would be roughly equivalent to the amount consumed by a residence or farmstead in the area, and likely not require mitigation.[35]

A water appropriations permit may also be required if temporary dewatering activities are needed during construction to provide dust control or water for concrete mixes.[36] The determination of need for the water appropriations permit for construction dewatering activities will be determined by the contractor during construction and will be entirely dependent on site conditions.

[32] Nobles 2 Power, LLC, response to EERA data request, May 18, 2018.
[33] Id.
[34] Id.
[35] Site Permit Application P. 54.
[36] Site Permit Application P. 34-5.

If a temporary concrete batch plant is sited in the project area for construction of turbine foundations, a water appropriations permit is required from the MDNR. Lincoln Pipestone Rural Water (LPRW) is the rural water supplier in the area and could also provide a water source for a temporary batch plant. While capable of supplying water for industrial uses, the ability of LPRW to serve a concrete batch plant for the proposed project is dependent upon the location of the batch plant and its water requirements.

Generic 260 MW LWECS
Water appropriations for a generic 260 MW LWECS would be similar to the proposed project, depending on the need for an on-site concrete batch plant and proximity to existing water supplies.

260 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.[37]

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.[38]

The minimal need for concrete in the construction of solar farms does not 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 LWECS projects. Given the rural nature in siting solar farms, it would be anticipated that domestic water and sewer services would generally be provided by an on-site private well, which would require similar regulatory review and permitting as for the LWECS projects.

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 MDNR permit no mitigation is required. 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.

[37] North Star Solar Project, Environmental Assessment (eDockets 20159-114256-01)
[38] Id.

Nobles 2

Operation of the proposed project would not generate wastewater. However, wastewater would be created by the operation and maintenance (O&M) building. Nobles 2 plans to build an on-site septic system to serve the O&M facility.[39]The potential impacts of this wastewater and septic system are anticipated to be minimal. Mitigation of the impacts, beyond a properly functioning septic system, is not anticipated.

Generic 260 MW LWECS

A generic 260 MW LWECS would have wastewater impacts similar to the proposed project.

260 MW Solar Farm

A solar farm would likely require a private well and septic system at the O&M facility to provide sanitary services and water for maintenance, like the North Star Solar Farm.[40]

Given the rural nature of most large solar farms, it would be 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 (ISTS) permits, no mitigation is required.

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.[41] Groundwater collects and flows beneath the Earth's surface, filling the porous spaces in soil, sediment, and rocks. 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 (USGS 1992). 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. Groundwater impacts that could occur during construction and operation are evaluated and compared for the proposed project and the CN Alternatives.

Nobles 2 Wind Project

[39] Site Permit Application P. 92.
[40] North Star Solar Project, Environmental Assessment, P. 40.
[41] Minnesota DNR Groundwater Provinces (https://www.dnr.state.mn.us/groundwater/provinces/index.html)

Nobles County is in the Western Groundwater Province. This Province is characterized by unconsolidated glacial sediments and is typically clayey and may contain limited extent surficial and buried sand aquifers. Fractured bedrock is usually buried deeply beneath glacial sediments and is only locally used as an aquifer.[42] The Western Groundwater Province has moderate to limited groundwater availability by source (surficial sands, buried sands, and bedrock).[43] The principal aquifers in the project area and surrounding region are in the Cretaceous age sandstones. Ground water supplies are sometimes obtained from weathered and fractured zones in the Sioux Quartzite. More commonly ground water is obtained from Cretaceous age sandstone and the buried glacial outwash sand and gravel deposits.[44]

Construction and operation of the proposed project is not expected to impact groundwater quantity and quality within the region, and construction of the proposed turbine foundations is unlikely to affect local water supply.[45] There may be a short term impact to water supply during construction if a water appropriations permit is needed for an on-site concrete batch plant.

According to the Minnesota Department of Health's County Well Index online database, (Minnesota Department of Health - Division of Environmental Health 2016), well depths vary widely, with most being in excess of 100 feet in depth. Geotechnical testing will occur at turbine locations prior to final design and construction.[46]

Generic 260 MW Wind Project

Impacts to groundwater from a generic 260 MW wind project would be comparable to the Nobles 2 Wind project, depending on site location and geological material underlying the project site. The potential for groundwater contamination resulting from construction may be higher in areas with karst topography, which is characterized by a different water province in the state.

260 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 Operations and Maintenance facility, and embedded transmission poles were installed at a depth above the average depth to groundwater of 15-40 feet.[47] 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.

[42] Minnesota DNR Groundwater Provinces (https://www.dnr.state.mn.us/groundwater/provinces/data.html)
[43] Id.
[44] Site Permit Application, P. 54.
[45] Id.
[46] Id.
[47] North Star Solar Project, Environmental Assessment, P. 61.

Mitigation
Large scale excavation at wind farms is limited to the turbine pads and the O&M facility (including well and septic if necessary) and are temporary. Groundwater resources are not expected to be impacted from these activities in the project area. Individual wind turbine locations should not impact the use of existing water wells; to comply with residential and noise setbacks, turbines are generally located at least 1,000 feet from homes, well away from where most residential wells are located. During "down-stream" permitting, measures would be taken to identify any nearby wells prior to construction of turbine foundations. Permitting agencies such as the MDNR, Minnesota Pollution Control Agency (PCA) and Minnesota Department of Health (MDH) determine appropriate actions to protect local groundwater resources.

For both LWECS and solar farms groundwater use is anticipated to be minimal, and supply and drawdown impacts will be further addressed in necessary appropriations permits.

6.2.4 Surface Water

Surface water in the vicinity of Nobles 2 consists of streams, rivers, lakes, and wetlands. This section assesses the potential for construction and operation of the proposed Project to affect surface water resources. 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. Surface water impacts that could occur during construction and operation are evaluated and compared for the CN Alternatives.

Nobles 2 Wind Project
The project area is located within the Des Moines River and Rock River watersheds, and is within the Missouri River water basin.[48] There are numerous small watercourses and wetlands in the project area, including named and unnamed creeks. According to the Minnesota Public Waters Inventory (PWI) there are eight streams within the project area that are classified as intermittent and a portion of one stream (Jack Creek) is classified as perennial. The portion of Jack Creek that is classified as perennial is located in the southeastern corner of the Project area where no infrastructure is proposed for the Project.

There are approximately 13 miles of perennial streams within the project area, with the majority of the watercourses being unnamed and intermittent. There are two marshes within the project area totaling nearly 50 acres and approximately 20 acres of unnamed wetlands. Willow Lake is the largest lake in the project area at just under 40-acres. **Map 16** illustrates surface waters in the project area and vicinity.

Table 5 identifies the public water inventory resources within the project area.

[48] Minnesota Pollution Control Agency
https://cf.pca.state.mn.us/water/watershedweb/datasearch/web_city.cfm?wrapper=1&city=Wilmont

Table 5. Mapped PWI Lakes, Wetlands and Watercourses

Table 5: Mapped PWI Lakes, Wetlands, and Watercourses within the Project Area		
PWI Name	**Type**	**Area/Length within Project**
Groth Marsh	Public Water Basin	33.0 acres
Jack Creek	Public Water Watercourse	9.3 miles
Kanaranzi Creek	Public Water Watercourse	4.5 miles
Penning Marsh	Public Water Wetland	16.7 acres
Unnamed Wetlands (2)	Public Water Wetland	21.2 acres
Unnamed Stream	Public Ditch/Altered Natural Watercourse	< 0.01 mile
Unnamed Streams (10)	Public Water Watercourse	36.0 miles
Willow Lake	Public Water Basin	38.3 acres

There are no MNDNR-designated Wildlife Lakes, Sensitive Lakeshores, Migratory Waterfowl Feeding and Resting Areas, or any State Wild, Scenic, or Recreation Rivers, within the Project area or 1-mile buffer.[49] There are also no outstanding resource value waters, sensitive lakeshore, or trout streams or lakes within the Project area.

Of the mapped streams and ditches within the Project area, Jack Creek (North Branch) is listed as impaired for turbidity by the MPCA.[50] Champepadan Creek located northwest of the Project area, is a state-wide area of importance for the state-listed threatened Blanding's turtle and plains topminnow. In addition, Champepadan Creek and Kanaranzi Creek are federally designated critical habitat for the Topeka Shiner.[51]

There are three general areas within the project area associated with Federal Emergency Management Agency (FEMA) mapped floodplains are shown on **Map 16**.[52] Floodplains are mapped along Kanaranzi Creek and unnamed tributaries in the west and southwest part of the project, Jack Creek in the southeast portion of the Project area, and two unnamed streams in the northeast portion of the Project area.

Based on publicly available desktop National Wetlands Inventory (NWI), National Hydrography Dataset (NHD) and MN PWI data sources, there are no turbines located within close proximity to perennial streams. Turbines closest to intermittent stream features are T-67 at a distance of 83 feet (NWI), and T-18 at a distance of 167 feet (NHD). Turbines T-4 and T-82 measure closest to wetlands (NWI) at a distance of 104 and 109 feet, respectively.[53]

Turbines T-13 and T-80 are those closest to NHD surface waters, at distances of 250 and 884 feet, respectively. Turbine T-47 measures closest to a MN PWI surface waters at a distance of 1,022 feet.[54]

[49] Site Permit Application, P. 56.
[50] Id.
[51] Id.
[52] Id.
[53] Nobles 2 Power, LLC, response to EERA data request, May 18, 2018.
[54] Id.

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 project and will be minimized to the extent possible. 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.

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. Wetland impacts are typically associated with construction of access roads. Impacts for road crossings typically require a small amount of fill for placement of culverts and road base materials. Temporary crossing widths would be between 40 and 45 feet to allow for construction cranes. Crossings would be reduced in width following construction to approximately 16 feet. Collector lines are generally installed by trenching and only result in temporary impacts to wetlands. It may be possible to directionally bore some collector lines beneath wetland areas and watercourse crossings, which would avoid temporary impacts to jurisdictional waters and wetlands. [55]

None of the proposed turbines, substation or access roads are located within a FEMA designated 100-year floodplain ("FEMA floodplain").[56] Underground electrical collection lines cross beneath three FEMA floodplain areas in proposed locations and one FEMA floodplain location associated with alternate turbine location. The Site Permit Application shows, three proposed access roads partially located within the FEMA floodplain. These have since been removed from consideration due to changes in the site plan. Two portions of an alternate access road are located in margins of the FEMA floodplain (near T-75 and near T-21), but are contemplated for creation only as contingency. If these alternate access roads become necessary, Nobles 2 will fulfill all the necessary federal, state and local approval and/or permitting requirements.

Generic 260 MW Wind Project

The primary source of impacts to surface water from a generic 260 MW wind project would be erosion and runoff during construction. Generally mitigation strategies would be similar to those of the proposed 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.

260 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. In the case of the North Star solar project, the potential for impacts to surface waters was limited due to the facility's components being designed and located to avoid surface water features.

[55] Site Permit Application, P. 57.
[56] Nobles 2 Power, LLC, personal communication.

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

Mitigation
Protection of surface waters from construction and operation of the proposed project is implemented through the National Pollutant Discharge Elimination System (NPDES) permit and the Stormwater Protection Plan (SWPPP). The Minnesota Pollution Control Agency issues NPDES permits for construction activities when more than an acre of land is disturbed. A Stormwater Protection Plan (SWPPP) will be developed prior to construction. BMPs such as silt fencing, management of exposed soils and revegetation plans to prevent erosion will be included in the SWPPP. In addition to erosion control measures, fueling and lubricating construction equipment away from waterways will ensure that fuel and lubricants do not enter waterways.

LWECS Site Permits issued by the Commission require permits and approvals from the DNR, U.S. Fish and Wildlife Service (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.

6.2.5 Wetlands

Wetlands provide a multitude of ecological, economic and social benefits. They provide habitat for fish, wildlife and plants - many of which have a commercial or recreational value - recharge groundwater, reduce flooding, provide clean drinking water, offer food and fiber, and support cultural and recreational activities. There are many types of wetlands in Minnesota, each with widely varying characteristics. Some wetlands are dry for much of the year; others are almost always covered by several feet of water. Some wetlands have grasses and sedges, shrubs, or trees. They may be small confined basins or extend for hundreds of miles.[57]

It is estimated that Minnesota has lost about 50 percent of its original wetland acreage.

The US Fish and Wildlife Service (FWS) is the principal US Federal agency tasked with providing information to the public on the status and trends of our Nation's wetlands. The US FWS National Wetlands Inventory (NWI) is a publically available resource that provides detailed information on the abundance, characteristics, and distribution of US wetlands. It is important to note that NWI wetlands are based on aerial imagery and are not field verified.

In Minnesota, wetlands are also protected under the Wetland Conservation Act (WCA), which is administered by the Board of Water and Soil Resources (BWSR) and the identified Local Government Unit (Nobles County).

Nobles 2 Wind Project
Wetlands are not a common feature in the project area. The National Wetlands Inventory (NWI) identified approximately 922 wetlands within the project area, comprising 2,242 acres, or approximately 5.3 percent of the Project area (**Map 16**).[58] The majority of the wetlands are classified as Freshwater

[57] Minnesota DNR http://www.dnr.state.mn.us/wetlands/index.html
[58] Site Permit Application, P. 55.

Emergent Wetland (73 percent) and Riverine (20 percent), and the remaining 7 percent classified as Freshwater Pond and Freshwater Forested/Shrub Wetland. Wetlands in the Project area are identified in **Table 6**

Table 6. NWI Wetland Types within the Project Region

Table 6: NWI Wet.land Types within the Project area			
Wetland Type	**Number in Project area**	**Total Area (Acres)**	**Percent of Project area**
Freshwater Emergent Wetland	677	2,023	4.8
Riverine	185	160	0.4
Freshwater Pond	48	45	0.1
Freshwater Forested/Shrub Wetland	12	14	< 0.1
Total	**922**	**2,242**	**5.3**

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 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.

Nobles 2 will be built on higher elevation land and ridges to avoid wetlands on the lower positions in the landscape. Access roads and operation facilities will be designed and sited to reduce direct impacts on wetlands.[59] Temporary impacts associated with electric feeder and collector lines, and crane paths will also be minimized by siting to avoid wetland features. Installation of underground utilities will decrease impacts by boring under PWI as necessary.

Turbine layouts under consideration are expected to have minimal impacts to wetlands based on completed field surveys of proposed turbine sites, access roads, and the O&M site and desktop review of NWI data of collection lines and crane path areas associated with the project.

Generic 260 MW Wind Project

The primary source of impacts to wetlands from a generic 260 MW wind project would be similar to those for the Nobles 2 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 proposed project, however the extent and degree of these strategies would be dependent on site specific features of the generic project.

260 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. The preferred method for minimizing impacts to wetlands is to avoid disturbance of the wetland through project siting and design. Similar to wind farms, potential impacts to wetlands from a solar farm can occur during the construction phase; there is the possibility of sediment

[59] Nobles 2 Power, LLC, response to EERA data request, May 18, 2018.

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.

Post-construction impacts from the development of a solar farm may continue to 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, which may cause disturbance, damage vegetative populations, and create the potential for contamination due to pesticides.

While the surface area or foot print (PV panels vs turbine tower) of a solar farm is larger than that associated with a wind farm, the mitigation strategies (avoidance through siting and minimization through BMPs) would be similar to those of the Nobles 2 Wind project, however the extent and degree of these strategies would be dependent on site specific features of the generic project.

Mitigation

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 National Pollutant Discharge Elimination System (NPDES) permit application to the PCA for construction activities. The application identifies which Best Management Practices (BMP) are to be employed during construction of the project. A Stormwater Protection Plan (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.

Access roads constructed adjacent to streams and drainage-ways would be designed and constructed to have a low-profile that will not impede natural drainage patterns. If construction occurs across drainage ways or drain tiles, it would be conducted in a manner to avoid adverse impacts. 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 for any crossings of PWI by roads, or electric feeder and collector lines; this license would specify methods and mitigation requisites.

A vegetation management plan can be developed to formalize measures to minimize the disturbance and removal of vegetation on project sites, prevent the introduction of noxious weeds and invasive species and re-vegetate disturbed areas consistent with the safe and reliable operation of the specific project.

A formal wetland delineation will be completed prior to final layout design and construction.[60] Final layout design will be completed in a manner that will avoid and minimize wetland impacts to the greatest extent practicable. For wetland impacts that cannot be avoided, Nobles 2 will secure all

[60] Site Permit Application, P. 57.

necessary permits required under Section 404 of the CWA, Section 401 of the CWA, and the Minnesota WCA.

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.

Nobles 2 Wind Farm
Potential hazardous materials within the project area 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.[61] 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.

The proposed project would generate solid waste during construction 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 proposed project is not expected to generate 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.[62]

Prior to construction, Nobles 2 will conduct an American Society for Testing and Materials (ASTM) conforming Phase I Environmental Site Assessment (ESA) within the project area to identify potential hazardous materials.[63]

Generic 260 MW LWECS
A generic 260 MW LWECS sited in an agricultural setting would have solid and hazardous waste impacts similar to the proposed project.

260 MW Solar Farm
As with a LWECS, 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 appropriately; hydraulic fluid, lubrication oil and grease would be disposed of through an approved waste disposal firm. Leaks or spills could be mitigated using

[61] Site Permit Application, P. 44.
[62] Site Permit Application, Pp. 45- 46.
[63] Id.

appropriate clean up techniques. A listing of all potentially hazardous materials related to the Project will be maintained at the O&M facility for the Project.

It is not anticipated that the Project would require a hazardous waste license. Hazardous waste generation would likely fall below the quantity required for a very small quantity generator license (220 pounds per month).[64]

The Phase I ESA will be used to identify and avoid potential hazardous waste sites within the Project area.[65]

6.4 Natural Resources

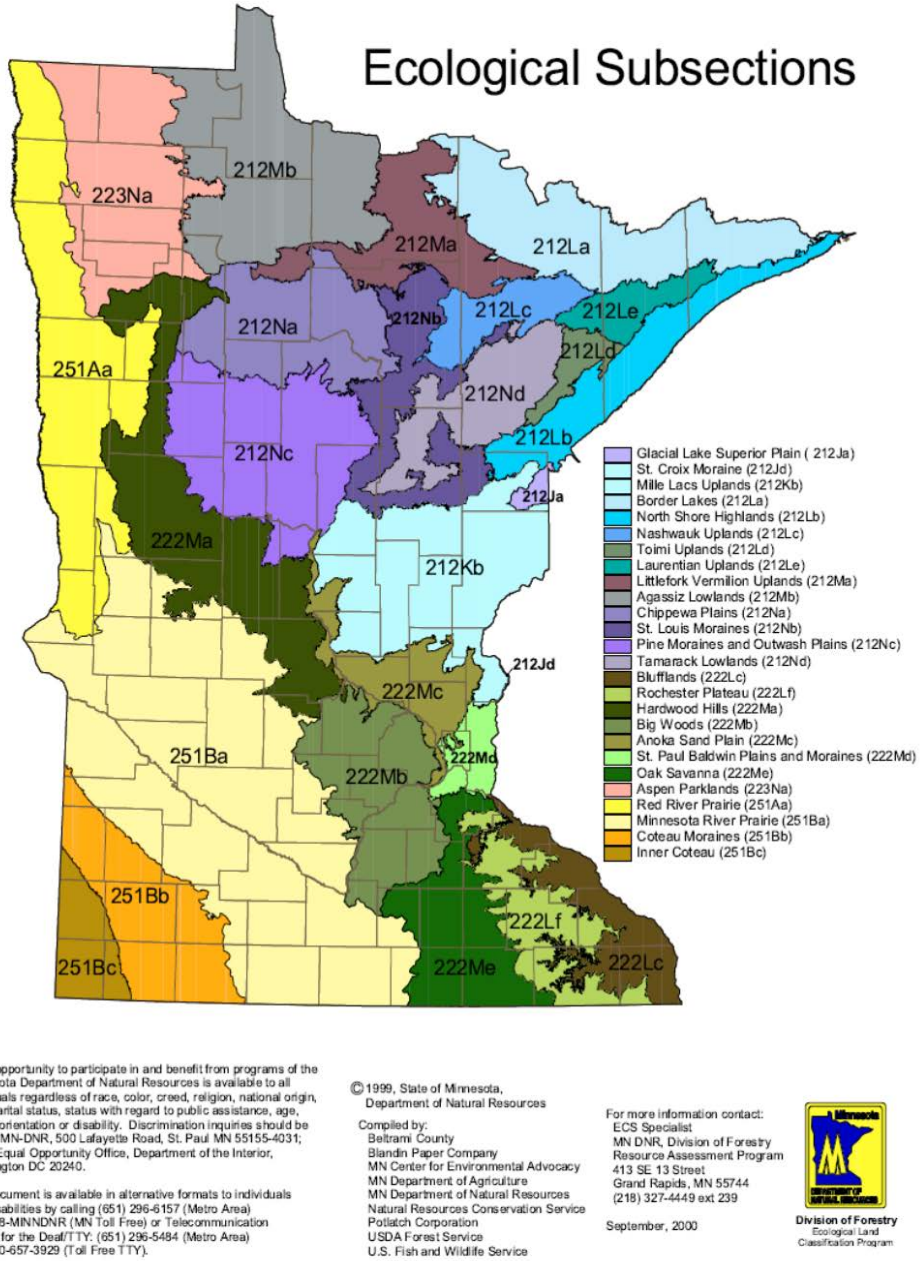
Large electric generation facilities have the potential to impact natural resources, including flora, fauna, habitat, soils and water. This section discusses potential impacts to natural resources from the operation of a generation facility.

6.4.1 Ecological Setting

The Minnesota Department of Natural Resources and the U.S. Forest Service have developed an Ecological Classification System (ECS) for ecological mapping and landscape classification in Minnesota[66] (**Figure 2**). 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.

[64] Very Small Quantity Generator Collection Programs, MPCA, https://www.pca.state.mn.us/sites/default/files/w-hw2-51.pdf
[65] Site Permit Application, P. 45
[66] See MN DNR Ecological Classification System, http://www.dnr.state.mn.us/ecs/index.html

Figure 2. Ecological Subsections of Minnesota



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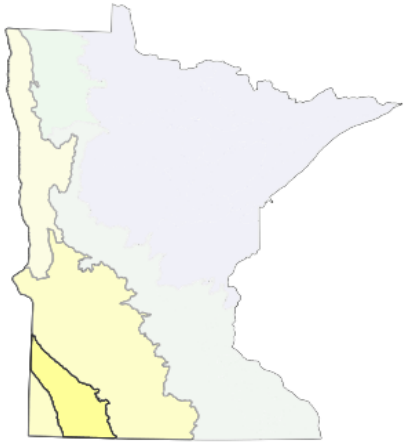
September, 2000

Division of Forestry
Ecological Land Classification Program

Figure 3. Coteau Moraines Subsection



The proposed project area is in the Coteau Moraines Subsection of the Prairie Parkland and Tallgrass Aspen Provinces, a large province extending from Manitoba and covering much of the Midwest.[67] The Coteau Moraines Subsection is located in the southwest corner of Minnesota and includes parts of southeastern South Dakota and northwestern Iowa and is shown in **Figure 3**.[68] Shallow lakes and prairie wetlands are numerous in this Subsection, and are important for waterfowl foraging, resting, and nesting.[69] Today, agriculture is the predominant land use and its expansion and intensification have resulted in water quality and water quantity concerns.[70] Gravel and boulder mining occur in this Subsection, and large-scale wind-power production has expanded dramatically.[71] Many of the remaining prairie-grassland complexes are in private ownership and have been used for grazing, and wetland protection and restoration are important conservation issues.[72]

Nobles 2 Wind Project

The majority of the land use in the project area is agricultural (**Table 7**). Cultivated land comprises approximately 37, 697 acres (89 percent) of the project area. The remaining land cover types comprise ten percent of the cover on the project area.[73] Pasture and grassland areas are fragmented across the project area and forested areas are limited to stream corridors, near lentic water features and around homesteads.

Table 7. Land Cover in the Project Area

Table 7: Land Cover in the Project area		
Land Cover Type	**Total Area (Acres)**	**Percent of Project area**
Cultivated Crops	37,697	88.6
Disturbed/Developed	2,348	5.5
Grassland	1,536	3.6
Wetlands	595	1.4
Forest	261	0.6
Shrub/Scrub	58	0.1
Hay/Pasture	26	0.1
Open Water	6	< 0.1
TOTAL	**42,527**	**100.0**

[67] Id.
[68] Id.
[69] Id.
[70] Id.
[71] Id.
[72] Id.
[73] Site Application, p. 59.

Converting cropland to the CRP and the RIM program is another source of farm income. CRP and RIM lands are cropland planted to conserve grasses and legumes to protect and improve the soil with limited harvesting or pasturing allowed on CRP land. CRP land is generally enrolled for 10-year periods, whereas RIM conservation easements are permanent.[74]

Soil within the Project Area is comprised primarily of silty glacial sediments. Sand and gravel are found along streams. The region is dominated by loamy, well-drained soils with thick, dark surface horizons including Mollisols, Aquolls, and Udols[75]. Two soil associations, the Everly-Sac-Rushmore association and the Webster-Clarion-Nicollet association, are mapped across the majority of the Project Area (**Map 14**).

As with most of the soils in southern and western Minnesota, soils within the project area have a combination of physical and chemical characteristics of Prime Farmland, or Farmland of Statewide Importance, as determined by the USDA NRCS (**Map 13**). Approximately 41 percent of the soil within the project is prime farmland. The USDA Natural Resource Conservation Service identifies prime farmland as land that has the best combination of both physical and chemical characteristics for the production of food, livestock feed and forage, fiber, and oilseed crops and is available for these agricultural uses. Important farmlands consist of prime farmland, unique farmland, and farmland of statewide or local importance (USDA, 2016).[76]

Minnesota Rule 7850.4400 subp. 4 states "No large electric power generating plant site may be permitted where the developed portion of the plant site, excluding water storage reservoirs and cooling ponds, includes more than 0.5 acres of prime farmland per megawatt of net generating capacity, or where makeup water storage reservoir or cooling pond facilities include more than 0.5 acres of prime farmland per megawatt of net generating capacity, unless there is no feasible and prudent alternative."[77] This will not significantly alter crop production in the project area or Nobles County. The proposed project will impact approximately 79 acres of prime farmland and will not exceed the restrictions in the above rule.

Generic 260 MW Wind Project

A generic 260 MW wind project located elsewhere in Minnesota may have different ecological and environmental features (setting) compared to the proposed project. However, LWECS are often sited in areas of the state that provide the greatest wind resources (**Map 19**), which also tend to be in agricultural areas of the state with similar ecological features. It is likely that a 260 MW project would have similar overall impacts as the proposed project with different site specific impacts.

260 MW Solar Farm

While the site selection criteria for LWECS 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 identification analysis for solar farms takes into account the suitability of the specific sites and may include such factors as:

[74] Id.
[75] Site Permit Application, P. 52.
[76] Id.
[77] Minnesota Rule 7850. 4400 Subp 5, https://www.revisor.mn.gov/rules/?id=7850.4400

- 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.
- Local weathering factors – Desert conditions often coincide with excessive dust fall, flooding and flash flooding, high erosion, etc., and these can limit the viability of a site and in many cases can make a site non-viable.
- Proximity to Grid connection- One of the biggest hidden costs of a solar farm is the distance required to connect to the grid.
- Local Transmission Capacity – Careful study must be done if the power grids will be able to handle the excess capacity that a solar farm would introduce.
- Proximity to Main Roads - Proximity of a solar farm to a main road is considered an economic factor as the transportation costs affect the overall cost benefits.
- Conservation and Environmental Impact Issues – Large tracts of undeveloped land too often 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.
- Prime Farmland-since 0.5 acres of prime farmland per megawatt of net generating capacity cannot be removed from agricultural production, it is likely that a solar facility of scale needed to generate 260 MW, would be limited in terms of site selection in areas with significant amounts of prime farmland.

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.

Nobles 2 Wind Project

Historically, the project area and surrounding region contained a variety of natural communities and habitat that supported numerous wildlife species. As the historic vegetation has been replaced with agricultural development, the wildlife species that occupy the landscape reflect changes in habitat type and availability. The most common species in the project area tend to be opportunistic and are able to utilize rural, urban or agricultural habitats.[78] According to the general distribution of wildlife in the region and their habitat preferences a variety of common and widespread species have the potential to occur in the project area at some time during the year. The majority of migratory wildlife species are birds, including waterfowl, raptors and songbirds and migratory bat species.

Local species use the grasslands, farm woodlots, wetlands and other areas for food and cover. Mammals common to this landscape include opossum, skunk, squirrels, rodents, rabbits, deer, fox, coyotes, and raccoons. Reptiles and amphibians are associated with wetlands, waterways and forested stretches

[78] Site Application, P. 66.

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.

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.[79] The potential for habitat avoidance by wildlife in response to wind turbines and associated infrastructure is highly variable depending on the species under consideration, seasonal and annual variation in weather, migration patterns, and local and individual behavior patterns.

State-managed, federally owned, and private lands under permanent conservation easement provide wildlife habitat that has long-term protections from development and encroachment. The Nobles 2 project area (**Map 5**) has a mixture of state-managed Wildlife Management Areas (WMAs) and federally owned Waterfowl Protection Areas (WPAs). These conservation lands are considered to be non-participating, and will be treated as such with respect to setbacks from turbine placement 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 conservation lands within and adjacent to the proposed project.

Birds

The potential for habitat fragmentation impacts as a result of the project is low because the Nobles 2 project area is primarily agricultural and much of the remaining habitat is disturbed. The project is designed to avoid placing turbines and access roads in MNDNR-mapped native prairie, native plant communities, and sites of biodiversity significance.

There are several areas of public and private conservation land, native plant communities and sites of biodiversity significance within the project area that also support wildlife. In general, these areas are concentrated in the central and northcentral parts of the project area, and to a lesser degree, in the southeast part. Larger concentrations of sensitive habitats are located outside the project area, particularly to the northwest along Champepadan Creek.[80]

The Nobles 2 Wind project has the potential to cause displacement of some bird species from the project area 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 project area are common, disturbance-tolerant species, similar to the results of surveys at other wind energy facilities in the region.[81]

The operation of the Nobles 2 project may result in avian mortality from collision with the turbines or other structures. Based on the results of post-construction monitoring at similar facilities located on agricultural landscapes in southern Minnesota, estimated bird carcass rates at the Nobles 2 Wind project would be expected to be within the range reported from studies at other wind facilities in the

[79] Wind Turbine Interactions with Birds, Bats, and their Habitats, National Wind Coordinating Committee, Spring 2010, https://www1.eere.energy.gov/wind/pdfs/birds_and_bats_fact_sheet.pdf
[80] Nobles 2 Bird and Bat Conservation Strategy, Site Permit Appendix G, P. 11.
[81] Site Permit Application, Appendix G, Pp. 16-27.

region (**Tables 8**). No single species or group is expected to experience a disproportionate amount of estimated mortality or impacts of a magnitude to affect the local or migratory population, as reflected in studies completed by Erickson et al.

Table 8. Annual Bird Carcass Rates in Southern Minnesota

Table 8: Annual Bird Carcass Rate Results from Post-construction Monitoring Studies in Southern Minnesota			
Project Name	**State**	**Estimated Bird Carcasses/ Megawatt/Year**	**Source**
Buffalo Ridge (Phase I; 1996)	MN	4.14	Johnson et al., 2000
Buffalo Ridge (Phase I; 1997)	MN	2.51	Johnson et al., 2000
Buffalo Ridge (Phase I; 1998)	MN	3.14	Johnson et al., 2000
Buffalo Ridge (Phase I; 1999)	MN	1.43	Johnson et al., 2000
Buffalo Ridge (Phase II; 1998)	MN	2.47	Johnson et al., 2000
Buffalo Ridge (Phase II; 1999)	MN	3.57	Johnson et al., 2000
Buffalo Ridge (Phase III; 1999)	MN	5.93	Johnson et al., 2000
Elm Creek	MN	1.55	Derby et al., 2010b
Elm Creek II	MN	3.64	Derby et al., 2012
Moraine II	MN	5.59	Derby et al., 2010c
Lakefield 2012	MN	2.75	Westwood, 2013
Lakefield 2014	MN	1.07	Westwood, 2015
Prairie Rose (2013)	MN	0.44[1]	Chodachek et. al, 2014
Big Blue, Grand Meadow, and Oak Glen (2013)	MN	0.3-0.5[2]	Chodachek et. al, 2014

[1] estimate per study period (April 15 – June 15 and fall August 15 – October 31)

[2] estimate per study period (July – October 31, 2013). Due to the focus of the study on bat fatalities, bird fatality estimates are not comparable with regional or national estimates.

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 project area. 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 134,000 to 327,000 birds per year.[82]

Bald eagle collisions with wind turbines are of additional concern as bald eagles populations continues to grow and expand throughout Minnesota. Bald eagles are afforded additional protections under the Bald and Golden Eagle Protection Act (BGEPA), which is administered by the USFWS.

Bald eagles are present seasonally in the project area.[83] The nearest occupied bald eagle nest is nearly 9 miles from the project boundary as seen on **Maps 17 and 18**. Mean eagle use within the project area is relatively low (0.001 eagles per hour), as a total of five bald eagles were observed, four of which were observed flying below 200 meters. While bald eagles nest within the region, the nesting density for the

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

[83] Site Application, P. 79.

species is relatively low. The nearest occupied nest of bald eagles was nearly 9 miles from the project area. There is little foraging opportunity within and near the project area, compared to foraging habitat elsewhere in the region.

Nobles 2 is unlikely to impact migrating and resident bald eagles that may be foraging or nesting in the general region. Risks to bald eagles are expected to be low to moderate for the project due to a combination of moderately low mean use rates; observed flight below 200 meters; lack of suitable trees for nesting, roosting and perching within the project area, and/or few to no records of fatalities at other wind facilities with publicly available data. [84]

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 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.[85]

Bat species present in Minnesota include the hoary bat, eastern red bat, big brown bat, silver-haired bat, tri-colored bat, little brown bat, northern long-eared bat, and evening bat. 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.

The Applicant conducted bat acoustic surveys from May through October 2016. Bat passes were observed at the following locations: 631 bat passes were detected at Met Tower 6, 462 bat passes at Met Tower 7, 23 bat passes at Met Tower 7 Temp(temporary location), and 2,908 bat passes at Met Tower 0734. Six species and six species groups were documented. The hoary bat composed the greatest proportion of bat passes (Exhibit 4-11). This was followed by the UNKLOW group (which was composed of potential calls by the silver-haired, big brown, hoary bat, and the big brown bat).

Special-status bat species detected included the little brown bat, big brown bat, and tricolored bat. While each of these species has been reported among fatalities at operating wind energy developments across the United States (Arnett and Baerwald 2013, Arnett *et al.* 2008), the project is designed to be a low-risk site for bats. The absence of topography, unique habitats or resources, or other features that could concentrate bats or bat activity in the project area.[86] No indicators of high bat risk in the Project area (e.g., impacts to roost trees or hibernaculum, high volume use as a migration corridor, etc.) were discovered during either the SCS (Tier 2 of the WEG) or the annual passive acoustic bat monitoring. Impacts are not expected to adversely affect populations.[87]

It is presumed that 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

[84] Id.
[85] Wind Turbine Interactions with Birds, Bats, and their Habitats, National Wind Coordinating Committee, Spring 2010, https://www1.eere.energy.gov/wind/pdfs/birds_and_bats_fact_sheet.pdf
[86] Site Application, P. 79
[87] Id.

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 Nobles 2 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.[88]

Table 9. Annual Bat Carcass Rates in Southern Minnesota

Table 9: Annual Bat Carcass Rate Results from Post-construction Monitoring Studies in Southern Minnesota			
Project Name	**State**	**Estimated Bat Carcasses/ Megawatt/Year**	**Source**
Buffalo Ridge (Phase I; 1999)	MN	0.74	Johnson et al., 2000
Buffalo Ridge (Phase II; 1998)	MN	2.16	Johnson et al., 2000
Buffalo Ridge (Phase II; 1999)	MN	2.59	Johnson et al., 2000
Buffalo Ridge (Phase III; 1999)	MN	2.72	Johnson et al., 2000
Buffalo Ridge (Phase II; 2001/Lake Benton I)	MN	4.35	Johnson et al., 2004
Buffalo Ridge (Phase II; 2002/Lake Benton I)	MN	1.64	Johnson et al., 2004
Buffalo Ridge (Phase III; 2001/Lake Benton II)	MN	3.71	Johnson et al., 2004
Buffalo Ridge (Phase III; 2002/Lake Benton II)	MN	1.81	Johnson et al., 2004
Elm Creek	MN	1.49	Derby et al., 2010b
Elm Creek II	MN	2.81	Derby et al., 2012
Moraine II	MN	2.42	Derby et al., 2010c
Lakefield 2012	MN	19.87	Westwood, 2013
Lakefield 2014	MN	20.19	Westwood, 2015
Prairie Rose (2013)	MN	0.41[1]	Chodachek et. al, 2015
Big Blue (2013)	MN	6.33	Chodachek et. al, 2014
Grand Meadow (2013)	MN	3.11	Chodachek et. al, 2014
Oak Glen (2013)	MN	3.09	Chodachek et. al, 2014

[1] estimate per study period (April 15 – June 15 and fall August 15 – October 31)

Generic 260 MW LWECS

Because impacts to wildlife would depend upon specific site characteristics, it is difficult to assess wildlife impacts for a generic 260 MW LWECS 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.

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

260 MW Solar Farm

As with LWECS, 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.

A 260 MW solar farm likely would be sited on agricultural land and similar types of wildlife common to disturbed areas, such as Nobles 2, would be expected. 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. The wildlife species found near these agricultural lands do not generally require specialized habitats and are able to find suitable habitat nearby, and would only be displaced a short distance.

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. Some fences have openings 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 260 MW solar farm would have fewer impacts on avian and bat species than a LWECS project due to its low profile and near-static nature of the component parts. A National Fish and Wildlife Forensics Laboratory report[89] 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 LWECS sites generally incorporate a combination of micro-siting and best management practices, including:

- Avoid and minimize siting turbines in MNDNR-mapped native prairie, native plant communities, and sites of biodiversity ranked below, moderate, high, or outstanding;
- Maintain, at a minimum, the three by five times the RD setback from WMAs and WPAs to reduce the risk to waterfowl/waterbirds and grassland-associated birds;

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

- Avoid and minimize disturbance of wetlands or drainage systems during construction. Use wetland delineations to inform the project layout, including towers, electric feeder and collector lines, and access roads;
- Protect existing trees and shrubs by avoiding tree removal for turbines, access roads, and collection lines;
- 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 silt fencing, temporary seeding, permanent seeding, mulching, filter strips, erosion blankets, grassed waterways, and sod stabilization;
- Construct wind turbines using tubular monopole towers;
- Minimize turbine lighting in accordance with FAA requirements;
- Re-vegetate non-cropland and pasture areas disturbed during construction or operation with an appropriate native seed mixes;
- Inspect and control noxious weeds in areas disturbed by the construction and operation of the project; and
- Prepare and implement a Bird and Bat Conservation Strategy (BBCS). The BBCS should consist of the utilities' corporate standards for minimizing impacts to avian and bat species during the construction of LWECS projects. It must be developed based on the USFWS WEG (USFWS, 2012). It should include commitments to wind farm siting, construction practices and design standards, operational practices, permit compliance, construction and operation worker training, and post-construction wildlife monitoring commitments. It should also include additional avoidance and minimization measures that may be implemented in coordination with the USFWS and MNDNR if avian and bat fatalities exceed an acceptable level.

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.[90] Curtailment of turbines has been found to effectively reduce bat fatalities by a minimum of 50 percent by raising operational cut-in speeds.[91]

The most likely impacts to wildlife due to the development of solar farms arise from the changes to the existing habitat (i.e., vegetation loss, species composition, and fragmentation) and displacement (i.e., altered species behavior) from the areas on and around development.

The siting of solar facilities in locations that avoid or minimize impacts to known wildlife movement corridors can minimize impacts to wildlife; requiring Biological and Natural Resource Inventories for the identification of any known wildlife movement corridors should be considered.

Planting wildflower meadows and restoring natural grasslands in the "unused" margins between solar panel rows to attract insects, bees, and butterflies to the sites may provide food and nesting spots for birds.

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

Avoiding the use of photodegradable erosion-control materials where possible and using biodegradable materials (typically made from natural fibers) instead, preferably those that will 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 include those impacts which are temporary; once the construction activity (i.e., 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 of wind turbines and associated facilities, such as collector and feeder lines, access roads, 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 through 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 on vegetation from removal of vegetation, localized physical disturbance, and compaction caused by the use of equipment. Such impacts on vegetation would be short-term and more localized than construction-related impacts.

Nobles 2 Wind Project

The Nobles 2 Project area is located in the Coteau Moraines subsection of the Prairie Parkland Province.[92] Pre-settlement vegetation in the Project Area and the surrounding consisted primarily of tallgrass prairie interspersed with scattered areas of wet prairie and woodland found along stream and river margins. The project area, much like most of southwestern Minnesota has largely been converted to farmland and used for crops, livestock, and pasture.

Based on the USGS National Land Cover Database, land cover in the Project area is primarily cultivated crops, which account for 89 percent of the land cover in the area. For the most part, pasture and grassland areas are fragmented across the Project area and forested areas appear limited to stream corridors, near lentic water features, and around homesteads.[93] Land cover in the project area is shown in **Table 10** and **Map 12.**

[92] Site Permit Application P. 59.
[93] Id.

Table 10. Land Cover in the Project Area

Table 10: Land Cover in the Project area		
Land Cover Type	**Total Area (Acres)**	**Percent of Project area**
Cultivated Crops	37,697	88.6
Disturbed/Developed	2,348	5.5
Grassland	1,536	3.6
Wetlands	595	1.4
Forest	261	0.6
Shrub/Scrub	58	0.1
Hay/Pasture	26	0.1
Open Water	6	< 0.1
TOTAL	**42,527**	**100.0**

The MNDNR maps native prairie and native plant communities in Yellow Medicine County. Both native prairie and native plant communities are also designated as MNDNR sites of biodiversity significance. A site's biodiversity 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. Sites are ranked from A-D, where A represents communities of the highest ecological integrity and D represents those with the lowest. There are four biodiversity significance rankings, outstanding, high, moderate, and below.[94]

The MNDNR also applies a conservation status rank to native plant communities (i.e., common to critically impaired) that reflects their relative rarity and endangerment in Minnesota. There are two prairie community types within the Project area located along the northwest edge of the Project Area and in the southeast corner of the Project Area (Map 16) and cover approximately 32 acres (**Table 11**). Although they have fair to poor ecological integrity and have been significantly altered and degraded by human activity or invasive species (MNDNR 2014). The prairie native plant communities within the Project Area have an imperiled status rank due to the rare presence of these community types in the state.

Table 11. MNDNR Native Plant Communities in the Project Area

Table 11: MNDNR Native Plant Communities within the Project Area		
Native Plant Community Type	**Condition Rank**	**Records**
Dry Hill Prairie (Southern)	C, D, NR	7
Prairie Wetland Complex	NR	2
Total	**--**	**9**

There is a large native plant community complex approximately 6.5 miles northwest of the Project area associated with Chanarambie Creek.[95]This complex includes several types of plant communities and

[94] Id.
[95] Site Permit Application, P. 60

contains communities with condition rankings of A and B. An additional complex is located north of the Project Area associated with Badger Lake and Lime Creek and similarly contains several records of high integrity communities.[96]

Based on MNDNR data there are no railroad right-of-way prairies in the Project area. In addition, land cover mapping indicates that grassland and pasture areas account for less than four percent of the Project Area and are highly fragmented across the Project. Native plant community data indicates the presence of native prairie remnants within the Project area and there is the potential for additional native prairie remnants to be identified. Field surveys of identified potential native prairie areas will be conducted in the future as part of Project siting and planning.[97]

The Project area does contain Minnesota Biological Survey sites (MBS) and sites of biodiversity significance (SBS). These sites represent areas with varying levels of native biodiversity that may contain high quality native plant communities, rare animals, and/or animal aggregations. A biodiversity significance rank is assigned based on the number of rare species, the quality of the native plant communities, size of the site, and context within the landscape. Sites characterized as "below" lack occurrences of rare natural features and rare species but offer conservation value at the local level. Sites considered "moderate" can contain rare features and species but are likely disturbed.

There are approximately 956 acres of SBSs located within the Project Area, of which 818 acres (86 percent) are classified as "below the minimum biodiversity significance threshold" and 133 acres (14 percent) are classified as "moderate biodiversity significance" (**Table 12**). The SBS sites within the Project Area encompass mapped MNDNR native plant communities, which are located primarily along stream corridors, and buffer lake and wetland complexes (**Map 16**).

Table 12. MBS Sites of Biodiversity Significance

Table 12: MBS Sites of Biodiversity Significance in the Project Area		
Biodiversity Significance	No. of Sites	Acres
MBS site below minimum biodiversity significance threshold	17	818
MCBS site with moderate biodiversity significance	6	133
MCBS site with High biodiversity significance	1	5
Total	24	956

In addition, one site rated as "high" is located adjacent to the northwest boundary of the Project Area. Additional MBS sites of biodiversity significance rated as "high" and "outstanding" are located within 10-miles to the northwest and north of the Project Area, respectively and encompass the native plant communities associated with Chanarambie Creek, Badger Lake, and Lime Creek.

[96] Id.
[97] Site Permit Application, P. 61.

Based on the ecological significance of moderately and highly ranked MBS sites, the MNDNR recommends avoidance of these areas within the Project Area. In addition, the MNDNR recommends avoidance of any "below" ranked MBS sites that contain native prairie.

Construction and operation of the proposed Nobles 2 Project would result in direct and indirect impacts to vegetation communities within the Project Area. 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.

Vegetation would be removed as a result of surface disturbing activities associated with blading, grading, vehicular traffic, and trenching. Construction would result in the disturbance of approximately 115 acres of vegetation **(Table 13)**. This includes approximately 111 acres of cultivated crops, 3 acres of disturbed/developed, 1ess than 1 acre of grassland, and 1 acre of wetland.

Table 13. Land Cover Impacts

Table 13: Land Cover Impacts	
Land Cover Type	**Total Area Impacted (Acres)**
Cultivated Crops	111.1
Disturbed/Developed	2.7
Grassland	0.7
Wetlands	1.0
TOTAL	**115.5**

Areas adjacent to the proposed wind turbine generator pad sites, access roads, and underground electrical collection system would experience temporary disturbance associated with equipment access, materials, stockpile locations, and workspace requirements. Indirect impacts would include the increased potential for soil compaction, establishment and spread of noxious weeds, and an increased potential for wind and water erosion of disturbed surfaces prior to reclamation.

It is expected that over 96 percent of all direct and indirect impacts to vegetation would be minor in extent and limited to cultivated cropland. To the extent practicable, direct and indirect impacts to natural vegetation communities will be avoided and minimized. Proposed turbine locations will be sited primarily on agricultural lands and access roads will be sited and connected to public roads while avoiding woodlands, shrub land, grasslands, and water resources to the extent practicable. Similarly, it is anticipated that collection lines can be also be sited to avoid such resources. Further, implementation of the recommended and required mitigation measures for vegetation would further act to avoid or minimize the potential for affecting sensitive natural communities and reduce the impact to a less than significant level.

Generic 260 MW LWECS

The potential impacts to vegetation, including native prairie, native plant communities, and sites of biodiversity significance, are difficult to assess for a generic 260 MW LWECS located elsewhere in

Minnesota without a full understanding of the project's environmental setting and site specific information.

260 MW Solar Farm

As with LWECS, 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 170 acres required grading (i.e., cut and fill).[98] 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 LWECS.

Land cover type impacts are an important metric because it is often used as a proxy for other effects. Changes in land cover type may indicate a loss of agricultural productive lands, habitat fragmentation and changes wildlife behavior and damage to ecological function.

Mitigation

In both LWECS 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.

Preparation and development of a Vegetation Management Plan, in consultation with resources agencies, is a common requirement of Commission issued site permits. If sensitive plants or communities are identified during plant surveys, individual avoidance (i.e., micro siting) and minimization measures 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.

In order to minimize impacts to natural vegetation communities, Nobles 2 has incorporated the following mitigation measures into the siting, construction, operations and decommissioning phases of the proposed Project.

- Project siting minimized impacts to native habitats to the maximum extent practicable;

[98] Environmental Assessment. North Star Solar PV, LLC Project, eDocket No. IP6943/GS-15-33

- Turbines were sited in agricultural fields to minimize impacts to grassland, forest, wetland and other native vegetation communities.

- For the proposed turbine layout, all native prairie will be avoided to the maximum extent practicable.

- Creation of new roads will be minimized to the maximum extent practicable and to accommodate landowner preferences;

- Existing roads or farm lanes will be utilized to the extent practical

- Approximately 24 miles of new service roads will be created to connect wind turbines to existing access roads.

- The permanent footprint of new access roads will be 16 feet in width to minimize disturbance to surrounding vegetation.

- Clearing and construction practices will reduce soil disturbance and allow for the reestablishment of natural vegetation;

- All construction equipment will be restricted to designated travel areas to minimize ground disturbance.

- Vegetation removal will be limited to the minimum area needed to construct the proposed Project and will be restricted in environmentally sensitive areas. During construction, travel and equipment staging will be restricted to designated access roads and work areas to minimize disturbance to nearby vegetation. The extent of these areas will be shown on the construction plans and clearly demarcated in the field with stakes, flagging, or fencing.

- Construction clearing for storage yards, staging areas, or temporary roads not needed for long-term operation of the Project will be allowed to revegetate after commissioning of the Project.

- If installed turbines require substantial maintenance involving large cranes or other heavy equipment, the same measures used during construction to limit clearing of vegetation and disturbance of soil will be used.

- BMPs will be used to avoid the introduction and spread of invasive species;

- Construction vehicles and equipment that arrive from other areas will be regularly cleaned.

- Following construction, depending on seed availability and landowner preferences, non-agricultural areas will be re-seeded and stabilized using native seed to restore natural habitat. Re-seeding will be consistent with State requirements to avoid the introduction of invasive plant species.

- Decommissioning activities will avoid additional site disturbances and removal of native vegetation to the extent practicable.

- Foundations will be removed to a depth of 4 feet below the surrounding grade and covered with soil to allow for reestablishment of native plants or crops or as otherwise prescribed by conditions specified in the Site Permit.

- If topsoil is removed during decommissioning, it will be stockpiled and used as topsoil for replanting. Once decommissioning activities are complete, topsoil will be restored, reseeded, and stabilized.

- Erosion and sediment control measures will be implemented in all disturbance areas where potential for erosion exists, consistent with storm water management objectives and requirements.

6.4.4 Rare and Unique Natural Resources

The Minnesota Biological Survey (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 delivers baseline data on the distribution and ecology of rare plants, rare animals and native plant communities.[99] 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.[100]

Bald eagle collisions with wind turbines are of additional concern as bald eagles populations continues to grow and expand throughout Minnesota. 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.

Nobles 2 Wind Project

Six special-status plant species and 32 special-status animal species were identified as potentially occurring within the project area and surrounding region. These species, including their status, general habitat requirements, and potential to occur within the Project area are presented in **Table 14**. Of these, five animal species have a "moderate" potential to occur in the project vicinity. The remaining species listed as "low" are not expected to occur on or adjacent to the project due to specific habitat requirements that are not found in the project area.

[99] Minnesota County Biological Surveys, http://www.dnr.state.mn.us/eco/mcbs/index.html
[100] Minnesota Natural Heritage Information System Database, http://www.dnr.state.mn.us/eco/nhnrp/nhis.html

Table 14. Special-Status Plant and Animal Species Likely to Occur

Table 14: Special-Status Plant and Animal Species with the Potential to Occur within the Project area and Surrounding Region			
Common Name *(Scientific Name)*	**Status (Federal/State)**	**General Habitat Requirements**	**Potential for Occurrence**
Mammals			
Gray Wolf (*Canis lupus*)	FT/--	Habitat generalists – found in prairies, forests, mountains, etc.	Low
Least Weasel (*Mustela nivalis*)	--/SC	Meadows, grasslands, and shrubby areas, most population data comes from northwest corner of MN. Sensitive to agricultural changes to the environment.	Low
Northern Grasshopper Mouse (*Onychomys leucogaster*)	--/SC	Prairies and plains with limited vegetation, often displaced by human activity due to territorial nature.	Moderate
Western Harvest Mouse (*Reithrodontomys megalotis*)	--/SC	Grasslands and overgrown fields.	Moderate
Little Brown Bat *(Myotis lucifigus)*	--/SC	Day roosts in man-made structures, caves, and hollow trees. Hibernates in caves and mines. Susceptible to white-nose syndrome.	Present
Big Brown Bat *(Eptesicus fuscus)*	--/SC	Day roosts in man-made structures, caves, and hollow trees. Hibernates in caves and mines. Susceptible to white-nose syndrome.	Present
Tri-colored Bat *(Pipistrellus subflavus)*	--/SC	Hibernates in caves, mines, and tunnels. Roosts in tree branches and under bark. No maternal colonies known to exist in MN. Susceptible to white-nose syndrome.	Present
Northern Long-eared Bat (*Myotis septentrionalis*)	FT/SC	Hibernates in caves, mines, and manmade structures. Days roosts under tree bark in wooded areas; often around wetlands. Will also use abandoned structures. Night roosts in caves and mines. Susceptible to white-nose syndrome. No known hibernaculum or roost tree has been identified in Nobles or Murray County.	Low
Birds			
American White Pelican (*Pelecanus erythrorhynchos*)	--/SC	Lakes, marshes, salt bays. In breeding season mostly inland, nesting on isolated islands in lakes and feeding on shallow lakes, rivers, marshes. Feeding areas may be miles from nesting sites.	Present
Bald Eagle (*Haliaeetus leucocephalus*)	BGEPA/--	Lakes, rivers, and deep marshes; will forage in open grasslands. Nest in perched areas like large trees and cliffs.	Present
Burrowing Owl	--/SE	Grazed pastures, and mixed grass prairies,	Low

(*Athene cunicularia*)		usually avoid intense agriculture. Uses rodent colonies for nesting burrows.	
Common Gallinule (*Gallinula galeata*)	--/SC	Cattail-bulrush marshes, sensitive to disturbance.	Low
Forster's Tern (*Sterna forsteri*)	--/SC	Wetland complexes with open water and emergent areas. Nest on muskrat houses, sensitive to disturbance and chemical contamination.	Low
Franklin's Gull (*Leucophaeus pipixcan*)	--/SC	Prairies, inland marshes; in winter, coasts, ocean. Nests on prairie marshes where habitat is extensive and water is fairly deep; forages during summer and migration over agricultural fields, prairie, flooded pasture, marshes, estuaries.	Present
Loggerhead Shrike (*Lanius ludovicianus*)	--/SE	Upland grassland with small trees and shrubs, can be found in pastures, old fields, farmyards, and cemeteries.	Present
Purple Martin (*Progne subis*)	--/SC	Historically inhabited areas along forest edges and nested in woodpecker holes. They are now found nesting predominately in and near cities with nesting boxes and forage in pastures, parks, and other open spaces.	Present
Trumpeter Swan (*Cygnus buccinator*)	--/SC	Small ponds and lakes with extensive cattail and bulrush populations and a mixture of open water and emergent vegetation. Sensitive to disturbance and pollution.	Present
Wilson's Phalarope (*Phalaropus tricolor*)	--/ST	Wet prairie, fens, and sedge/grass dominated wetlands with mosaic of open water and short vegetation. Sensitive to degradation of water quality.	Present
Dickcissel (*Spiza americana*)	BCC/--	Alfalfa and other fields; meadows, prairies. Originally nested in native prairies and meadows. Today, many nest in fields of alfalfa, clover, timothy, or other crops.	Present
Red-headed Woodpecker (*Melanerpes erythrocephalus*)	BCC/--	Groves, farm country, orchards, shade trees in towns, large scattered trees. Avoids unbroken forest, favoring open country or at least clearings in the woods. Forest edges, orchards, open pine woods, groves of tall trees in open country are likely habitats.	Present
Solitary Sandpiper (***Tringa solitaria***)	BCC/--	Streamsides, wooded swamps and ponds, fresh marshes. In migration generally along shaded streams and ponds, riverbanks, narrow channels in marshes.	Present
Swainson's Hawk (***Buteo swainsoni***)	BCC/--	Plains, dry grassland, farmland, ranch country. Breeds most commonly on northern Great Plains, in prairie regions with scattered	Present

		groves of trees for nest sites.	
Upland Sandpiper (*Bartramia longicauda*)	BCC/--	Grassy prairies, open meadows, fields. Favored nesting habitat is native grassland, with mixture of tall grass and broad-leafed weeds.	Present
Reptiles			
Blanding's Turtle (*Emydoidea blandingii*)	--/ST	Wetland complexes and adjacent sandy uplands, calm waters with abundant vegetation. Will also use shallow streams and oxbows, prairie marshes, and agricultural fields.	Moderate
Amphibians			
Blanchard's Cricket Frog (*Acris blanchardi*)	--/SE	Shallow lakes and wetlands, streams and rivers with emergent vegetation; pollution sensitive.	Low
Fish			
Plains Topminnow (*Fundulus sciadicus*)	--/ST	Spring-fed pools and backwaters of clear to moderately turbid waters with sand or rock bottoms and dense vegetation.	Moderate
Topeka Shiner (*Notropis Topeka*)	FE/SC	Prairie rivers and stream pools and oxbows with sand or gravel bottoms.	Moderate
Insects			
Dakota Skipper (*Hesperia dacotae*)	FT/SE	Dry to dry-mesic native prairie with mid-height grasses with some topographic variability.	Low
Iowa Skipper (*Atrytone arogos iowa*)	--/SC	Dry to dry-mesic native prairie with big and little bluestem.	Low
Phlox Moth (*Schinia indiana*)	--/SC	Native upland prairie with prairie phlox.	Low
Powershiek skipperling (*Oarisma powershiek*)	FE/SE	Wet to dry native prairie; sites with non-native grasses are unsuitable.	Low
Regal Fritillary (*Speyeria idalia*)	--/SC	Native upland and wet prairie. Feed only on violets, especially bird's-foot violet.	Low
Plants			
Prairie bush clover (*Lespedeza leptostachya*)	FT/ST	Mesic to dry-mesic native prairie with well-drained soils. Often found on N, NE, and NW facing slopes in concave areas of the mid-slope and areas used as pasture.	Low
Prairie Moonwort (*Botrychium campestre*)	--/SC	Dry, dry hill, dry bedrock bluff, and sand gravel prairies with predominantly native species.	Low
Rattlesnake-master (*Eryngium yuccifolium*)	--/SC	Habitat range is broad but in MN found almost exclusively in dry to moist prairies.	Low
Red Three-awn (*Aristida purpurea*)	--/SC	Dry and dry-mesic prairies with well-drained soils dominated by grasses. Commonly found	Low

		on ridge crests and upper hillslopes and in areas degraded by grazing.	
Sullivant's Milkweed (*Asclepias sullivantii*)	--/ST	Remnant mesic tallgrass prairie; sensitive to pollution and disturbance.	Low
Western Prairie Fringed Orchid (*Platanthera praeclara*)	FT/--	Mesic to wet tallgrass prairies and meadows, also found in old fields and ditches. Depend on hawkmoth for pollination; thus they are uncommon in areas with insecticide use.	Low

Generic 260 MW LWECS
A generic 200 MW LWECS 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.

260 MW Solar Farm
A solar farm would likely have fewer impacts to rare and unique natural resources if it is sited entirely on agricultural land. By occupying a single location rather than being dispersed across thousands of acres, opportunities for conflict with rare and natural resources would be reduced. Additionally, a biomass plant could also be sited to avoid unique habitats and would utilize construction practices that would avoid or minimize disturbances to wetlands or drainage systems.

Mitigation
The following measures would help prevent potential impacts to rare and unique natural resources in the Project area.

- Conduct a pre-construction inventory of existing biological resources, native prairie and wetlands in the Project area to inform micrositing;
- Avoid or minimize disturbance of individual wetlands or drainage systems during construction of the Project; and
- Avoid or minimize placement of turbines in high quality native prairie and MBS “Sites of Biodiversity Significance” ranked as “Outstanding,” “High” or “Medium.”

The DSP currently identifies the following Conditions and to monitor and mitigate the potential impacts on rare and unique natural resources:

- Condition 4.7 – The Permittee shall prepare a Prairie Protection and Management Plan in consultation with MN DNR.
- Condition 7.5.1 – Includes requirements to maintain an updated ABPP in coordination with MN DNR, USFWS, and the Commission, quarterly and immediate incident reporting, and utilizing operational software that can adjust turbine cut-in speeds.

6.5 Human and Social Environment

LWECS 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 this wind project is being proposed

to be set is rural and predominately agricultural. From a larger landscape perspective there are already a number of commercial wind turbines operating to the south and southwest of the Project area.

6.5.1 Demographics

Nobles 2 Wind Project

The Project is located in southwestern Minnesota in a rural agricultural region within Nobles County. The 2010 census population for Nobles County was 21,378. Based on the more recent U.S. Census 2012-2016 American Community Survey (ACS) 5-Year Estimates, the population estimate was 21,729, an increase of 1.6 percent. The household size for Nobles County based on the 2010 Census data was 2.64 people, with 8,565 housing units. Household incomes in Nobles County remain relatively competitive with the state average, with the percentage of the Nobles County population below the poverty line similar to the state average (**Table 15**).

Table 15. Population and Economic Characteristics

Table 15: Population and Economic Characteristics					
Location	**Population**	**Housing Units**	**Non-White Population**	**Per Capita Income**	**Persons with Income Below poverty Level (%)**
Nobles County	**21,729**	**8,565**	**20.2%**	**$24,188**	**14.10%**
City of Wilmont	405	180	3.5%	$23,163	12.90%
Bloom Township	161	72	0.0%	$33,200	5.80%
Larkin Township	191	86	2.1%	$42,772	1.90%
Leota Township	396	181	0.5%	$30,386	5.60%
Lismore Township	178	105	1.1%	$26,803	1.60%
Summit Lake Twn.	328	170	0.9%	$28,945	4.90%
Wilmont Twn.	187	56	4.3%	$36,430	0.00%

Nobles County has a 20 percent non-white population, although the non-white population within the project area is significantly smaller than the county as shown in **Table 15**. Based on the low non-white population and the relatively low poverty level in the project area, neither population will be disproportionately affected. No environmental justice concerns are anticipated.

The human and social environment/demographics data for Nobles County and the surrounding Minnesota counties, Rock County (west), Pipestone County (northwest), Murray County (north), Cottonwood County (northeast) and Jackson County (east) show significant similarities (**Table 16**). Nobles County has the greatest population at 21,729 compared with the other counties populations ranging between 8,463 (Murray County) and 11,557 (Cottonwood County). The population of Nobles County is larger because it contains the only significant city (Worthington) in the six county area. The population of Worthington is 13,036.[101] The population of the remainder of the county is 8,693, placing it within the range of the other counties.

[101] US Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

The counties are similar in size, with three counties being approximately 720 square miles in area, and the two smallest counties each having approximately 475 square mile areas. The population density of the counties ranges from 14 people per square mile to 30 people per square mile. Comparing the rural areas (townships) shows a much smaller range of population density of 4.5 to 11 people per square mile. The townships are very uniform in size, averaging approximately 36 square miles in size. The populations range from 154 to 396. Wilmont Township, where the Project is centered, has a population of 187 and a population density of 5.27 people per square mile.

Table 16. Regional Population Density

Table 16: Regional population Density			
	Total Population	Total Number of Housing Units	Population Density/Square Mile
State of Minnesota	5,450,868	2,382,855	62.69
Nobles County, Minnesota	21,729	8,565	30.05
Bloom Township	161	72	4.48
Larkin Township	191	86	5.34
Leota Township	396	181	10.94
Lismore Township	178	105	4.97
Summit Lake Township	328	170	9.09
Wilmont Township	187	56	5.27
City of Wilmont	405	180	355.58
Murray County, Minnesota	8,463	4,589	11.75
Fenton Township	167	58	4.66
Iona Township	154	60	4.36
Moulton Township	202	69	5.74
Rock County, Minnesota	9,554	4,253	19.78
Pipestone County, Minnesota	9,285	4,453	19.92
Cottonwood County, Minnesota	11,557	5,399	17.81
Jackson County, Minnesota	10,163	5,005	14.13

Generic 260 MW LWECS

The potential impacts on the host community of a generic 260 MW LWECS, located elsewhere in Minnesota, is dependent on the social and economic characteristics of the local population and surrounding area. Due to the set-back requirements for LWECS, these projects are generally located in rural, agricultural areas with relatively low population densities. A generic wind farm of similar capacity would have similar land requirements as the proposed project.

260 MW Solar Farm

As with LWECS, impacts on the host community of a 260 MW solar farm would be dependent on the social and economic characteristics of the local population and surrounding area. There would be a

short-term influx of contractor employees during construction of the various aspects of the solar farm (North Star solar farm developer estimated 250-300 jobs during the construction phase and up to 12 permanent employees for operation/maintenance).[102]

The solar farm would pay property taxes and production taxes to local governments in accordance with state and county law (North Star's estimated annual electricity production of approximately 200,000 MWh, the production tax would produce approximately $240,000 annually for local governments).[103]

For a solar project to meet the same amount of direct energy output as the Project would require more than 570 MW of nameplate capacity covering more than 2,850 acres of land.[104] The larger foot print of a solar project would remove a significantly greater acreage of land from agricultural production than a wind project of the same energy output over the life of the project (approximately 25 years). Nobles 2 will remove approximately 110 acres from agricultural production compared to 800 acres for the 100 MW North Star Solar project.[105]

Mitigation
For Nobles 2, no mitigative measures are proposed; 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 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 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

[102] Environmental Assessment. North Star Solar PV, LLC Project, eDocket No. IP6943/GS-15-33
[103] Id.
[104] Certificate of Need Application, P. 24.
[105] Environmental Assessment. North Star Solar PV, LLC Project, eDocket No. IP6943/GS-15-33

viewing angle and viewer position relative to a feature or area, can also be contributing factors to viewer exposure.

Nobles 2

The proposed project would alter the current landscape through the introduction of large wind turbines. 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. Nobles 2 would be located in a predominantly rural, agricultural area characterized by flat to gently rolling topography. Numerous commercial wind farms are located in the immediate area and surrounding area, including the Nobles Wind Farm.

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.[106] 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.

Some of the proposed turbines will be within the viewshed of public lands within and adjacent to the Project area as shown on **Map 16**. WMAs, SNAs, WPAs, and wildlife refuges provide recreational opportunities in a passively managed, natural landscape. Public lands provide numerous benefits, including aesthetic and visual. Recreational users would likely see turbines from these areas, potentially diminishing qualities of perceived remoteness and scenic value.

Southwestern Minnesota has experienced substantial wind energy development. Of the counties that are adjacent to Nobles County, Murray County has seen the most wind development as shown in **Map 7**. As of 2016, Nobles County has approximately 184 installed turbines.[107]

260 MW Generic LWECS

The potential impacts of a generic 260 MW LWECS located elsewhere in Minnesota would have similar impacts if sited in an agricultural setting with other LWECS, such as Nobles 2. The impacts could vary in other settings or be perceived as more impactful, such as in a more populated area.

260 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 LWECS (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.

[106] A Visual Impact Assessment Process for Wind Energy Projects, Clean Energy States Alliance, March 2011, http://www.cbuilding.org/sites/cbi.drupalconnect.com/files/CESA_Visual%20Impacts_Methodology_032111.pdf
[107] Site Permit Application, P. 23.

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. The potential rotor diameters for the turbines proposed for the Nobles 2 Wind project are shown in **Table 1**. Turbines are designed to be a uniform off-white color to blend in with the horizon and reduce visibility impacts.

Specific to the Nobles 2 Wind project, and in addition to the above measures, the Applicant will incorporate the following measures:

- 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.
- The primary use of large nameplate capacity turbines will result in a fewer number of turbines than would be utilized in a project that utilizes 1.5 or 2.0 MW turbines

The primary strategy for minimizing aesthetic impacts associated with solar farm development is choosing a site where the solar facilities are in keeping 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.

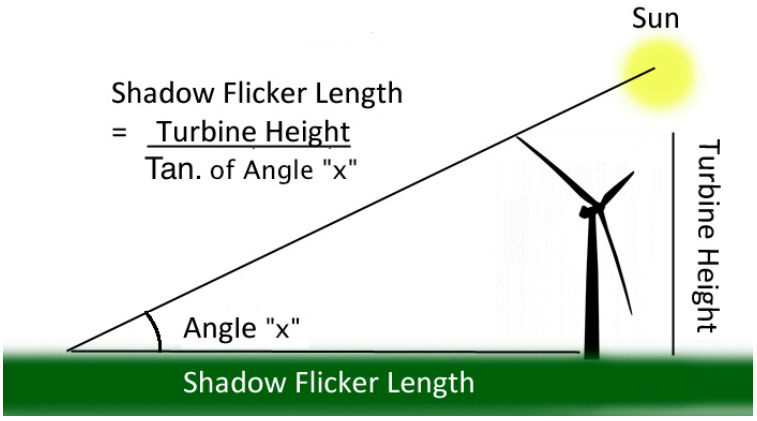
As an alternative to the standard security chain link fencing (a seven-foot fence with an additional extension angled outward at 45 degrees) commonly used, eight foot wood pole and woven wire fence should be considered. This fence design is frequently referred to as a "deer fence" or an "agricultural fence" and potentially offers superior aesthetics to the standard chain link fence.

6.5.3 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 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.

Figure 4. Shadow Flicker Length



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.[108] Standards depend on assumptions about how flicker impacts are to be calculated:

- 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 in an EIA.
- Denmark recommends a maximum of 10 hours/yr. assuming average cloud cover in the Project area.
- 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.

[108] Spatial Planning of Wind Turbines, European Actions for Renewable Energy (PREDAC), http://www.oddzialywaniawiatrakow.pl/upload/file/302.pdf

Nobles 2

Shadow flicker would occur as a result of the proposed project. Areas most likely to experience shadow flicker would occur to the south and southwest of turbines. The number of shadow flicker hours per year experienced by a receptor is dependent on sun angle and path, cloud cover, distance from turbine(s), wind direction and speed, topography, presence of visual obstacles(i.e. trees or buildings), and the light intensity within the home.

Shadow flicker modeling for the maximum worst case scenario predicts a home would receive a maximum of 29 hours and 7 minutes per year, or less than 1 percent of all daytime hours.[109] The shadow flicker modelling used the Vestas V136, which has the largest rotor diameter of the turbines proposed by the Applicant, at each of the 86 wind turbine pad sites. Of the 590 residences, 80 percent received no shadow flicker. Shadow flicker will not be any greater than the worst case scenario regardless of which Vestas turbine model is selected for the project and consistent with industry standards. **Table 17** shows the expected distribution of shadow flicker in the project area and **Map 9** shows 0, 5, 10, 30, and 50 hour/year shadow flicker lines for the Vestas V136-3.6 MW (or any of its variants) proposed layout under realistic case scenarios.

Table 17. Distribution of Shadow Flicker

Table 17: Distribution of Shadow Flicker in the Project Area	
Realistic Shadow Flicker (hrs/year)	Vestas V136 3.6-82
	Total # Structures
0	472
0 to 5	31
5 to 10	22
10 to 15	27
15 to 20	23
20 to 25	10
25 to 30	5
30+	0

Generic 260 MW LWECS

Depending on surrounding landscape and topography, a generic 260 MW LWECS would have similar shadow flicker impacts and mitigation. 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.

260 MW Solar Farm

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

[109] Site Application, Pp. 28-29.

Mitigation
The applicant's computer modeling of the proposed Project can be used to minimize shadow flicker at receptors within and adjacent the project area by using micrositing of wind turbines and maintaining designated setbacks from participating and non-participating landowners. Nobles 2 is maintaining a minimum 1,600 foot setback from all residences, which should be effective in reducing shadow flicker.

A number of mitigation options are available and have been proposed by the applicant to reduce the potential for shadow flicker impacts. Nobles 2 has indicated that providing indoor screening (i.e. window curtains or blinds), exterior screening (i.e. vegetation buffers or awnings), or operational software adjustments (brief, temporary shutdown of specific turbines) will be considered and utilized where appropriate and reasonable.[110]

It is important to note that all of the proposed turbine models being considered for the project do not pose a health risk to photosensitive individuals, including those with epilepsy.[111] 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.[112] 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.[113]

6.5.4 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 navigation.[114] Generally, to meet this requirement wind turbines are lighted with red flashing lights, which can create an undesirable nighttime view in a rural setting for some individuals.

Nobles 2
The Project will have some non-turbine facilities, which must be lit at times to allow for worker safety. 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.

Generic 260 MW LWECS
A generic 200 MW LWECS located elsewhere in Minnesota would have lighting impacts similar to the proposed Project.

[110] Site Permit Application, pg. 28.
[111] Id.
[112] Id.
[113] Id.
[114] FAA Advisory Circular AC 70/7460-2K, http://rgl.faa.gov/REGULATORY_AND_GUIDANCE_LIBRARY/RGADVISORYCIRCULAR.NSF/0/22990146db0931f186256c2a00721867/$FILE/ac70-7460-2K.pdf

260 MW Solar Farm

Because of the relatively low profile of PV solar farms FAA lighting requirements are unnecessary.

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. Standard downward lighting should be utilized to minimize impacts to adjacent land uses.

Mitigation

All non-turbine facilities will only be lit when workers are present, or at other times when lighting is absolutely necessary. Downward facing lights will be used at non-turbine facilities.

Nobles 2 must submit and receive FAA approval of lighting plan. A lighting plan will be provided prior to construction.

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.

An additional mitigative measure available for wind turbine lighting is the aircraft detection lighting system (ADLS). The FAA-has approved commercial operation of ADLS for use at wind farms. The ADLS is designed to mitigate the impact of nighttime lights by deploying a radar-based system around a wind farm, turning lights on only when low-flying aircraft are detected nearby.[115]

Vestas has developed an ADLS, termed *InteliLight*, for its wind turbines. InteliLight delivers reliable activation of aviation lights when needed, avoiding continuous and unnecessary lighting. The system autonomously scans a wind farm's surrounding area. Each radar has a minimum range of eight kilometers. If an approaching airplane is detected, its distance, speed, and heading are tracked and an assessment is made on whether or not to activate the aviation lights. InteliLight was especially designed for wind farms, and integrates into the Vestas portfolio of products, systems, and siting tools.[116]

Approval was received from the Federal Communications Commission (FCC) and FAA Spectrum Office for the Vestas Intelilight system on January 11, 2017. The Vestas InteliLight system was installed at a wind park near Hancock, Maine in October 2017.[117]

Given the number of turbines near the project area, it is unclear how ADLS for Nobles 2 would be effective if only a portion of the turbines (such as the Nobles 2 Project) utilize this technology and the surrounding wind projects do not. ADLS may be a more effective mitigation measure for new projects in areas with few to no LWECS or when all turbines in a given area, such as Nobles County, use the same technology.

[115] http://www.airporttech.tc.faa.gov/Download/Airport-Safety-Papers-Publications-Detail/dt/Detail/ItemID/563/PERFORMANCE-ASSESSMENT-OF-THE-LAUFER-WIND-AIRCRAFT-DETECTION-SYSTEM-AS-AN-AIRCRAFT-DETECTION-LIGHTIN

[116] https://www.windpowerengineering.com/business-news-projects/vestas-launches-intelilight-u-s/

[117] http://www.airporttech.tc.faa.gov/Download/Airport-Safety-Papers-Publications-Detail/dt/Detail/ItemID/580/Performance-Assessment-of-the-Vestas-InteliLight%E2%84%A2-System-as-an-Aircraft-Detection-Lighting-System

6.5.5 Noise

Large electric generation facilities produce noise. Potential human impacts due to noise include hearing loss, stress, annoyance, and sleep disturbance.[118] 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. For example, "dB(A)" indicates a loudness reading using an A-weighted calculation (or "scale").

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.

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).[119]

[118] Guidelines for Community Noise, World Health Organization, 1999.
[119] Site Permit Application, P. 20.

Table 18. Minnesota Noise Standards by Area Classification (expressed in dB A)[120]

Table 18 : Minnesota Noise Standards by Area Classification (expressed in dB(A)[121]				
Noise Area Classification[122]	Daytime		Nighttime	
	L_{50}[123]	L_{10}	L_{50}	L_{10}
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.[124]

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.[125]

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.[126]

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. (Massachusetts Department of Public Health 2012). 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 LFN and IS include wind interacting with vegetation, agricultural machinery and roadway noise.[127] Noise levels depend on the distance from the noise source and the attenuation of the surrounding environment. **Table 19** below provides an estimate of decibel levels of common noise sources.

[120] https://www.pca.state.mn.us/sites/default/files/p-gen6-01.pdf
[121] Minnesota Rule 7030.0040, https://www.revisor.leg.state.mn.us/rules/?id=7030.0040
[122] Minnesota Rule 7030.0050, https://www.revisor.leg.state.mn.us/rules/?id=7030.0050
[123] Minnesota Rule 7030.0020, https://www.revisor.leg.state.mn.us/rules/?id=7030.0020
[124] Id.
[125] Id.
[126] Id.
[127] Site Permit Application, P. 20.

Table 19. Common Noise Sources and Levels

Table 19. Common Noise Sources and Levels	
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

Source for Common Indoor/Outdoor Noise Sources: *A Guide to Noise Control in Minnesota*, Minnesota Pollution Control Agency (November 2015)

Nobles 2 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 turbine blades).[128] 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.[129] 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.[130]

Nobles 2 conducted a preliminary noise assessment of the proposed project, which models the anticipated sound levels that will be experienced at 540 noise-sensitive receptors throughout the project area (**Map 6**).[131] The sound impact analysis used the Vestas V136-3.6 MW proposed turbine

[128] Public Health Impacts of Wind Turbines, Minnesota Department of Health, May 22, 2009, http://www.health.state.mn.us/divs/eh/hazardous/topics/windturbines.pdf
[129] Id.
[130] Id.
[131] Site Permit Application, P. 22.

layout using sound data supplied by the turbine manufacturer, collected wind data, and site topography.[132] The maximum calculated noise level at any noise-sensitive receptor was 48.8 dBA. Based on this data, it is anticipated there would be no exceedances of the MPCA rules at any of the residential receivers for any of the wind turbine options.[133]

Generic 260 MW LWECS

A generic 200 MW LWECS would have noise impacts and mitigation similar to the proposed project. Depending on location, surrounding vegetation, topography, and turbine selection, impacts from noise could be more or less than those expected of the proposed Project.

260 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 (NEMA) Standards; anticipated inverter noise for the North Star Solar Project was predicted to produce 65 dBA[134] at the source.

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. While most maintenance activities would be performed during the day, it may be preferable to perform some maintenance activities after the sun is down in order to limit impacts to energy production.

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.[135] For rural residential areas in Nobles County, this means sound levels must meet an L_{50} standard of 50 dB(A). The distance that turbines are setback from residences would depend on the type and size of turbine. As required in the DSP, and proposed by the Nobles 2, no turbines will be built within 1,600 feet of any residence. Cumulative noise impacts must also be considered. That is, if there are multiple turbines in the vicinity of a residence, the standards set by Minnesota Rule 7030 must still be met. This may require additional setbacks.

[132] Id.
[133] Id.
[134] Environmental Assessment. North Star Solar PV, LLC Project, eDocket No. IP6943/GS-15-33
[135] Minn. Rules 7030.0040, Noise Standards, https://www.revisor.leg.state.mn.us/rules/?id=7030.0040

Setback requirements are enforced by the Site Permit issued by the Commission. The Commission continuously reviews public health setbacks related to wind farms to determine if they remain appropriate and reasonable.[136]

6.5.6 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.

Nobles 2 Wind Project
The proposed Project would be located in Nobles County in southwest Minnesota. Southern and southwestern Minnesota have experienced the greatest development of wind energy facilities in the state, which could make the addition of another large wind facility in the area to be less influential on property values then it may be if the facility was placed in area where wind energy facilities are less common on the landscape. More specifically, there are other wind farms near the project area.

The impacts on property values due to the Project is difficult to quantify. Numerous factors influence a property's market value, including acreage, schools, parks, neighborhood characteristics and improvements. A direct influence on property value is often the status of the housing/land market at the time of sale.

In December 2009, The Department of Energy (DOE) Lawrence Berkeley National Laboratory released a technical analysis of wind energy facilities' impacts on the property values of nearby residences:

> Using a combination of different analytic approaches, the investigation finds no evidence that prices of homes surrounding wind facilities are consistently, measurably, and significantly affected by either the view of wind facilities or the distance of the home to those facilities. Though the analysis cannot dismiss the possibility that individual homes or small numbers of homes have been or could be negatively impacted, it finds that if these impacts do exist, their frequency is too small to result in any widespread, statistically observable impact.[137]

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

[136] Commission Investigation into Large Wind Energy Conversion Systems Permit Conditions on Setbacks and the Minnesota Department of Health Environmental Health Division's White Paper on Public Health Impacts of Wind Turbines, CI-09-845, found on eDockets, https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showeDocketsSearch&showEdocket=true&userType=public, enter "09" for year and "845" for number

[137] The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis, Hoen et al. December 2009, https://eetd.lbl.gov/sites/all/files/publications/report-lbnl-2829e.pdf

property values as a result of wind farms.[138] 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. [139]

Generic 260 MW LWECS

A generic 260 MW LWECS would have property value impacts similar to that of the proposed project. If a generic 260 MW LWECS were constructed and operated in an area of the state with minimal or no wind energy facilities present on the landscape there could be more noticeable impacts on property values, but this impact is difficult to quantify or estimate for comparison purposes.

260 MW Solar Farm

Electrical generating facilities have the potential to impact property values. Often, negative effects from these facilities are the result of impacts that extend beyond the immediate footprint. Examples include noise, emissions and visual impacts. Unlike fossil-fueled electric generating facilities however, a PV 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 proposed 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).

6.5.7 Local Economy

Short-term and long-term economic benefits would result from the construction of the Nobles 2 Wind Project. Short-term economic benefits would occur as a result of construction jobs generated by the Project and additional expenditures in the local economy. Once the project becomes operational, local economies may benefit from more long-term benefits, such as jobs to operate and maintain the facility.

[138] Stearns County Board of Commissioners Meeting, June 8, 2010, Stearns County Resolution #10-46, https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7B84D17419-28C1-4D3F-AAE0-5D4DE117F9E4%7D&documentTitle=20106-52067-01

[139] Id.

Landowners with turbines or other Project facilities on their land would receive an annual lease payment for the life of the Project. Long-term benefits would occur through the Wind Energy Production Tax paid to local units of government.

Nobles 2 Wind Project

According to the 2017 Southwest Regional Profile, [140] the primary industries in Nobles County includes manufacturing; trade, transportation and utilities; education and health services. In Nobles County, manufacturing is a particularly strong sector of the local economy. Local contractors and material suppliers will be used for portions of project construction.[141] The applicant estimates that construction of the project will require approximately 230 short-term construction jobs. During the operations phase of the project, Nobles 2 anticipates that approximately 15 permanent positions will be created to operate and maintain the Project.[142]

The Nobles 2 Wind project will have a positive impact on both the tax base and local economy. Landowners and farmers will have an opportunity to increase land and agricultural profitability, and a more diverse source of income as a result of development of the proposed project. Wind energy generation provides a long-term, annual benefit to participating landowners. Landowners involved with the project, as well as those who have leased their wind rights to the project, will receive a royalty or lease payment annually for the life of the project.[143]

Based on a production tax of $0.0012 per kWh produced, wind energy production taxes would provide an estimated $1.1 to $1.3 million annually to the county and to townships within the Project.[144] Additionally, payments to landowners would provide income that could add to the local economy.

Generic 260 MW LWECS

Economic benefits of a generic 260 MW LWECS would be similar to those of the proposed project.

260 MW Solar Farm

During construction, a 260 MW solar farm would be expected to have similar socioeconomic impacts resulting from the influx of wages and expenditures made at local businesses during the construction of the project, increased tax revenue and increased opportunities for business development may also be attributed to the development of a solar farm.

The North Star Solar Project anticipated that approximately 250-300 jobs would be directly created during the construction phase of the project, and once operational, up to 12 permanent employees would be required.[145]

Additionally, the solar farm would be expected to pay property taxes and production taxes. For North Star Solar Project will pay property taxes on the land underlying the facility; the value of the equipment at the

[140] Minnesota Department of Employment and Economic Development (2017), https://mn.gov/deed/assets/rp_edr8_2017_tcm1045-133260.pdf
[141] Site Permit Application, pg. 50.
[142] Site Permit Application, pg. 51.
[143] Id.
[144] Id.
[145] Environmental Assessment. North Star Solar PV, LLC Project, eDocket No. IP6943/GS-15-33

facility is not included in the calculation. In lieu of the personal property tax on the equipment, North Star Solar Project will pay a production tax of $1.20 per MWh. Production taxes are calculated based on energy production, and are paid to the local governments where the facility is located; 80 percent to the county and 20 percent to the city or township. Based on the North Star Solar Project's estimated annual electricity production of approximately 200,000 MWh, the production tax would produce approximately $240,000 annually for local governments.[146]

Mitigation
Because potential impacts are largely anticipated to be positive, no mitigation measures are proposed.

6.5.8 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.

6.5.8.1 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.

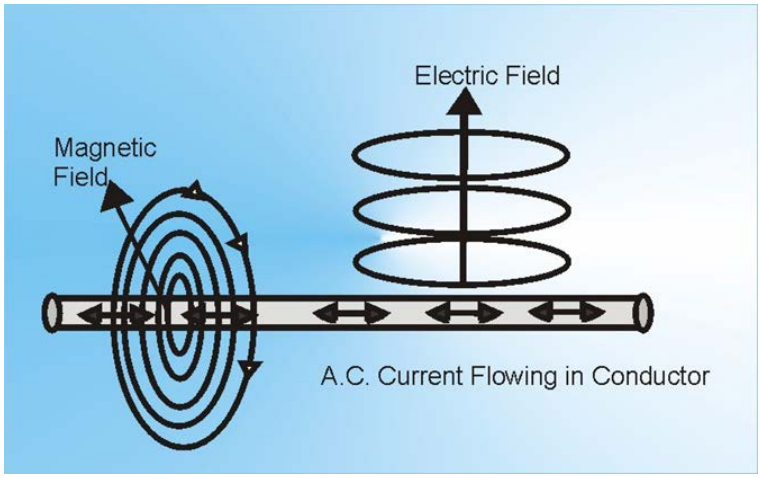
- Electric fields are created by the electric charge (i.e., voltage) on a transmission line. Electric fields are solely dependent upon the voltage of a line (volts), not the current (amps). Electric field strength is measured in kilovolts per meter (kV/m). The strength of an electric field decreases 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.

[146] Id.

Figure 5. Electric and Magnetic Fields



Nobles 2 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 42 inches (with the exception of junction boxes) and will be located no closer than 110 feet from a residence. EMF associated with the transformers within the nacelle dissipates within 5 feet, so the 1,500-foot turbine setback from residences will be adequate to avoid any EMF exposure to homes.

Generic 260 MW LWECS

A generic 260 MW LWECS will generally require transmission facilities to an interconnection point, similar to those of the proposed 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 260 MW LWECS would likely be similar to those of the proposed project; however, depending on the size of any associated facilities in Minnesota they would be subject to the Power Plant Siting rules.[147]

260 MW Solar Farm

As with LWECS, a generic 260 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

The Nobles 2 Wind project will design, construct, and operate all electrical equipment, including turbines, transformers, collection lines, and transmission lines in accordance with applicable codes, manufacturer

[147] https://www.revisor.mn.gov/rules/?id=7850

specifications, and required setbacks. Because no impacts due to EMF are anticipated, no mitigation is warranted.

6.5.8.2 Stray Voltage

Stray voltage is sometimes raised as an issue associated with electric transmission. Stray voltage is an extraneous voltage that appears on metal surfaces in buildings, barns and other structures, which are grounded to earth. This voltage is also called a neutral-to-earth voltage (NEV). 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.[148] 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.[149]

Nobles 2 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 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.

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 260 MW LWECS

A generic 260 MW LWECS will generally require transmission facilities to an interconnection point, similar to those indicated for Nobles 2 Wind project. Stray voltage concerns from collector and feeder lines located within the wind farm are addressed in the design of these systems.

[148] Stray Voltage, NDSU Extension Publication #108, http://www.ag.ndsu.edu/extension-aben/epq/files/epq108.pdf.
[149] Answers to Your Stray Voltage Questions: Backed by Research, Wisconsin Public Services, http://www.wisconsinpublicservice.com/business/pdf/farm_voltage.pdf

260 MW Solar Farm

As with LWECS, a generic 260 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 LWECS, stray voltage concerns from collector and feeder lines located within the solar farm are addressed in the design of these systems.

Mitigation

Due to low risk, mitigation measures are not proposed.

6.6 Associated Electrical Facilities and Existing Infrastructure

Electric generation facilities (fossil fuel power plants, LWECS, 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.

Nobles 2 Wind Project

The proposed project will utilize existing transmission infrastructure. Xcel has existing 115kV overhead transmission facilities that abut the planned location of the new project substation within the boundary of the overall project area. Due to the close proximity of the planned substation to the point of interconnection, new transmission lines are not planned.[150] The project substation is expected to be located in the central portion of the project area in the southeast quadrant of the intersection of Erickson Avenue and 140th Street.

The collector lines coming into the substation will combine the electrical output of the wind turbines into two 34.5kV circuits and will be stepped up to the 115 kV transmission voltage within the Project substation, and then to the POI on the power grid.[151]

The use of existing transmission infrastructure will eliminate additional impacts associated with the construction and operation of associated facilities. There may be temporary adverse impacts on the existing plants and animals, soil and water resources, and human settlement (aesthetics and noise) during construction of the project substation, however, these impacts would be expected to be minimal. Use of the existing transmission line will not increase potential bird collisions with the lines; create new visual impacts as a result of poles or frames; or have impacts on property values.

Generic 260 MW LWECS

A generic 260 MW LWECS often requires construction of transmission facilities to an interconnection point, similar to those indicated for proposed project. Impacts associated with construction of new transmission lines and substations can include impacts to plants and animals due to the loss of vegetation, potential migratory bird collisions with the transmission line, visual impacts due to placement of poles or structures, and additional impacts to farmland. Mitigation associated with the

[150] Site Permit Application, P. 11.
[151] Id.

construction of a transmission line and substation would likely be similar to those identified for associated facilities for the Nobles 2 Wind project.

260 MW Solar Farm

As with LWECS, a generic 260 MW PV solar farm would also require the installation of similar infrastructure 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

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.

6.7 Infrastructure

Electric generation facilities (fossil fuel power plants, LWECS, and solar farms) typically require that the existing transportation infrastructure to be adequate, or improvable, to handle loads required to deliver 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.

6.7.1 Roads

Nobles County has an established transportation network of state, county and township roads. County and township roads generally follow section lines. Private roads, mostly used for agricultural purposes, are also common. The County State Aid Highways (CSAHs) and Interstate Trunk Highways (ISTH) are two-lane paved roads. The remaining roads within the project area are two-lane gravel roads. Access from surrounding roadways will reduce the need for extensive access roads and allow existing primarily agricultural uses to continue relatively unaltered.

Interstate Trunk Highway 90 is located approximately 7.5 miles south of the Project area. MNTH 91 runs north/south east of the City of Lismore. CSAH 15 runs north/south in the center of the Project area (Edwards Avenue). CSAH 13 extends north/south east of the City of Wilmont (Hesselroth Avenue). CSAH 25 adjoins the southern point of CSAH 13 east of the City of Wilmont and extends southeast for approximately 1 mile before reaching the Project area boundary. CSAH 16 (160th St) runs east/west 1 mile north of the southern boundary of the Project area. CSAH 18 (130th St) extends east/west approximately in the center of the Project area. CSAH 9 (McCall Avenue) runs north/south along the southeast Project area border.

Within the Project area road surfaces vary, and gravel roads are common. Traffic volumes in the area are fairly light. Of the roads within or adjacent to the project area, a segment of MNTH 91 has the highest AADT count at 1,350 vehicles per day. Other roadways in the vicinity of the project have AADTs ranging from 1,300 to as few as 30 cars per day in the center of the project area.[152] **Table 20** identifies the roadways and number of miles within the project area

Table 20. AADT Levels in the Project Area

Table 20: Roadway and Existing Daily Traffic Levels in the Project area			
Road	**Number of Road Segments in Project**	**AADT (Range over Segments)**	**Total Miles within Project**
MNTH 91	2	1,200-1,350	4.5 Miles
CSAH 9 (McCall Ave)	2	360-465	<1 Mile
CSAH 13 (Hesselroth Ave)	2	225-350	5 Miles
CSAH 15 (Edwards Ave)	3	200-320	7 Miles
CSAH 16 (160th St)	6	170-1,300	10.5 Miles
CSAH 18 (140th St)	2	120-185	8.5 Miles
CSAH 25	1	1,250	2 Miles
CSAH 31 (Grain St)	1	135	<1 Mile
CR 63 (Knauf Ave)	3	205-630	1 Mile
CR 66 (140th St)	1	30	1 Mile
CR 69 (150th St)	1	50	1.5 Miles
CR 70 (110th St)	2	120-200	1 Mile
CR 71 (1st St)	1	45	4.5 Miles
CR 72 (1st St)	2	45-70	1.5 Miles
CR 88 (1St St)	1	75	<1 Mile

[152] Site Permit Application, Pg. 29

Table 20: Roadway and Existing Daily Traffic Levels in the Project area			
Road	**Number of Road Segments in Project**	**AADT (Range over Segments)**	**Total Miles within Project**
MNTH 91	1	65	<1 Mile
CSAH 9 (McCall Ave)	1	35	<1 Mile

Nobles 2 Wind Project

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, the applicant estimates there will be an additional 200 vehicle trips per day.[153] Current traffic levels in the Project area are below roadway capacities, typically in excess of 5,000 vehicles per day or Annual Average Daily Traffic (AADT).

Impacts to traffic will be short-term, intermittent, and occur during the construction phase of the Nobles 2 Project. Impacts will be from the transport of project components to the project site and from the movements of construction workers. Equipment and materials used in construction of wind farms can be extremely heavy and/or oversized loads. Therefore, increased wear and tear of local roads may be expected from delivery of materials and equipment. 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. 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.

Constructing the Project will require the construction of approximately 24 miles of gravel access roads, the final mileage will depend on the wind turbine model selected and final design. [154] Access roads would be used by operation and maintenance crews while inspecting and servicing the wind turbines throughout the life of the Project. The access roads would be between towers and one road would be required for each turbine string. The roads will be primarily gravel with varying thickness and may contain a geofabric layer, depending on specific soil conditions. The roads will initially be wide enough for construction traffic, but the permanent access road will be 16 - 18 feet wide with a low profile to allow cross travel by farm equipment.[155]

Nobles County will require permits for installations or modification of road approaches, overweight and over-dimension loads to transport equipment and materials over the County Highway System. In addition, roadway maintenance and repair, county ditch repair and movement of cranes over highways would also be involved. MNDOT District 7 responded that Trunk Highway 91 would be resurfaced and two box culverts replaced in the fall of 2018 or summer of 2019, which could impact delivery of wind

[153] Site Permit Application, pg. 30.
[154] Site Permit Application, pg. 12.
[155] Site Permit Application, P. 12.

turbine components. MNDOT also commented that work must be completed outside of MNDOT right-of-way, turbines should be set back far enough to prevent any piece from landing on the trunk highway, and work in MNDOT right-of-way would require a permit from MNDOT.

Generic 260 MW LWECS
A generic 260 MW LWECS will generally require similar utilization of regional roadways to those identified for proposed project. Impacts and mitigations associated with the use of available roadways for the generic 260 MW LWECS would be similar to those identified for the Nobles 2 Wind project.

260 MW Solar Farm
As with LWECS, a generic 260 MW PV solar farm would also require utilization of regional roadways for delivery of employees, materials and equipment to the solar farm site.

Mitigation
The Applicant will coordinate with the applicable local and state jurisdictions to ensure that the weights being introduced to area roads are acceptable. Nobles 2 will work with the Cities of Lismore and Wilmont; Nobles and Murray County, Leota, Wilmont, Bloom, Summit Lake, Larkin and Lismore Townships, and Minnesota Department of Transportation, as necessary, regarding roadway concerns, right-of-way work (if any), and setbacks during construction of the project. Nobles 2 will also work closely with the landowners in the placement of access roads to minimize land-use disruptions during construction and operation of the Project to the extent possible.[156]

The applicant 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.

6.7.2 Airports and Aviation

Airports are valuable transport, tourism, employment, and business assets for the local and national economy. The development of large energy projects need to consider the potential impacts to air service and operations (airports, landing strips, crop spraying activities, etc.) within a 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.

Nobles 2 Wind Project
There are no registered airports or heliports located within the Project area. Airports within ten miles of the Project area include Slayton Municipal (9.4 miles to the north), Ramerth (8.3 miles to the east), and Worthington Municipal (9.2 miles to the southeast). The wind turbines will be the tallest structures of the proposed Project and will exceed 200 feet; therefore, notification will be made to the FAA and requirements imposed by the FAA will be followed.

Crop dusting is generally conducted during the day by highly maneuverable airplanes or helicopters. Installing wind turbine towers, aboveground transmission lines, or other associated aboveground facilities in active croplands may create a potential for collisions with crop-dusting aircraft.[157]

[156] Site Application, Pg. 31.
[157] Id.

Setbacks to airport facilities must be in accordance with MNDOT Office of Aeronautics and FAA requirements. The project turbines must each receive a Determination of No Hazard from the FAA, and all turbines over 499 feet tall must also obtain an Airspace Obstruction Permit from the MNDOT Aeronautics Division prior to construction.[158]

The Nobles 2 project proposes to use wind turbines with a maximum tip height of 492 feet and will not be required to get additional permits or approvals from MNDOT or FAA based on turbine height.

Generic 260 MW LWECS
A generic 260 MW LWECS 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.

260 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.[159]

It is anticipated that an FAA review of a 260 MW solar farm, with proper site prescreening, would result in a “No Hazard” determination.

Mitigation
There are no mitigation measures proposed at this time. 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. The Applicant will follow FAA guidelines for marking towers and implement the necessary safety lighting. Notification of construction and operation of the Project will be sent to the FAA and steps will be taken to ensure compliance with FAA requirements.

6.7.3 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 facility in the Project area.

[158] Id.
[159] Implementing Solar Technologies at Airports, July 2014. Kandt and Romero. NREL?TP-7A40-62349.

Nobles 2 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.[160] Analog signals (e.g., AM and FM radio, microwaves) can be interfered with by direct obstruction and by indirect signal interference, resulting in ghosting of television pictures or signal fading. **Map 8** shows existing infrastructure within the project area and vicinity.

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 proposed project are anticipated to be minimal.

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. 40 microwave beam paths intersect the Project area. Comsearch calculated the Fresnel Zones, which is an area of signal swath which proposed turbines should avoid. To prevent disruption of the microwave beam path, turbines should not be sited the centerline of a beam path. Appropriate turbine siting would mitigate potential impacts.

R**adar**

The federal government has a large number of departments and agencies that operate a set of 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.[161] Nobles 2 requested a review by NTIA to determine if there would be any concerns with radio frequency transmission blockage, and the NTIA responded with a review finding that No Harmful Interference Anticipated.[162]

Telephone Service

Construction and operation of the proposed project is not expected to impact telephone service in the Project area.[163] Generally, construction, operation, and maintenance of a wind project does not impact cellular towers. To the extent Project facilities cross or otherwise affect existing telephone lines or

[160] Post Digital Television Transition - The Evaluation and Mitigation Methods for Off-Air Digital Television Reception in-and-around Wind Energy Facilities; Comsearch, 2009, http://acvamoonqa.comsearch.com/newsletter/archiveWP/WirelessPulseDec09.html

[160] For more information on the National Telecommunications and Information Administration, http://www.ntia.doc.gov/about.html

[161] For more information on the National Telecommunications and Information Administration, http://www.ntia.doc.gov/about.html

[162] Nobles 2 Power, LLC, response to EERA data request, May 18, 2018.

[163] Site Permit Application, P. 32.

equipment, the Nobles 2 will enter into agreements with service providers to avoid interference with their facilities.[164]

Broadcast Facilities

There is a possibility that broadcast facilities (HDTV and digital television) would be impacted by the proposed Project. 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 where 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. The Nobles 2 has indicated that the Project may negatively affect television reception at homes within the Project area.[165]

There are 54 station records within 75 kilometers (46.6 miles) of the Project area.[166] Of these 54 records, only 32 are currently licensed and operating. Eight of the stations are full power stations and 22 are low power. Twelve are low-power stations or translators. Translator stations receive signals from distant broadcasters and retransmit the signal to a local audience.

Comsearch analyzed the off-air television stations (i.e. not broadcasting) for which service could potentially be affected by the Project. Comsearch compiled all off-air television stations within 150 kilometers (93.2 miles) of the Project Area; however, the TV stations that are most likely to provide off-air coverage to the Project area will be those stations at a distance of 75 kilometers (46.6 miles) or less.

Seven of the full power stations (KCMN, KELO-TV, KSFY-TV, KDLT-TV, KTTW, KWSD, and KCSD-TV) may have their reception disrupted. The affected areas would primarily be within 10.2 miles of the Project that have clear line of site to a wind turbine, but not to the station.[167] Degradation of reception would be the result of multipath interference causing signal scattering as TV signals are reflected by the turbines. Two low-power stations (K22HJ-D and K43LX-D) may also be disrupted in the same manner.

Modern digital TV receivers, when used in combination with a direction antenna reduces the likelihood that signal scattering from wind farms will cause interference to digital TV reception. TV cable service, (where available) and direct satellite broadcast are believed to be the dominant delivery mode of TV service to the Project area, and these services will be unaffected by the presence of the Project.[168]

GPS

Global positioning systems (GPS) use satellite signals to determine locations on the earth's surface and are commonly used to guide agricultural operations.[169] 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

[164] Id.
[165] Site Permit Application, P. 33.
[166] Id.
[167] Id.
[168] Site Permit Application, P. 34.
[169] Precision Farming Tools: Global Positioning Systems (GPS), Virginia Cooperative Extension; http://www.pubs.ext.vt.edu/442/442-503/442-503.html

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).

Radio

The potential for interference with radio signals is low. Impacts to AM broadcast coverage attributable to wind farms is only anticipated when broadcast stations with directive antennas are within 1.9 miles or 10 wavelengths of turbine towers and broadcast stations with non-directive antennas are within 1 wavelength.[170] Because the nearest AM station transmitter is 4.5 miles from the Project Area, no interference with AM broadcast stations is expected.

FM stations are usually not at risk to interference from wind turbines, especially when the turbines are in the far field region of the radiating FM antenna. All of the identified FM stations are outside of the Project Area and at least 3.2 miles from the Project Area. Consequently, no impact to FM broadcasts is expected.

Microwave Beam Paths

To prevent disruption of the microwave beam path, turbines will not be sited in the centerline of a beam path. Appropriate turbine siting would mitigate potential impacts.

Telephone Services

Nobles 2 is not anticipated to impact telephone services within the Project area. If the Project does negatively impact telephone services, Nobles 2 will provide a mitigation plan and work with the service provider to promptly restore the impacted services.[171]

Generic 260 MW LWECS

A generic 260 MW LWECS would have communications impacts similar to the proposed 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 260 MW LWECS for impacts to communication services would also be similar to the mitigation efforts at Nobles 2.

260 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 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

Nobles 2 and their consultant, have conducted a microwave beam path analysis, an off-air television analysis, and requested a radio blockage review from NTIA for the Nobles 2 project area. Nobles 2 has indicated that, where possible, turbines and associated facilities will be sited in manner that does not interfere with microwave beam paths, radio transmissions, or television reception. If the turbines or associated facility infrastructure are the cause of disruption or interference with television reception or

[170] Site Permit Application, P. 33.
[171] Site Permit Application, pg. 32.

microwave patterns the Nobles 2 will work with affected residents to establish a comparable alternative to the previously existing service.

6.7.4 Wireless Broadband Internet

It is unclear if there are impacts to wireless broadband internet signals due to operation of a wind project. For a previous wind project,[172] EERA contacted engineers at the local wireless broadband internet service provider (StarCom/StarNet) for further information. 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.

Nobles 2 Wind Project
Wireless broadband internet service is provided via line of sight signals. If an obstacle such as a wind turbine interferes with the line of sight, then the internet service could be impacted. Nobles 2 has authorized Comsearch to prepare a study of the local wireless broadband internet service to determine whether wireless broadband internet service could be impacted.[173] To the extent any customer impacts are identified prior to or after construction, Nobles 2 will work with the local provider, Lismore Cooperative Telephone Company (LCTC), on a case-by-case basis to adjust the line of sight to a customer to eliminate the impacts. Comments provided by LCTC indicate that the western half of the Project area is served by cable broadband service. LCTC plans to install a repeater tower east of Lismore in the near term to facilitate better wireless broadband coverage in the eastern half of the Project Area. LCTC also noted that it has not received any complaints about wind farms disrupting wireless broadband service.

Generic 260 MW LWECS
A generic 260 MW LWECS would have impacts similar to the proposed project.

260 MW Solar Farm
It is unlikely a Solar Farm would cause interference with wireless broadband internet signals. However, if building components (e.g. a 150-foot tall boiler stack) were constructed within the "line of sight" between a broadband signal tower and residential antenna, it is possible the broadband customer could experience intermittent signal loss. Potential mitigation could be relocating biomass plant building components to ensure no interference with wireless broadband internet signals or relocating the residential antenna.

Mitigation
Project construction and operation will be designed to avoid adverse impacts to telephone, television, internet, or cellular phone service. To the extent project facilities are installed in proximity to existing telephone lines or communication equipment, Nobles 2 will closely coordinate with the applicable service providers to avoid interference with such facilities.[174] Should inadvertent impacts to these systems arise, Nobles 2 will work to remedy service interruptions on a case-by-case basis.[175]

[172] Elm Creek II Wind Project, Environmental Report, P. 30, http://mn.gov/commerce/energyfacilities/documents/20051/ECII%20Final%20ER_112309.pdf
[173] Nobles 2 Power, LLC, response to EERA data request, May 18, 2018.
[174] Site Application, Pg. 32.
[175] Id.

6.8 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 the proposed project, the project can create impacts related to harvesting and delivery of the fuel. LWECS 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.[176]

Generic 260 MW Wind Project

LWECS 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.[177]

Wind capacity varies across Minnesota. Extensive wind measurements have been taken and analyzed by the Minnesota Department of Commerce.[178] Local data collection suggests the mean annual wind speeds at 80 meters is approximately 7.5 to 8.5m/s.[179] Power generation by the Nobles 2 Wind project depends not only on wind speed (how much energy it contains), but also the frequency of attaining optimal wind speeds. Wind turbines generate power only when the wind is blowing, and the developer anticipates that the turbines in the Nobles 2 Wind project will be available for production at least 95 percent of the year, which is the industry standard.[180] The frequency of attaining optimal wind speed is expressed as capacity factor, which is expressed as how much power the turbine generates compared to how much it could generate if it was operating all the time. Capacity factors of 35 to 40 percent are common in Minnesota for large wind energy conversion systems.

Generic 260 MW LWECS

To be economically feasible, a 260 MW LWECS sited elsewhere in Minnesota would need to be sited in an area with sufficient wind resources to meet generation projections. Few areas of the State have wind resources that are equal to the southwestern portion of the State where Nobles 2 is located. As shown on **Maps 15 and 19** the highest areas of good wind resources are located in southwestern Minnesota. Because of transmission constraints, as well as advances in turbine technology, wind projects have become operational, and more have been proposed throughout the State. The availability of productive, undeveloped wind resources in Minnesota still remains available.

[176] Commission Order Establishing General Permit Standards, January 11, 2008 https://mn.gov/commerce/energyfacilities/documents/19302/PUC%20Order%20Standards%20and%20Setbacks.pdf
[177] Id.
[178] Designing a Clean Energy Future: A Resource Manual, Chapter 4 – Wind, Clean Energy Resource Teams, http://www.cleanenergyresourceteams.org/files/CERTsManualCh4.pdf
[179] Site Permit Application, P
[180] Application for Certificate of Need, P. 30.

260 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.

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. 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.

6.9 Agriculture

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

6.9.1 Cropland

Wind farms placed in cultivated areas do take a limited amount of acreage out of production for turbine placement, access roads, substation, and the O&M facility. However, agricultural cropping and "wind farming" are generally compatible uses.

Nobles 2 Wind Project

Approximately 88.6 percent of the project area is classified as cultivated land. Less than 1 percent of the project area is classified as hay/pasture.[181] Fifty nine percent of the farmland within the Project area is classified as prime farmland, 34.4 percent is prime farmland when drained, and 3.0 percent is classified

[181] Site Permit Application, P. 59

as farmland of statewide importance.[182] The remaining 3.2 percent of the Project area is not considered farmland of statewide importance as seen on **Map 13**.

Nobles 2 estimates that approximately 100 acres of farmland will be removed from agricultural production for turbine pads and access roads.[183] Farmland preservation programs such as the federal Conservation Reserve Program and Minnesota's RIM provide land preservation and provide a small income for participating landowners. Wind development is allowed on these lands with adequate consultation with state and federal agencies.

Corn and soybeans are the major crops, with some small grains and forage crops grown as well. [184]

The only land that will be taken permanently out of crop production will be those areas encumbered by turbines, access roads, and supporting above-ground infrastructure. Additional farmland may be temporarily impacted for use during construction as staging and access areas. **Table 21** summarizes the potential permanent impact to agricultural land within the project using two turbine layouts.

If 74 turbines are installed, approximately 81 acres of total farmland will be permanently impacted, as further explained in Section 8.15.2 of the site permit application (79 acres of Prime Farmland and 2 acres of Farmland of Statewide Importance). If 79 turbines are installed, the total farmland permanently impacted is conservatively estimated to be approximately 88 acres.

Table 21. Permanent and Temporary Impacts to Cropland

Table 21. Permanent and Temporary Impacts to Cropland			
Number of Turbines	Est Temp Disturbance	Est. Perm Disturbance	Total Disturbance
74 case array	< 635 acres	< 81 acres	< 716 acres
79 case array	< 710 acres	< 88 acres	< 798 acres
All 86 proposed	< 792 acres	< 98 acres	< 890 acres

Generic 260 MW LWECS

Impacts to farming at a generic 260 MW LWECS would be similar to those of the proposed project if placed in a predominantly agricultural area.

260 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 170 acres required grading (i.e., cut and fill).[185] Given the larger footprint required for solar farms, it would be expected that the impacts to croplands would be greater when compared to an equivalent capacity LWECS.

Mitigation

Farming activities will continue on the land surrounding turbines and access roads. Impacts to drain tile in the Nobles 2 Wind project area are not anticipated, however, any damages sustained as a result of

[182] Site Permit Application, Pg. 46.
[183] Nobles 2 Power, LLC, response to EERA data request, May 18, 2018.
[184] Site Permit Application, P. 46.
[185] Environmental Assessment. North Star Solar PV, LLC Project, eDocket No. IP6943/GS-15-33

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.

6.9.2 Livestock

Large electric generation facilities have the potential to impact domesticated animals and livestock indirectly through environmental impacts. Potential impacts to wildlife are discussed in Section 6.4.

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 (Sections 6.1 discussing air pollutants).

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 or NEV) on dairy cows has been conducted over the past 40 years.[186]

Nobles 2 Wind Project

Livestock operations in the project area consist of beef cattle, hogs, chicken (broilers), turkey, and sheep. Livestock in and adjacent to the project area 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.

The MPCA is the state agency charged with regulating animal feedlots in Minnesota. However, Nobles County administers the MPCA's feedlot program and has recently prepared and submitted to the MPCA the required Feedlot Program Delegation Agreement Work Plan for the period January 1, 2016-December 31, 2017. There are currently 432 registered feedlots in Nobles County (MPCA FY2016 County Program Base Grant Award Schedule).[187] There are approximately 95 feedlots within the Project Area.

The electrical collection system proposed for Nobles 2 is designed to be a separately derived system as defined in the National Electrical Safety Code. 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.

[186] Literature Review and Synthesis of Research Findings on the Impact of Stray Voltage on Farm Operations, March 31, 2008, Douglas J. Reinemann, Ph.D., http://www.uwex.edu/uwmril/pdf/08%20OEB%20SV%20Research%20Report_Reinemann_20080530.pdf

[187] Site Permit Application, P. 46.

Because of the type of transformers used at each turbine and the design of the collection system, there are no ground currents in the collection system, whether the system is operating at zero generation or maximum generation. Therefore, under normal operating conditions, the grounding for the wind farm collection system has no current with which to create stray voltage.

Potential impacts to livestock can arise during project construction, or during O&M activities. Gates restricting livestock can inadvertently be left open, and livestock fences can be damaged. Cattle, in particular, can be put 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 260 MW LWECS

A generic 260 MW LWECS located elsewhere in Minnesota would have impacts to livestock similar to the proposed project.

260 MW Solar Farm

While offering some siting and design challenges, solar farms can be compatible with livestock operations. In the United Kingdom solar farms and sheep operations have been successfully collocated for years.[188] Clearly, cattle and other large livestock may 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.

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.[189] Good electrical connections and choosing proper wiring materials for wet and corrosive locations will improve grounding and reduce stray voltage levels.

The DSP has specific conditions requiring the protection of livestock during all phases of the proposed project, and also the immediate repair of any fences or gates damaged during Project construction or O&M activities.

[188] https://www.onpasture.com/wp-content/uploads/2017/05/solar_on_farms_report_2017.pdf
[189] Stray Voltage, Public Service Commission of Wisconsin, http://psc.wi.gov/utilityinfo/electric/strayvoltage.htm

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 Nobles 2 Power Partners, LLC, Application for Certificate of Need.

7.1 Nobles 2 Wind Project

The 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. In addition, convenient access to the grid is available within the Project area, with the need to construct only minimal new transmission facilities, including the project substation. Nobles 2 Wind, LLC is in the final stages of obtaining a MISO Large Generator Interconnection Agreement, and additional studies are being conducted to determine interconnection details and engineering designs.[190]

The proposed project is feasible and available to be implemented once interconnection details and designs have been completed.

7.2 Generic 260 MW LWECS

An alternative to the proposed Nobles 2 Wind Farm in Nobles County is a large 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 260 MW Project or a combination of smaller dispersed Projects. Several feasible projects are being evaluated in Minnesota. At the time this report was prepared, 63 LWECS are operating in Minnesota and have a total nameplate capacity of 3,208 MW. There are 350 MW of LWECS that have been permitted but not yet constructed. There are Four additional LWECS projects with a proposed nameplate capacity of 600 MW currently going through the State permitting process at this time. 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.

7.3 260 MW Solar Farm

A 260 MW solar farm is potentially feasible, however a site with adequate space and interconnection to the grid has not been identified in this ER. Recently permitted solar farms include the 100 MW Aurora Distributed Solar Project (eDocket No. 14-515),191 the 100 MW North Star Solar Project (eDocket No. 15-33),192and the 62.25 MW Marshall Solar Project (eDocket 14-1052).[193]

[190] Site Permit Application, Pg. 11.
[191] https://mn.gov/commerce/energyfacilities/Docket.html?Id=33924
[192] https://mn.gov/commerce/energyfacilities/Docket.html?Id=34064
[193] https://mn.gov/commerce/energyfacilities/Docket.html?Id=34083

Minnesota has a significant and important solar resource that is being used for renewable energy. However, advances to make solar installations more compact would be needed to make solar a reasonable alternative to the proposed project. Specifically, Nobles 2 estimates that, for a solar project to meet the same amount of direct energy output as the Project, the solar project would need to have more than 570 MW of nameplate capacity covering more than 2,850 acres of land.[194] Acquiring the easements for such a project could potentially be cost prohibitive, and the ability to find a single site could be challenging. Dispersed sites would increase the amount of associated facilities needed for the project and thus increasing the cost. In addition, the current estimated levelized cost of solar is more expensive than wind.[195]

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 and neighboring states. Minnesota has committed to a renewable energy objective of generating 25 percent of its electricity from eligible renewable sources by the year 2025.[196] Minnesota utilities had approximately 3,177 MW of wind generation in their portfolios in 2013. 5,307 MW of wind generation will be required by the year 2025 to meet the new objective.[197] 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 and regional demand for electric power and for renewable generation in particular.

7.5 Additional Renewable Alternatives

Nobles 2 Wind, LLC also considered other renewable energy alternatives in their Certificate of Need application; including hydropower, and emerging technologies. Hydropower production has decreased by 20 percent over the past 10 years, and hydropower facilities are considered to be prohibitively expensive to maintain and pose significant negative effects to Minnesota's river ecosystem.[198] A number of emerging technologies for renewable energy production, compressed air, superconducting magnets, and fuel cells, were considered as alternatives. However, these technologies are currently not available on a commercial scale, preventing viable use as an alternative for the proposed Project.[199]

[194] Certificate of Need Application, P. 24.
[195] Id.
[196] Minn. Statute 216B.1691
[197] Presentation (RE Integration and Transmission Study)
[198] Application for Certificate of Need, P. 25.
[199] Id.

8 Permits

The Nobles 2 Wind Project would require permits and approvals from entities other than the Commission. Potential federal, state, and local permits or approvals that have been identified for construction and operation of the proposed project are listed below in **Table 22.**

Table 22. Potential Permits and Approvals

Table 22: Potential Permits and Approvals Required for Construction and Operation of the Proposed Facility		
Agency Name		**Name and Type of Permit/Approval**
Federal	Federal Aviation Administration	Form 7460-1 Notice of Proposed Construction or Alteration (Determination of No Hazard)
		Notice of Actual Construction or Alteration (Form 7460-2)
	U.S. Army Corps of Engineers	Federal Clean Water Act Section 404 and Section 10 Permits; Wetland Delineation Approvals; Jurisdictional Determination.
	U.S. Fish and Wildlife Service	Review for compliance with Federal Endangered Species Act; Bald and Golden Eagle Protection Act
	Environmental Protection Agency ("EPA")/("MPCA")	Spill Prevention Control and Countermeasure ("SPCC") Plan
	Lead Federal Agency	Federal Section 106 Review
	National Historic Preservation Act	Cultural Field Survey
	U.S. Department of Agriculture	Conservation / Grassland / Wetland Easement and Reserve Program releases and consents
		FSA Mortgage Subordination & Associated Environmental Review
	Federal Communications Commission	Federally Licensed Microwave Study
		NTIA Communication Study
State of Minnesota	Minnesota Public Utilities Commission	Large Wind Energy Conversion System (LWECS) Site Permit
		Certificate of Need for LWECS
	Minnesota State Historic Preservation Office	Cultural and Historical resources review; State and National Register of Historic Sites review
	Minnesota Department of Natural Resources	General Permit for Water Appropriations, dewatering
		Native Prairie Protection Plan Review
		Public Waters Work Permit
		License to Cross Public Lands and Waters

Table 22: Potential Permits and Approvals Required for Construction and Operation of the Proposed Facility		
Agency Name		**Name and Type of Permit/Approval**
	Minnesota Pollution Control Agency	Aboveground Storage Tank ("AST") Notification Form
		NPDES Permit for Construction Activities and Storm Water Pollution Prevention Plan (SWPPP)
		License for Very Small-Quantity Generator of Hazardous Waste
		Section 401 Water Quality Certification
	Minnesota Department of Health	Environmental Bore Hole ("EBH")
		Plumbing Plan Review
		Water Well Permit
	Minnesota Department of Labor and Industry	Request for Electrical Inspection
	Minnesota Department of Transportation	Utility Access Permit
		Highway Access Permit
		Aviation clearance from Office of Aeronautics
		Oversize and Overweight Permit
Local Governments	Nobles County	Roadway Access Permit
		Drainage Permit
		Subsurface Sewage Treatment System Permit
		Working in the Right-of Way Permit
		Overweight/Over-Dimension Permit
		Utility Permit
	Nobles County Soil and Water Conservation District	Wetland Conservation Act Approval
	Townships	Right-of-way permits, crossing permits, road access permits, and driveway permits for access roads and electrical collect system, as needed.
MISO		Generator Interconnection Agreement

Appendix B: Environmental Scoping Decision

COMMERCE DEPARTMENT

In the Matter of the Application of Nobles 2 Power Partners, LLC for a Certificate of Need for a 260 MW Wind Project in Nobles County PUC Docket No. IP-6964/CN-16-289

ENVIRONMENTAL REPORT SCOPING DECISION

The above matter has come before the Department of Commerce for a decision on the content of the Environmental Report (ER) to be prepared in consideration of the Nobles 2 Power Partners, LLC Application for a Certificate of Need for the proposed 260 Megawatt (MW) Nobles 2 Wind project in Nobles County. Nobles 2 Power Partners, LLC is a wholly-owned subsidiary of Tenaska Wind Holdings II, LLC.

The project requires a Certificate of Need (CN) and a Site Permit to construct the project from the Minnesota Public Utilities Commission (Commission). The CN (CN-16-289) and the site permit (WS-17-597) are separate dockets being considered by the Commission. The Department of Commerce's Energy Environmental Review and Analysis (EERA) staff is responsible for preparing the ER, which must comply with Minnesota Rule 7849.1100-2100. The Commission considers the project record, including the ER, when issuing a CN.

The proposed project encompasses 42,547 acres, of which approximately 115.5 acres will be used for project facilities. The Applicant proposes to use a combination of Vestas wind turbines for the project. At least 10 of the turbines will be Vestas V110-2.0 MW with the remainder of the turbines being one of the following: V136-3.45 MW, V136-3.6 MW, V136-4.0 MW, V136-4.2MW models. Associated facilities for the project include a project substation, collector and feeder lines, access roads, meteorological towers and an operations and maintenance building.

On October 13, 2017, Nobles 2 Power Partners, LLC filed a Certificate of Need Application with the Commission for the Nobles 2Wind Project[1]. On January 4, 2018, the Commission issued an order accepting the Application as substantially complete and authorizing an informal review process[2]. The proposed project is a large energy facility under Minnesota Statute 216B.2421. As such, it requires the Minnesota Department of Commerce to prepare an Environmental Report for the project pursuant to Minnesota Rule 7849.1200.

A public meeting was held on February 28, 2018, in Wilmont, Minnesota, to receive comments on the scope of the environmental report. Approximately 75 persons attended the meeting, with five individuals providing verbal comments at the meeting. The comment period closed on March 20, 2018. Sixteen written comments were received during the comment period.

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[1] Application for a Certificate of Need (e-dockets numbers 201710-136484-01, 201710-136484-02, 201710-136484-04, 201710-136484-05)

[2] Order accepting Certificate of Need Application (e-dockets 20181-138636-01)

Citizen comments focus on the following concerns: ensuring internet and broadband service is not disrupted or minimized as a result of the project, as well cell phone disruption or "dead' zones; breaking or damaging drain tiles; impacts to native plant communities; potential changes to storm water run-off; and potential limitations to farming operations.

Verbal comments received at the meeting further emphasized concerns about disruption of internet and cell phone service and support for the use of labor from Minnesota for the construction of the project.

State agency comments focused on specific concerns. MNDOT provided comments on corridor sharing with utility projects in highway rights-of way and other possible roadway restrictions and concerns during project construction; and microwave paths used for communications. MDNR provided a range of comments on the project, including: turbine locations within the project area and potential avian and bat fatalities, possible setback distances from DNR managed wildlife areas, use of guyed meteorological towers, and potential impacts to natural communities. The MPCA commented on potential noise impacts and surface water and floodplain resources.

Nobles County Board of Commissioners submitted a letter in support of the economic benefits from wind projects in Nobles County, specifically the production taxes that are used for infrastructure projects.

Four organizations submitted comments. The comments from labor and industry organizations are in support of using Minnesota labor for the construction and maintenance of the project and Lismore Cooperative Telephone provided information on plans to install fiber/wireless hybrid internet system in Nobles County, which will include a repeater tower in Summit Lake Township section 5.

No system or project alternatives were submitted during the comment period.

The proposed project will produce renewable energy to meet Minnesota's renewable energy objectives. Accordingly, alternatives examined in the ER are limited to "eligible energy technologies" that support these objectives (Minnesota Statute 216B.1691). These alternatives will include: (1) a generic 260 MW wind generation project sited elsewhere in Minnesota, (2) a 260 MW solar farm, and (3) a "no-build" option. An ER provides a high level environmental analysis of the proposed project and system alternatives, and reviews environmental impacts associated with alternative projects. It is a part of a larger Public Utilities Commission investigation of the Certificate of Need Application. The Commission in its overall review will address all the issues and alternatives required by rule.

Having reviewed the matter and consulted with the Department of Commerce Energy Environmental Review and Analysis staff, and in accordance with Minnesota Rules 7849.1400 and 7849.1500, I hereby make the following scoping decision:

MATTERS TO BE ADDRESSED

Abstract

1 Introduction

2 Regulatory Framework

- 2.1 Environmental Report
- 2.2 Permitting Authority and Additional Permits
- 2.3 Public Participation

3 Description of the Proposed Project [Minn. Rule 7849.1500, subp. 1, A]

- 3.1 Project Description
- 3.2 Project Location
- 3.3 Project Cost and Schedule

4 Description of Project Alternatives [Minn. Rule 7849.1500, subp. 1, B]

- 4.1 260 MW LWECS
- 4.2 260 MW Solar Farm
- 4.3 No Build Alternative

5 The No Build Alternative

- 5.1 Impacts
- 5.2 Benefits

6 Human and Environmental Impacts [Minn. Rule 7849.1500, subp. 1, C, D,E]

- 6.1 Air Quality [Minn. Rule 7849.1500, subp. 2,]
  - 6.1.1 Criteria Pollutants
  - 6.1.2 Hazardous Air Pollutants and Volatile Organic Compounds
  - 6.1.3 Ozone
- 6.2 Water Resources
  - 6.2.1 Water Appropriations [Minn. Rule 7849.1500, subp. 2, G]
  - 6.2.2 Wastewater [Minn. Rule 7849.1500, subp. 2, H]
  - 6.2.3 Groundwater
  - 6.2.4 Surface Water
  - 6.2.5 Wetlands
- 6.3 Solid and Hazardous Wastes [Minn. Rule 7849.1500, subp. 2, I]
- 6.4 Natural Resources
  - 6.4.1 Environmental Setting
  - 6.4.2 Wildlife
  - 6.4.3 Vegetation
  - 6.4.4 Rare and Unique Natural Resources

6.5 Human and Social Environment
- 6.5.1 Demographics
- 6.5.2 Aesthetic Impact and Visibility Impairment
- 6.5.3 Shadow Flicker
- 6.5.4 Facility and Turbine lighting
- 6.5.5 Noise [Minn. Rule 7849.1500, subp. 2, J]
- 6.5.6 Property values
- 6.5.7 Local Economy
- 6.5.8 Public Health and Safety

6.6 Associated Electrical Facilities and Existing Infrastructure
- 6.6.1 Associated Electrical Facilities [Minn. Rule 7849.1500, subp. 2, F]
- 6.6.2 Existing Infrastructure

6.7 Fuel Availability [Minn. Rule 7849.1500, subp. 2, E]

6.8 Agriculture
- 6.8.1 Cropland
- 6.8.2 Livestock

7 Availability and Feasibility of Alternatives [Minn. Rule 7849.1500, subp. 1, F]
- 7.1 Nobles II Wind Project
- 7.2 Generic 260 MW LWECS
- 7.3 260 MW Solar Farm
- 7.4 No-build Alternative
- 7.5 Additional Renewable Alternatives

8 Permits [Minn. Rule 7849.1500, subp. 1, G]

The above outline is not intended to serve as a "Table of Contents" for the ER document, and as such, the organization (i.e., structure of the document) of the information and the data may vary to that in the ER.

ISSUES OUTSIDE OF THE ENVIRONMENTAL REPORT

The Environmental Report will not consider the following matters:

1. Impacts or mitigative measures associated with specific sites, including specific tower or road locations for the proposed project and alternatives.
2. The negotiation and content of easement agreements by which land owners are paid for property rights, including wind rights.
3. Any alternatives not specifically described in this scoping decision.

SCHEDULE

The Environmental Report will be completed no later than May 30, 2018. A public hearing will be held in the Project Area before an Administrative Law Judge after the Environmental Report has been issued and notice served.

Signed this 29th day March 2018

STATE OF MINNESOTA
DEPARTMENT OF COMMERCE
DIVISION OF ENERGY RESOURCES

William Grant, Deputy Commissioner