Environmental Report

Stoneray Wind Farm

In the Matter of the Application of
Stoneray Power Partners, LLC for a
Certificate of Need for a 105 MW Wind Project
in Pipestone and Murray Counties

PUC Docket No. IP-6646/CN-13-193

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Minnesota Department of Commerce

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Abstract

On April 29, 2013, Stoneray Power Partners, LLC filed a Certificate of Need application with the Minnesota Public Utilities Commission for the Stoneray Wind Farm. The Applicant is proposing to construct an up to 105 megawatt large wind energy conversion system in Pipestone and Murray counties.

The proposed Project is a large energy facility as defined by Minn. Statute 216B.2421. Such a facility requires a certificate of need from the Commission (Minn. Statute 216B.243). As part of the application review, the Department of Commerce must prepare an Environmental Report for the Project (Minn. Rules 7849.1200).

The Department's Energy Environmental Review and Analysis staff is responsible for preparing the Environmental Report. This Environmental Report has been prepared per Minnesota Rule 7849.1100-2100, and is part of the record which the Commission will consider in making a decision on a certificate of need for the Project.

Information about the Commission's certificate of need process can be obtained by contacting Tricia DeBleeckere, Minnesota Public Utilities Commission, 121 7th Place E., Suite 350, Saint Paul, MN 55100, (651) 201-2254, tricia.debleeckere@state.mn.us.

Information about this Project can be found on the Department's energy facilities website: mn.gov/commerce/energyfacilities/Docket.html?Id=33153, or obtained by contacting David Birkholz, Department of Commerce, Energy Environmental Review and Analysis, 85 7th Place East, Suite 500, St. Paul, Minnesota 55101, (651) 539-1838, david.birkholz@state.mn.us.

The record for the certificate of need for this Project can be found on the eDockets system at: https://www.eDockets.state.mn.us/EFiling/search.jsp; search on the year "**13"** and number "**193**".

Preparer: David Birkholz

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Appendix A. Environmental Report Scoping Decision

1 Introduction

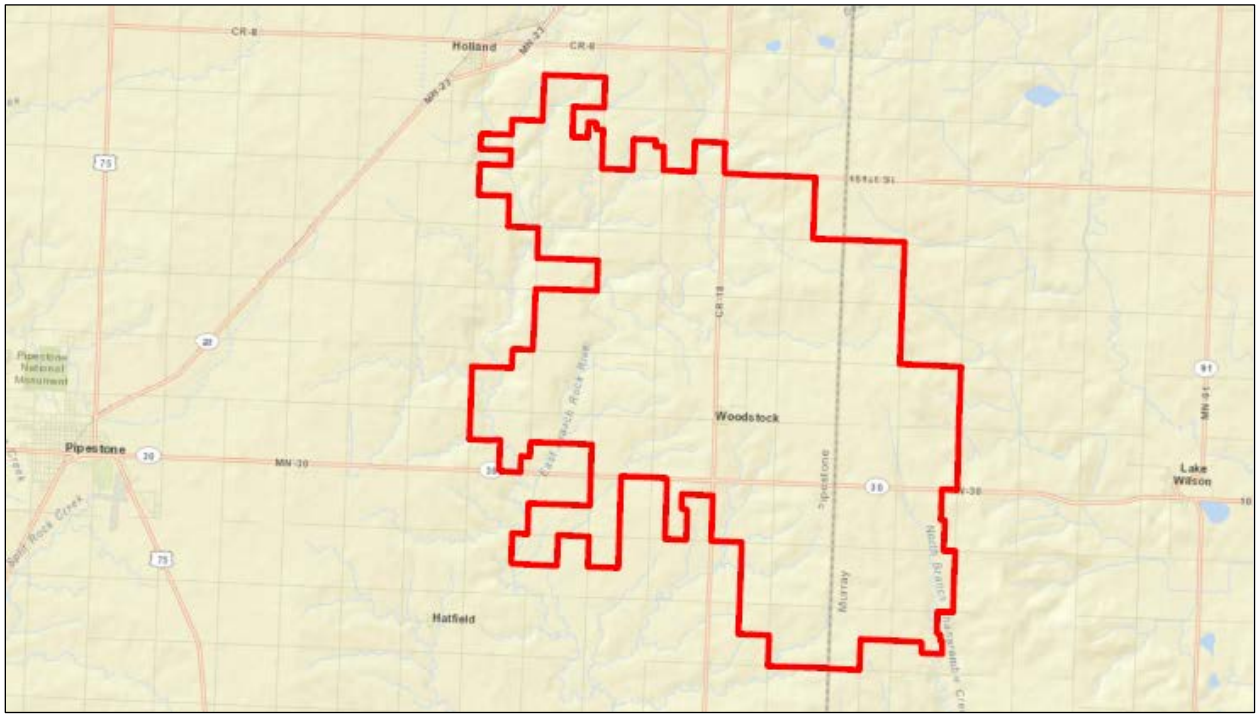
On April 26, 2013, Stoneray Power Partners, LLC (Applicant), an EDF Renewable Energy (EDF) company, filed a Certificate of Need (CN) application with the Minnesota Public Utilities Commission (Commission) for the Stoneray Wind Farm (Project). The Applicant is proposing to construct a 105 megawatt (MW) large wind energy conversion system (LWECS) in Pipestone and Murray counties.

Project Overview

The Project consists of wind turbines and associated structures, which include access roads, communication lines, meteorological towers and electrical collector and feeder lines connecting to the existing Chanarambie Substation within the Project site. Stoneray currently anticipates that the Project would consist of up to 62 turbines yielding a total nameplate capacity of 105 MW.

The Project is located in southwest Minnesota around the community of Woodstock (See Figure 1). The majority of the Project is within Rock and Burke townships in Pipestone County with portions of the Project in Chanarambie and Cameron townships in Murray County.

Figure 1. General Project Vicinity



Within the approximately 29,500 acre Project area, Stoneray has secured wind rights for approximately 14,500 acres of private land. Chanarambie Power Partners, another EDF company, holds easements on approximately 3,500 additional acres of private land within the Stoneray Project area. The Project intends to commence commercial operation in December 2014, dependent upon securing a power purchase agreement.

Stoneray intends to offer wind-generated electricity on the wholesale market or through a Power Purchase Agreement. Production is intended to help utilities satisfy 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 100 MW wind generation Project sited elsewhere in Minnesota, (2) a 38.5 MW biomass plant, and (3) the "no build" option.

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 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 are the site and CN applications submitted by Stoneray Power Partners. [1, 2]

Information from other reports issued by the Minnesota Environmental Quality Board and Minnesota Department of Commerce has been incorporated as applicable.

[1] Application for a Certificate of Need (CNA), Stoneray Power Partners, LLC, April 26, 2013
[2] Site Permit Application for a Large Wind Energy Conversion System (LWECS) (SPA), Stoneray Power Partners, LLC, June 11, 2013, revised July 15, 2013

2 Regulatory Framework

The Project is a large wind energy conversion system as defined in the Wind Siting Act (Minnesota Statute 216F). Upon completion, the Project would produce up to 105 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 Certificate of Need by the Minnesota Public Utilities Commission. Accordingly, on April 26, 2013, the applicant submitted a Certificate of Need application to the Commission. On July 24, 2013, the Commission issued an order accepting the application as complete and authorizing an informal review process.

The informal review process is designed to develop a record upon which a CN decision is made, including: (1) a notice and comment period, (2) analysis by the Department of Commerce (DOC) Energy Regulation and Planning staff, (3) environmental review by DOC Energy Environmental Review and Analysis (EERA) staff and (4) a public hearing conducted by an administrative law judge (ALJ). Based on the ALJ's hearing report and the entire record, Commission staff will make a recommendation to the Commission on issuance of the certificate of need. The Commission is the final decision-making body.

2.1 Environmental Report

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 August 14, 2013, in Lake Wilson to receive comments on the scope of the Environmental Report. Approximately 45 persons attended the meeting, with four people commenting. A public comment period followed the meeting, closing on August 31, 2013. No written public comments were received during the comment period, except for comments from the Minnesota Department of Natural Resources (DNR) and Pollution Control Agency (PCA).

Public comments at the meeting included questions on where turbines would be located, what transmission build might be required, where the power from the project would go and government subsidies for the producer.

PCA submitted a letter reminding that a Construction Stormwater Permit is required for the Project and that a new permit became official on August 1, 2013, with more stringent requirements for permanent stormwater treatment. DNR submitted notes on the Casey Jones State Trail, biodiversity sites, updating threatened and endangered species lists, bat monitoring and Blanding's turtles. DNR also noted its concurrence that the Project as planned is a low risk site for bird and bat fatality.

Based on the scoping comments received and the rules governing the scope of an ER (Minnesota Rule 7849.1500), the Department of Commerce Deputy Commissioner issued a scoping decision on September 6, 2013 (Appendix A). This Environmental Report has been developed in accordance with the scoping decision.

A public hearing conducted by an ALJ will be held in the Project area to further develop the record for a Commission decision. This ER will be introduced into the record by EERA staff.

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-13-216). A Site Permit authorizes the siting and construction 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

The Commission relies on public participation for the development of a thorough record for the Project for both the Certificate of Need and Site Permit processes. People are assured state-issued notices for Project events by placing their name on the appropriate EERA Project contact list. Interested persons can sign up for the Stoneray Wind Farm project mailing list online at: http://mn.gov/commerce/energyfacilities/Docket.html?Id=33153.

People may also join the Project mailing list by contacting Environmental Review Manager David Birkholz, phone: (651) 539-1838, email: david.birkholz@state.mn.us; or Public Advisor Tracy Smetana at phone: (651) 296-0406, email: consumer.puc@state.mn.us.

3 Description of the Proposed Project

Stoneray Power Partners, LLC (Stoneray or Applicant) is proposing to build a 105 MW LWECS. Stoneray is responsible for the oversight and management of the Project, along with construction, operations and maintenance. Stoneray Power Partners, LLC is a wholly-owned subsidiary of EDF Renewable Energy (EDF) - formerly enXco Development Corporation.

3.1 Project Description

The Project consists of wind turbines and associated structures, which include access roads, electrical connection lines, transformers, meteorological towers, communication lines and connection to the existing Chanarambie Substation located within the Project site.

Stoneray currently anticipates that the Project would consist of up to 62 turbines yielding a total nameplate capacity of up to 105 MW. The final number and size of the turbines will be dictated by current market conditions, turbine availability and the terms of the final Site Permit for the Project. Four wind turbines are currently under consideration and described in the Stoneray applications: The General Electric 1.7 MW, Vestas 2.0 MW, Siemens 2.3 MW or Siemens 3.2 MW. The specifications for each are described below in **Table 1**.

Table 1. Turbine Specifications[3]

Characteristics	Turbines			
	GE 1.7-100	Vestas V110-2.0	Siemens SWT-2.3-108	Siemens SWT-3.2-113
Nameplate Capacity	1,700 kW	2,000 kW	2,300 kW	3,200 kW
Hub Height	100 m	95 m	100 m	100 m
Rotor Diameter	100 m	110 m	108 m	113 m
Rated Capacity Wind Speed	7.5 m/s	11.5 m/s	11-12 m/s	Unavailable
Wind Swept Area	7,854 m²	9,503 m²	9,144 m²	10,000 m²
Blade Length	48.7 m	54 m	53 m	55 m
Gearbox	multi-stage planetary/helical	two helical stages and one planetary stage	3-stage planetary/helical	N/A - Direct Drive

[3] SPA at 7-8

The wind turbines under consideration are three-blade, upwind, and horizontal axis. Hub heights range from 80 meters to 100 meters, and the rotor diameters range from 90 meters to 113 meters. A smooth tubular steel tower will be used to support 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 Project would require additional facilities beyond the turbines. Those facilities include:

- gravel access roads;
- step-up transformers installed at the turbines;
- 34.5 kV collector lines installed between turbine strings, generally trenched underground to a depth of 36" or greater ;
- installation of a Site Control And Data Acquisition (SCADA) system;
- construction of a Project substation adjacent to the existing 115 kV Chanarambie Substation located in Section 6 of Chanarambie Township in Murray County;
- construction of an Operation and Maintenance facility or acquisition of an existing structure; and
- up to three permanent meteorological towers (four temporary towers are currently located in the project area).

The SCADA system would be installed to monitor turbine availability and conditions. This system remotely monitors the conditions of the wind farm and will alert technicians to any irregularities with the wind turbines, circuit breakers, meters, meteorological equipment, etc..

Given the location of the Chanarambie Substation, no associated transmission facilities are required for the Project. It should be noted, the Project had a signed Large Generator Interconnection Agreement (LGIA) with the Midwest Independent System Operator (MISO). However the Applicant has relinquished that and is currently working to establish a new Agreement.

3.2 Project Location

The Project is in eastern Pipestone and western Murray counties, near the community of Woodstock. The majority of the Project is within Rock and Burke townships in Pipestone County with portions of the Project in Chanarambie and Cameron townships in Murray County. **Table 2** identifies the townships and sections within the Project boundary.

Table 2. Project Location

County	Township Name	Sections	Township	Range
Murray	Cameron	30, 31	107N	43
	Chanarambie	5-8, 17-20, 29, 30	106N	43
Pipestone	Rock	8, 15-29, 32-36	107N	44
	Burke	1-17, 19-21, 23-26	106N	44

The total Project area is 29,500 acres. Stoneray currently has agreements with land owners for approximately 14,500 acres of private land within the Project area. Chanarambie Power Partners, another EDF Renewable Energy company, holds easements on an additional 3,500 acres of private land within the Stoneray Project area.

3.3 Project Cost and Schedule

The total Project installed capital costs are estimated to be between $160 and $232 million, including wind turbines, associated electrical and communication systems, and roads. Final costs will be dependent on site conditions and final turbine selection and layout. Ongoing operations and maintenance costs and administrative costs are estimated to be approximately $1 million per year, not including royalties to landowners for wind easement rights and property taxes.

Dependent on securing a power purchase agreement or other distribution mechanism, and provided a new LGIA is signed, the Project is expected to achieve commercial operation by December 31, 2014.

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 Stoneray Wind Farm 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.4

Alternatives evaluated include: (1) a 100 MW wind generation plant sited elsewhere in Minnesota, (2) a 38.5 MW biomass plant, and (3) a "no build" alternative.

4.1 100 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, theoretically, be an approximately 100 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 100 MW wind project sited in Minnesota and the Stoneray Wind Farm, sited in Pipestone and Murray counties.

4.2 38.5 MW Biomass Plant

One alternative renewable energy source to the proposed Project would be a biomass plant of similar electricity generation as the proposed Project. Biomass is any organic matter that is available on a renewable or recurring basis. It includes all plants and plant derived materials, including agricultural crops and trees, wood and wood residues, grasses, aquatic plants, animal manure, municipal residues, and other residue materials. Plants (on land or in water) use the light energy from the sun to convert water and carbon dioxide to carbohydrates, fats, and proteins along with small amounts of minerals.[5] Combustible gases from landfills or anaerobic digestion of waste material is referred to as biogas.

Solid biomass can be burned like coal to produce steam. It can also be gasified and burned like natural gas. Various forms of biomass are utilized in Minnesota. The St. Paul District Energy, a combined heat and power facility in downtown St. Paul, is fueled primarily by woody biomass and has an electric generation capacity of 25 MW. Other biomass plants in Minnesota, such as Fibrominn, utilize turkey litter or combinations of woody biomass and agricultural biomass, as with the Laurentian Energy Authority in Hibbing and Virginia.

[4] Minn. Statute 216B.1691, Subd. 1. Eligible energy technologies include technologies that generate electricity from solar, wind, hydroelectric, hydrogen, or biomass.
[5] From the Oak Ridge National Laboratory's Biomass Energy Notebook, http://cta.ornl.gov/bedb/introduction/Biomass_Overview.shtml

The 38.5 MW NGPP Minnesota Biomass, LLC, electric generation facility underwent environmental review in Minnesota (2003). [6] Given today's technological improvements in turbine design, the net capacity factor for Stoneray is anticipated to be between 42-47 percent,[7] so 38.5 MW is not an exact equivalency for a modern 105 MW wind farm. However, this biomass project has been chosen for review as it provides reliable data on potential impacts for fairly comparable production. This biomass alternative would likely burn a combination of woody and agricultural biomass, such as corn stover, with natural gas as a backup fuel.

4.3 No Build Alternative

The no build alternative means that no wind Project is constructed. The analysis for this alternative will consider the potential benefits and drawbacks of not constructing the proposed Project.

[6] EQB Docket No. 03-67-EAW-NGP Biomass [hereafter Minnesota Biomass EAW]; see http://mn.gov/commerce/energyfacilities/Docket.html?Id=4452
[7] SPA at 55

5 The No Build Alternative

Analysis of the no build alternative involves a discussion of the environmental impacts of continuing the status quo. For example, with a proposed highway project, the no build alternative would take into account the impacts associated with continuing to have traffic increase along existing roads and highways and the potential impacts on development occurring along these existing arteries. Potential impacts and benefits of the no build alternative for the Stoneray Wind Farm are discussed here.

5.1 Impacts

At least three categories of impacts can be identified if the Stoneray Wind Farm is not built: (1) a hampering of the state's ability to meet its renewable energy objective, (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.

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.[8] Minnesota utilities forecast the need for 5,841 MW of renewable generation by the year 2025 to meet this objective.[9] If the Stoneray Wind Farm is not built, it could hinder the ability of the state to meet its renewable energy objective. There are wind resources in other parts of the state and wind farms could be placed in these areas (**Figure 2**.) However, the wind resources of the state are finite. The wind resource in the Project area is very good, and, if untapped, could hinder the state's ability to meet its renewable energy objective.

Loss of Economic Benefits

If the Stoneray Wind Farm 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 $427,000[10] annually. The Stoneray Wind Farm is expected to generate approximately 150 temporary construction jobs and up to 15 permanent operation and maintenance jobs.[11] These employment opportunities and their associated income would be lost if the Project is not built.

Replacement with a Non-Renewable Resource

If the Stoneray Wind Farm is not built, the electrical power it would have produced may need to be replaced, possibly with a non-renewable energy resource.[12] The Stoneray Wind Farm would produce approximately 397,100[13] megawatt-hours annually (MWh/yr).

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[8] Minn. Statute 216B.1691

[9] "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

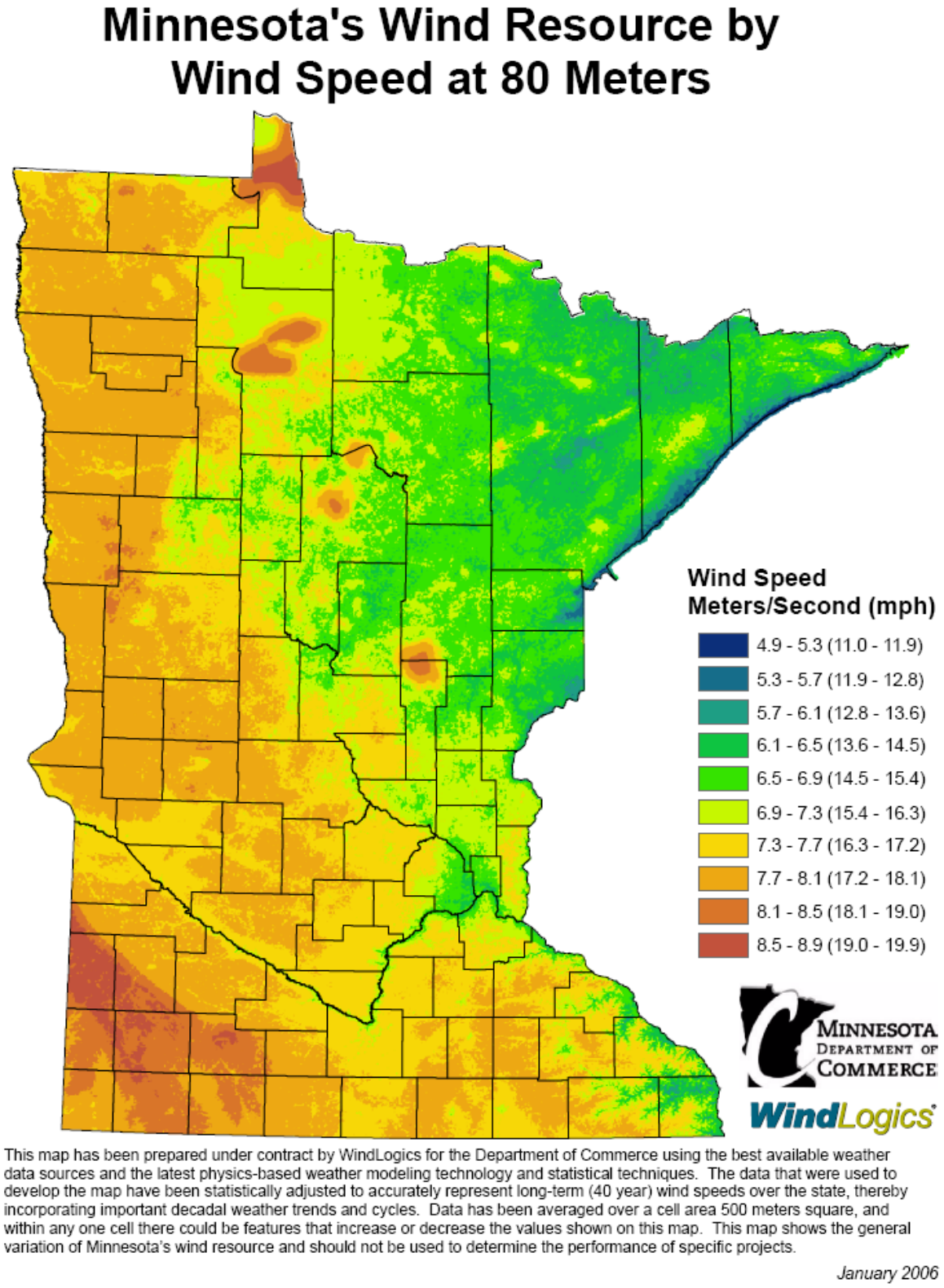
[10] SPA at 29

[11] SPA at 28

[12] In 2008, non-renewable energy sources accounted for approximately 92 percent of Minnesota's electrical energy supply. Energy Policy and Conservation Report ("Quad Report"), 2008

[13] SPA at 55

Figure 2. Wind Resources



This map has been prepared under contract by WindLogics for the Department of Commerce using the best available weather data sources and the latest physics-based weather modeling technology and statistical techniques. The data that were used to develop the map have been statistically adjusted to accurately represent long-term (40 year) wind speeds over the state, thereby incorporating important decadal weather trends and cycles. Data has been averaged over a cell area 500 meters square, and within any one cell there could be features that increase or decrease the values shown on this map. This map shows the general variation of Minnesota's wind resource and should not be used to determine the performance of specific projects.

January 2006

Though the impacts associated with non-renewable sources vary, it is possible to estimate, as an example, the impact of replacing the Stoneray Wind Farm MWh/yr output with natural gas or, less likely, coal energy. However, since no non-renewable proposals are being considered in this case, that comparative analysis is not pursued in this Environmental Review.

5.2 Benefits

Benefits of not building the Stoneray Wind Farm would include avoidance of potential human and environmental impacts associated with the Project. These impacts are discussed in Section 6 of this ER.

6 Human and Environmental Impacts

The Stoneray Wind Farm and the Project alternatives have the potential for human and environmental impacts, which are discussed below. The alternatives include: (1) a 100 MW wind energy conversion system sited elsewhere in Minnesota and (2) a 38.5 MW biomass plant. 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.[14]

Stoneray Wind Farm

The Stoneray Wind Farm would emit no criteria pollutants during operation. Impacts from construction will be minimal and localized and 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 areas. The project area includes multiple construction "sites" in the form of individual turbines and a network of 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 100 MW LWECS

A generic 100 MW LWECS would emit no criteria pollutants during operation, and would have ancillary emissions (construction, transmission line) similar to those from the Stoneray Wind Farm.

38.5 MW Biomass Plant

A 38.5 MW biomass plant would emit criteria pollutants (Table 3). These pollutants are based on a plant similar to the NGPP Minnesota Biomass plant (see Section 4.2). Each of these pollutants is known to cause environmental health impacts. Sulfur oxides (SO_x) cause acid rain and human respiratory illness.[15]

[14] What Are the Six Common Air Pollutants?, http://www.epa.gov/air/urbanair/.
[15] Health and Environmental Impacts of SO_2, http://www.epa.gov/air/urbanair/so2/.

Nitrous oxides (NO_x) are greenhouse gases that cause ozone and related respiratory illnesses.[16] Carbon dioxide (CO_2) is a greenhouse gas that contributes to climate change and associated impacts.[17] Mercury can cause impaired neurological development in children.[18] Inhalation of particulate matter causes and contributes to human respiratory illness.[19] Table 3 provides potential emission rates and annual emissions of criteria pollutants associated with a 38.5 MW biomass plant.[20]

Table 3. Criteria Pollutants from a 38.5 MW Biomass Plant

Pollutant	Emissions Rate (lbs/kWh)	Annual Emissions (tons/year)
Sulfur Dioxide (SO_2)	3.46 E-04	58.3
Nitrogen Oxides (NO_x)	1.98 E-03	333.9
Carbon Dioxide (CO_2)	0.66[21]	1.11 E-05[22]
Mercury (Hg)	1.19 E-08	2.00 E-03
Particulate Matter (PM)	7.18 E-04	121.1

lbs/kWh = pounds per kilowatt-hour

Because these pollutants are diffused into the global atmosphere, regional impacts are difficult to quantify. However, impacts due to particulate matter and ground-level ozone can be localized. Particulate matter and ozone are the pollutants of most concern in Minnesota and are tracked regionally by the Minnesota Pollution Control Agency (MPCA). Because the plant would primarily utilize biomass for generation, net impacts from carbon dioxide would be minimal. Carbon dioxide released by the biomass plant would be utilized by living plants, which in time, would serve as fuel. The plant would operate as a largely closed carbon dioxide loop. However, fuels used to collect and transport biomass would likely not be carbon neutral and would create carbon dioxide emissions.

Mercury exists throughout the environment; however, the primary source of mercury in air emission is coal, i.e., the burning of coal in a coal-fired power plant. The biomass plant considered here would use biomass as a primary fuel and natural gas as a backup fuel. Thus, emissions of mercury, and related impacts, would be minimal.

[16] Health and Environmental Impacts of NO_x, http://www.epa.gov/air/nitrogenoxides/.
[17] Climate Change 2007: Synthesis Report, Summary for Policymakers, An Assessment of the Intergovernmental Panel on Climate Change (IPCC), http://www.ipcc.ch/.
[18] Health Effects, http://www.epa.gov/mercury/effects.htm.
[19] Health and Environment, http://www.epa.gov/air/particlepollution/health.html.
[20] Adapted from Minnesota Biomass EAW, http://mn.gov/commerce/energyfacilities/Docket.html?Id=4452.
[21] AP-42, Fifth Edition, Volume 1, Chapter 1 External Combustion Sources, Section 1.6 Wood Residue Combustion in Boilers, http://www.epa.gov/ttn/chief/ap42/ch01/final/c01s06.pdf.
[22] Because the plant is fired with biomass (excepting natural gas backup) net carbon dioxide emissions from the plant would be minimal. Carbon dioxide released from the plant would be integrated into new biomass materials which, in time, would be harvested and used to fire the plant. There would be carbon dioxide emissions related to transport of biomass and plant operations.

Mitigation

Emissions of some criteria air pollutants can be mitigated through control technologies. Nitrous oxides emissions could be reduced by approximately 75 percent through use of a selective non-catalytic reduction system on the biomass boiler.[23] Particulate matter emissions could be reduced by 90 percent with add-on devices such as a multi-cyclone and dust collector.[24]

In addition to the use of control equipment to mitigate pollutant impacts, a best available control technology (BACT) analysis could be conducted. The BACT analysis is a requirement of new facilities under federal new source review prevention of significant deterioration (PSD). A BACT analysis and implementation could limit emissions from the plant to less than those presented in Table 3.

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.[25]

Stoneray Wind Farm

The Stoneray Wind Farm would not emit 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 100 MW LWECS

A generic 100 MW LWECS would have HAP and VOC emissions similar to the Stoneray Wind Farm.

38.5 MW Biomass Plant

A 38.5 MW biomass plant would emit HAPs and VOCs. The amounts of these pollutants are based on a plant similar to the NGPP Minnesota Biomass plant. Because these pollutants are diffused into the global atmosphere, regional impacts are difficult to quantify. The only area in Minnesota with a cancer risk due to HAPs greater than 100 in a million is the Minneapolis - Saint Paul metro area.[26] The emissions from the biomass plant would be relatively small compared with other sources. Table 4 lists the potential emission rate and annual emissions of hazardous air pollutants and volatile organic compounds associated with a 38.5 MW biomass plant. [27]

[23] Minnesota Biomass EAW.
[24] *Id.*
[25] About Air Toxics, http://www.epa.gov/ttn/atw/allabout.html;
[26] Summary of Results for the 2002 National-Scale Assessment, http://www.epa.gov/ttn/atw/nata2002/risksum.html.
[27] Adapted from Minnesota Biomass EAW, http://energyfacilities.puc.state.mn.us/Docket.html?Id=4452.

Table 4. HAP and VOC Emissions from a 38.5 MW Biomass Plant

Pollutant	**Emission Rate** (lbs/kWh)	**Annual Emissions** (tons/year)
Hazardous Air Pollutants (HAPs)	1.80 E-04	30.4
Volatile Organic Compounds (VOCs)	5.55 E-04	93.6

lbs/kWh = pounds per kilowatt-hour

Mitigation
It is possible to mitigate HAP and VOC emissions with control technologies. However, given the relatively small amounts of HAP and VOC emissions compared with the costs of control equipment, it is likely that control technologies would not be employed.

6.1.3 Ozone

Large electric power generating facilities, such as biomass facilities, have the potential to produce reactive organic 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]

Stoneray Wind Farm
The Stoneray Wind Farm would not produce ozone or ozone precursors. Thus, there would be no human or environmental impacts or mitigation related to ozone formation.

Generic 100 MW LWECS
A generic 100 MW LWECS would not produce ozone or ozone precursors and would have no impacts related to ozone formation.

38.5 MW Biomass Plant
A 38.5 MW biomass plant would produce ozone precursors (e.g., NO_x, VOC) that would lead to ozone formation. Impacts from ozone are localized. The State of Minnesota is designated as in attainment for ozone by the Environmental Protection Agency (EPA). Given this status, ground level ozone formation and associated impacts are anticipated to be minimal.

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

[28] Ozone, http://www.epa.gov/Ozone/. Air Quality – Ozone, http://www.health.state.mn.us/divs/eh/air/ozone.htm.

6.2 Water Resources

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

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.

Stoneray Wind Farm
The proposed Project would require water appropriations for potable and sanitary water for the operations and maintenance facility. Water would be supplied through the existing rural water supply or a single domestic-sized well. This amount of water used would be roughly equivalent to the amount consumed by a residence or farmstead in the area, and would likely not require mitigation.

Generic 100 MW LWECS
A generic 100 MW LWECS would have water appropriations similar to the Stoneray Wind Farm.

38.5 MW Biomass Plant
A 38.5 MW biomass plant would require water appropriations for energy production (process water) and sanitation. Process water could come from a well; however, a municipal water source may also be required. For some aspects of the process, such as in the cooling tower, effluent water from a wastewater treatment facility could be used. The sources of water would depend on the type and availability of water sources near the facility location.

The required quantity of water would be dependent on plant design and water quality. Functions within the plant that require water include cooling, sanitation, washing and separations. The average anticipated water use would be approximately 1275 gallons per minute. If a source of effluent wastewater were available, the appropriation of well or municipal water would be relatively lower. If the plant used only well or municipal water, the water appropriation would be higher. Based on anticipated water use, the plant would require a water appropriations permit from the Minnesota Department of Natural Resources (MDNR)[29] if using well water.

Mitigation
Mitigation of well water and municipal water use by the plant could be achieved through plant equipment choices and through the use of effluent water (water that has already been appropriated). If municipal water were used for the plant, modifications or an expansion of the municipal water treatment plant may be required to accommodate the increase in demand.

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.

[29] Water Use Permits, http://www.dnr.state.mn.us/waters/watermgmt_section/appropriations/permits.html.

Stoneray Wind Farm

The proposed Project does not create wastewater during the generation of electricity. However, wastewater would be created by the operation and maintenance (O&M) building. This wastewater would likely be discharged into a septic system associated with the building. 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 100 MW LWECS

A generic 100 MW LWECS would have wastewater impacts similar to the Stoneray Wind Farm.

38.5 MW Biomass Plant

A 38.5 MW biomass plant would have process and sanitary wastewater discharges. The amount of wastewater discharge would depend on the water sources used for the plant. If well and municipal water are used, anticipated average wastewater discharge would be approximately 1,275 million gallons per year. If effluent water is also utilized, wastewater discharge could decrease to approximately 310 million gallons per year.

Mitigation

Wastewater impacts could be mitigated by processing. The most likely scenario is transference of the wastewater to a municipal sewage system for treatment and release. Wastewater could be held or pre-treated at the biomass plant. Holding could reduce discharges through evaporation. However, holding introduces risks related to keeping wastewater stored away from surface and ground waters.

6.2.3 Groundwater

The southwest area of the state has scattered, shallow alluvial sands and limited, buried sand aquifers. The depth to bedrock throughout the Project site varies from as little as 50 feet to nearly 500 feet, with the bedrock in the northern half of the Project tending to be closer to surface.[30] The highest yielding aquifers in this region are mostly narrow, channel outwash deposits. The Sioux Quartzite aquifer is near the surface in much of the region and is known for its low yield and high vulnerability to contamination.[31] Many residents of this region are now served by rural water supply systems.

Stoneray Wind Farm

Impacts to geologic and groundwater resources are not anticipated. Water supply needs would be quite limited. It is likely that operations and maintenance water requirements would be satisfied with either a well or rural water service.

Mitigation

Large excavations in the Project are limited to the turbine pads and the few other support buildings. Groundwater resources should not be impacted. Wind turbine locations should not impact the use of existing water wells. To comply with residential and noise setbacks, turbines would be located at least 1,000 feet from homes, where most of the residential wells would be located. Measures would be taken to identify any nearby wells prior to construction of turbine foundations.

[30] SPA at 30

[31] Ground Water in Minnesota, Pollution Control Agency website

Agencies such as the DNR, PCA and Minnesota Department of Health should also be contacted as necessary to determine appropriate actions to protect local groundwater resources.

Generic 100 MW Wind Project
Impacts to groundwater from a generic wind project would be similar or higher depending on site location and geological material of the project. The potential for groundwater contamination resulting from construction may be higher in areas with karst topography.

38.5 MW Biomass Plant
As discussed in Section 6.2.1, a biomass plant would be expected to require approximately 1,275 gallons per minute of water for cooling, sanitation, washing and separations. A biomass plant would be expected to have similar impacts on resources as the proposed project depending on resources on and near the project site. Siting of the biomass plant utilizing construction practices that minimize impacts to surface water would likely mitigate impacts.

6.2.4 Surface Water

Potential impacts to surface waters from electric generation projects are largely related to construction activities. In the case of a biomass facility, where fuel may be stored onsite, fuel supplies need to be properly stored to prevent potential impacts to surface waters from runoff.

Stoneray Wind Farm
The Project area sits on the divide between the Missouri and Upper Mississippi watersheds. There are numerous watercourses in the Project area, notably Rock River, East Branch Rock River, and North Branch Chanarambie Creek. Watercourses generally flow north to south. DNR data indicates that approximately 96 linear miles of intermittent streams and 13 linear miles of perennial streams occur within the Project area. Additionally, approximately three linear miles of other types of streams (categorized as connectors to lakes and wetlands) are within the Project area.[32] There are numerous farm ponds but no large water bodies in the Project area. The closest large water bodies appear to be Lake Wilson, approximately four miles east of the Project area, and Current Lake, approximately nine miles northeast of the Project area.

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.

Mitigation
Because construction of the Project requires disturbance of more than one acre of soil, Applicants would need to submit a National Pollutant Discharge Elimination System (NPDES) permit application for construction facilities to the PCA. The application would identify Best Management Practices (BMP) 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 far equipment away from waterways would ensure that fuel and lubricants do not enter waterways.

[32] SPA at 31

LWECS permits issued by the Commission require permits and approvals from the DNR, U.S. Fish and Wildlife Service (USFWS) 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 water shed.

Generic 100 MW Wind Project
The primary source of impacts to surface water from a generic 100 MW wind project would be erosion and runoff during construction. Generally mitigation strategies would be similar to those of the Stoneray Wind Farm. In areas where a surface water body is identified as impaired, the SWPPP would provide detailed mitigation on how impacts to the impaired water body would be avoided.

38.5 MW Project
Construction of a 38.5 MW project would also increase the potential for soil erosion. As such a project would require disturbance of an area larger than one acre, the developer would be required to apply for an NPDES permit and develop a SWPP for both the construction and operation components of the project. Fuel stocks stored onsite would need to be properly contained and covered to minimize the potential for runoff.

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 human health impacts, e.g., cancer.[33]

Stoneray Wind Farm
The proposed Project would create solid wastes during construction including scrap wood, plastics, cardboard and wire to name a few. Small amounts of solid and hazardous wastes would be generated during operation, such as oils, grease, hydraulic fluids and solvents, likely less than three tons per year.[34] Lubricants and fluids would be stored at the operation and maintenance building.

Mitigation
These materials would need to be stored, recycled or disposed of according to applicable local, state and federal regulations. Hazardous wastes would need to be handled appropriately; hydraulic fluid, lubrication oil and grease would be disposed of through a used oil recycler or off-site incinerator. Leaks or spills could be mitigated using appropriate clean up techniques. A listing of all potentially hazardous materials related to the Project should be maintained 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).[35]

[33] Volatile Organic Compounds (VOCs) in Minnesota's Ground Water, http://www.pca.state.mn.us/water/groundwater/gwmap/voc-fs.pdf.
[34] CNA at 39
[35] Very Small Quantity Generator Hazardous Waste Collection Program, http://www.pca.state.mn.us/publications/w-hw2-50.pdf.

Generic 100 MW LWECS
A generic 100 MW LWECS would have solid and hazardous waste impacts similar to the Stoneray Wind Farm.

38.5 MW Biomass Plant
A 38.5 MW biomass plant would create solid and hazardous wastes. Solid wastes would be generated during construction, e.g., scrap wood, plastics, cardboard and wire. Solid waste generated from operations would consist primarily of ash from the biomass boiler. Small amounts of hazardous wastes would be generated during operation, e.g., oils, grease, hydraulic fluids and solvents. Hazardous materials would likely be stored on site, e.g., diesel fuel.

Mitigation
Ash generated by the plant would be held on-site in an ash holding facility or removed to an off-site disposal facility. Storage tanks would be registered and maintained in accordance with PCA guidelines.

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 in the Project area.

6.4.1 Ecological Setting

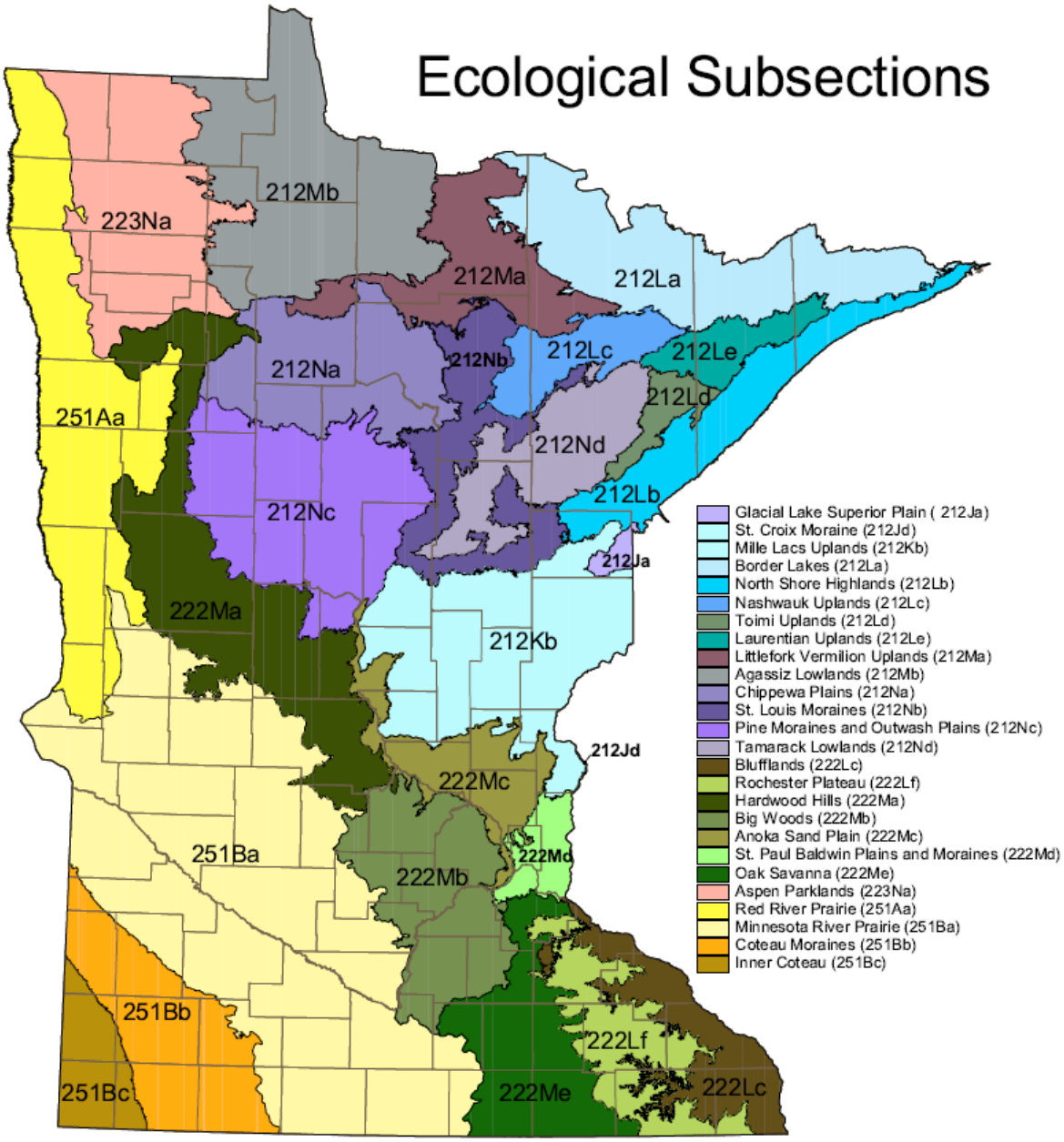
The Minnesota Department of Natural Resources and the U.S. Forest Service have developed an Ecological Classification System (ECS) for ecological mapping and landscape classification in Minnesota[36] (**Figure 3**). Ecological land classifications are used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features.

The Stoneray Wind Farm sits in the Inner Coteau Subsection of the Prairie Parkland Province, a large province extending from Manitoba and covering much of the Midwest.[37] This subsection is west of the Buffalo Ridge and serves as the western boundary of the Coteau Moraines Subsection.

The Inner Coteau subsection is located in the extreme southwest corner of Minnesota and includes parts of southeastern South Dakota and northwestern Iowa. This subsection contains some excellent tracts of remaining native prairie interspersed with wetlands and streams, which provide habitat for a variety of species. Fire and grazing by bison and elk was essential to maintaining prairie communities and preventing trees and shrubs from establishing. Today, agriculture is the predominant land use and its expansion and intensification have resulted in water quality and water quantity concerns. Gravel and boulder mining occur in this subsection, and large-scale wind-power production is expanding dramatically. Many of the remaining prairie-grassland complexes are in private ownership and have been used for grazing. Wetland protection and restoration are important conservation issues.

[36] See MN DNR Ecologcial Classification System, http://www.dnr.state.mn.us/ecs/index.html
[37] See MN DNR Coteau Morraines Subsection Profile, http://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/cwcs/profiles/coteau_moraines.pdf

Figure 3. Ecological Subsections



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Division of Forestry
Ecological Land Classification Program

Land use within the project area is primarily agricultural, with cultivated lands making up approximately 76 percent of the total land cover and grasslands approximately 23 percent. All other cover types (water, wetland, forest) make up less than 1 percent. Only 1 percent of the total land cover is developed.[38]

6.4.2 Soils

Most of the soils in the Project area consist of glacial till deposited from the late Wisconsin and Holocene periods. Silty clay loams of the Kranzburg-Vienna or Estelline-Lamore soil associations predominate to the west, northwest, north and southeast of Woodstock.[39] The soils directly to the east of Woodstock tend to be loams or clay loams of the Barnes-Buse complex.[40] Sand and gravel deposits are common, especially in the northwest and west portions of the Project area.[41]

6.4.3 Wetlands

Wetlands provide direct benefits to the environment and vary according to the type or class of wetland and the season. Wetlands serve as floodwater detentions, provide nutrient assimilation and sediment entrapment (water quality), and provide wildlife habitat. Wetlands are either protected federally under Section 404 of the Clean Water Act or by the State of Minnesota under the Wetland Conservation Act. The National Wetland Inventory (NWI) developed by the USFWS identifies wetlands based on imaging from aerial photography or digital aerial imagery. Although the NWI data has not been field verified, it provides a good start to identify potential wetland areas.

A desktop wetlands assessment for the 29,500 acre Project area was performed by Burns & McDonnell[42] using publicly available data to identify potential wetland areas. The desktop analysis identified the wetland types found in **Table 5** below.

Based on DNR data, three types of rare wetland-related features, marsh, calcareous fen and wet meadows, have been recorded in the Project area totaling approximately 45 acres.[43] A marsh is a type of emergent wetland that is frequently or continually inundated with water. Calcareous fens are a type of wetland fed by groundwater that supports a unique plant community and are considered to be exceptionally rare in regard to both occurrence and the abundance of vegetation communities (often sensitive and protected species) that they support. Wet meadows are a type of wetland that occurs in poorly drained, often low lying areas that are saturated at the surface, but without standing water except for brief periods during the growing season.

[38] *Id.*
[39] Hokanson, H. L., 1976. *Soil Survey of Pipestone County, Minnesota*. United State Department of Agriculture, Soil Conservation Service.
[40] Nelson, G.D., 1990. *Soil Survey of Murray County, Minnesota*. United State Department of Agriculture, Soil Conservation Service.
[41] SPA at 29-30
[42] SPA at Appendix C-13
[43] *Id.*

Table 5. NWI Wetland Type and Acreage

Wetlands Estimates from Databases	Acreage
Palustrine Emergent Wetland (PEM)	657
Palustrine Forested/Shrub Wetland (PSS)	7
Palustrine Pond (PUB)	23
Riverine Wetland (R)	1
PWI Wetland	63
RIM Wetland Areas	14
NLCD Wetland	62*
Calcareous Fen	3*
Wet Meadow	37*
Marsh	5*

* These land cover types overlap with the national and statewide wetland inventories.

Mitigation
Wind permits issued by the Commission prohibit placement of wind turbines or associated facilities such as roads, transformers, foundations, or underground cables within public water wetlands. Electric collector or feeder lines may cross or be placed in public waters or public waters wetlands subject to permits and approvals the DNR, the USACE, and local units of government as implementers of the Minnesota Wetland Conservation Act (WCA).

Once a final project layout is determined, Applicants will be expected to conduct wetland delineation in areas identified for construction of turbines, roads, or other facilities associated with the Project. Depending upon the results of the delineation results, project components may be shifted to avoid delineated wetlands.

Generic 100 MW Wind Project
Because wind projects are designed to avoid wetlands to the extent possible, impacts and mitigation would be expected to be similar for a generic 100 MW wind project.

38.5 MW Biomass Facility
It is likely that a biomass facility could be designed and located to avoid wetland impacts. If the project could not avoid wetlands, permits from the USACE, DNR, and the local county or implementer of the WCA would be required depending upon jurisdiction.

6.4.4 Wildlife

Wildlife in the project area consists of birds, mammals, fish, reptiles, amphibians and insects, both resident and migratory, which utilize the habitat in the project area for forage, breeding and shelter. The resident species are representative of game and non-game fauna in southwestern Minnesota. There are few wetlands and forest in this landscape; however, small groves of trees and wooded shelterbelts are common features of farmsteads in the area. The majority of migratory wildlife species are birds, including waterfowl, raptors and songbirds.

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 and other carnivores. Reptiles and amphibians are associated with wetlands, waterways and forested areas. Reptiles and amphibians include snakes, turtles and frogs. Blanding's Turtle, a state-listed threatened species, is known to occur near the project area. The Topeka shiner, a federally-listed endangered and state-listed special concern species of minnow, is also found in the area. Several species of birds and bats are also known to occur in this landscape, including grassland birds, migratory birds, raptors and waterfowl. Birds and bats are discussed below.

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.[44] 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 and migration patterns, and local and individual behavior patterns.

Public lands surrounding the project area provide important wildlife habitat in a landscape dominated by agricultural uses, particularly for resident and migratory birds. Public lands and other conserved lands, such as The Nature Conservancy lands, form key corridors along Buffalo Ridge. [45]

Based on DNR data[46] there is a Conservation Reserve Enhancement Program (CREP) area located in the central part of the Project area. The Terrace Wildlife Management Area (WMA) is located along the western boundary of the Project area. The Van Beek WMA is located along the eastern boundary of the Project area. The Salt & Pepper WMA is located along the southern boundary of the Project area. In total, five state-managed WMAs, three Reinvest in Minnesota (RIM) conservation easements, and five CREP conservation easements are located along the boundary or within one mile of the Project area. Some of these state-managed lands are known to or could potentially host sensitive species and habitats. See **Table 6** for a list of the areas.

[44] National Wind Coordinating Committee, Spring 2010.
[45] Tomorrow's Habitat for the Wild and Rare, Minnesota DNR, 2006.
[46] Minnesota Department of Natural Resources, Natural Heritage and Nongame Research Program, April 2012 through June 2013, *Review of the Minnesota Natural Heritage database for rare plant or animal species or other significant features in Murray and Pipestone Counties, St. Paul*, Natural Heritage Program.

Table 6. Public Areas within or Adjacent the Project

Name/Area	Location
WMA	
Holland	T107N, R44W, Section 5
Gromer's Draw	T107N, R44W, Section 10
Terrace	T106N, R44W, Section 6 and T107N, R44W, Section 31
Van Beek	T107N, R44W, Section 24
Salt & Pepper	T106N, R43W, Section 29
RIM	
Wetland Preserve	T107N, R43W, Section 18
Marginal Cropland	T107N, R44W, Section 7
Marginal Cropland	T107N, R44W, Section 13
Unspecified	T107N, R44W, Section 35
CREP	
Native Prairie Bank	T106N, R43W, Section 32
Native Prairie Bank	T106N, R43W, Section 32
Native Prairie Bank	T106N, R43W, Section 33
Native Prairie Bank	T106N, R43W, Section 33
Native Prairie Bank	T106N, R43W, Sections 32 and 33

Birds

The impact of wind facilities on avian species has been relatively well documented in the United States. With the exception of some wind facilities in California, raptor fatality rates are low. Songbirds, or passerines, have the highest fatality rates, although the fatality rates of all species generally range from 1-4 birds per MW per year. [47] A study of bird fatality rates at a wind farm in Iowa resulted in estimated fatality rates between 0.3 and 0.8 birds per turbine per year.[48] This estimate is similar to results from studies in other states where fatality rates ranged between < 1 to 2.83 birds per turbine per year.[49]

[47] National Wind Coordinating Collaborative. *Wind Turbine Interactions with Birds, Bats, and their Habitats: a Summary of Research Results and Priority Questions*. Spring 2010 http://www.nationalwind.org/publications/bbfactsheet.aspx?

[48] Bird and Bat Behavior and Mortality at a Northern Iowa Windfarm, (Jain 2005) http://www.batsandwind.org/pdf/Jain_2005.pdf.

[49] *Id.*

Studies conducted in the Buffalo Ridge region of southwestern Minnesota resulted in estimated bird fatality rates between 1.0 and 4.5 birds per turbine per year.[50] Nocturnal migrants suffered relatively more fatalities; local grassland species suffered relatively less. The studies noted that birds tend to avoid turbine towers, but utilize the surrounding habitat.

In sum, studies of bird fatalities near wind farms indicate that fatalities will occur and that they will vary with bird type (e.g., raptor, passerine) and bird use (habitat). It is unclear how fatalities will impact avian populations at a broader scale.

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 range from 1 to 9 bats/MW/year.[51], [52] Bat studies conducted at the Buffalo Ridge, Minnesota, found an average of 1 to 3 bat fatalities/turbine/year. The highest bat fatalities were found at the Blue Sky Green Field wind facility in Wisconsin, where bat fatalities averaged 24 bats/MW/year.

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 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. [53]

There are seven species of bats that occur in Minnesota, all of which have the potential to occur throughout the state.[54] Two bat species are state-listed as special concern and also Species of Greatest Conservation Need (eastern pipistrelle / tricolored bat *Pipistrellus subflavus* / *Perimyotis subflavus* and northern myotis / northern long-eared bat *Myotis septentrionalis).* The northern long-eared bat is also under consideration by the USFWS for protection under the Endangered Species Act. Two species of bats are proposed to be state-listed as special concern (little brown myotis / little brown bat *Myotis lucifugus* and big brown bat *Eptesicus fuscus).* Bats roost in trees and other structures during the day and commute to foraging sites after sunset and utilize a variety of habitats for foraging, including riparian corridors, open grasslands, and forests. [55]

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[50] Avian Monitoring Studies at the Buffalo Ridge, Minnesota Wind Resource Area: Results of a 4-Year Study, http://mn.gov/commerce/energyfacilities/documents/AvianMonitoringBuffaloRidge.pdf [hereafter Buffalo Ridge Studies].

[51] National Wind Coordinating Collaborative. *Wind Turbine Interactions with Birds, Bats, and their Habitats: a Summary of Research Results and Priority Questions*. Spring 2010 http://www.nationalwind.org/publications/bbfactsheet.aspx?

[52] EERA notes this number may be conservative, as unpublished reports in the teens and twenties have been recorded in Minnesota and Wisconsin.

[53] *Id.*

[54] DNR http://www.dnr.state.mn.us/mammals/bats.html

[55] Kunz et al. 2011. *Ecosystem Services Provided by Bats, Annals of the New York Academy of Sciences: 1223* (2011) 1–38. http://www.caves.org/WNS/WNS%20Kunz%20April%205%20%202011.pdf

The high proportion of agricultural land and low proportion of forested area within the project boundary would appear to limit habitat for tree-roosting bat species. Bat activity is greatest in late July through mid-August. Fatality rates of migrating bats (tree-roosting species) peak during late summer and early fall.[56] There is also a small spike in bat fatalities during the spring migration. The cumulative impacts to bat populations are unknown at this time.

Stoneray Wind Farm

The Project area is dominated by row crop production, estimated at 22,000 acres, approximately 75 percent of the Project area. Other portions of the Project area include approximately 3,800 acres of grasslands, 1,600 acres of pasture/hay, 1,500 acres of developed/open space, and up to 750 acres of wetlands.

In addition to the primary land use of cultivated agriculture, DNR-Natural Heritage Information System (NHIS) data indicates there are four state-designated rare natural community types recorded in the Project site, which include three calcareous fens, 38 wet meadows, 435 upland prairie segments, and four marshes. Many of these features are located in the north and west portions of the Project site and appear associated with streams. There appear to be no USFWS-owned lands, Waterfowl Production Areas (WPAs), DNR-Designated Wildlife Lakes, DNR Migratory Waterfowl Feeding and Resting Areas (MWFRAs), State Game Refuges, or State Wild, Scenic, and Recreational Rivers (WSRs) within the Project boundary. Portions of the designated Prairie Coteau Complex IBA and the Prairie Pothole and Eastern Tallgrass Prairie Bird Conservation Region IBA occupy the northwestern corner and a small portion of the far southeastern corner of the Project area. [57]

Impacts to most wildlife species are expected to be minimal. Avian and bat fatalities would occur. While the extent of such fatalities is not known, it is likely they would be within the range seen at other large wind facilities in the Midwest – 1 to 4 birds/MW/year and 1 to 9 bats/MW/ per year. Given the lack of forested habitat in the project area, it is assumed bat fatalities in the project area would be similar to those at other large wind facilities in the Midwest and that fatalities would likely be migrating bats.

Impacts to ground animals are expected to be minimal and no specific mitigation has been proposed.

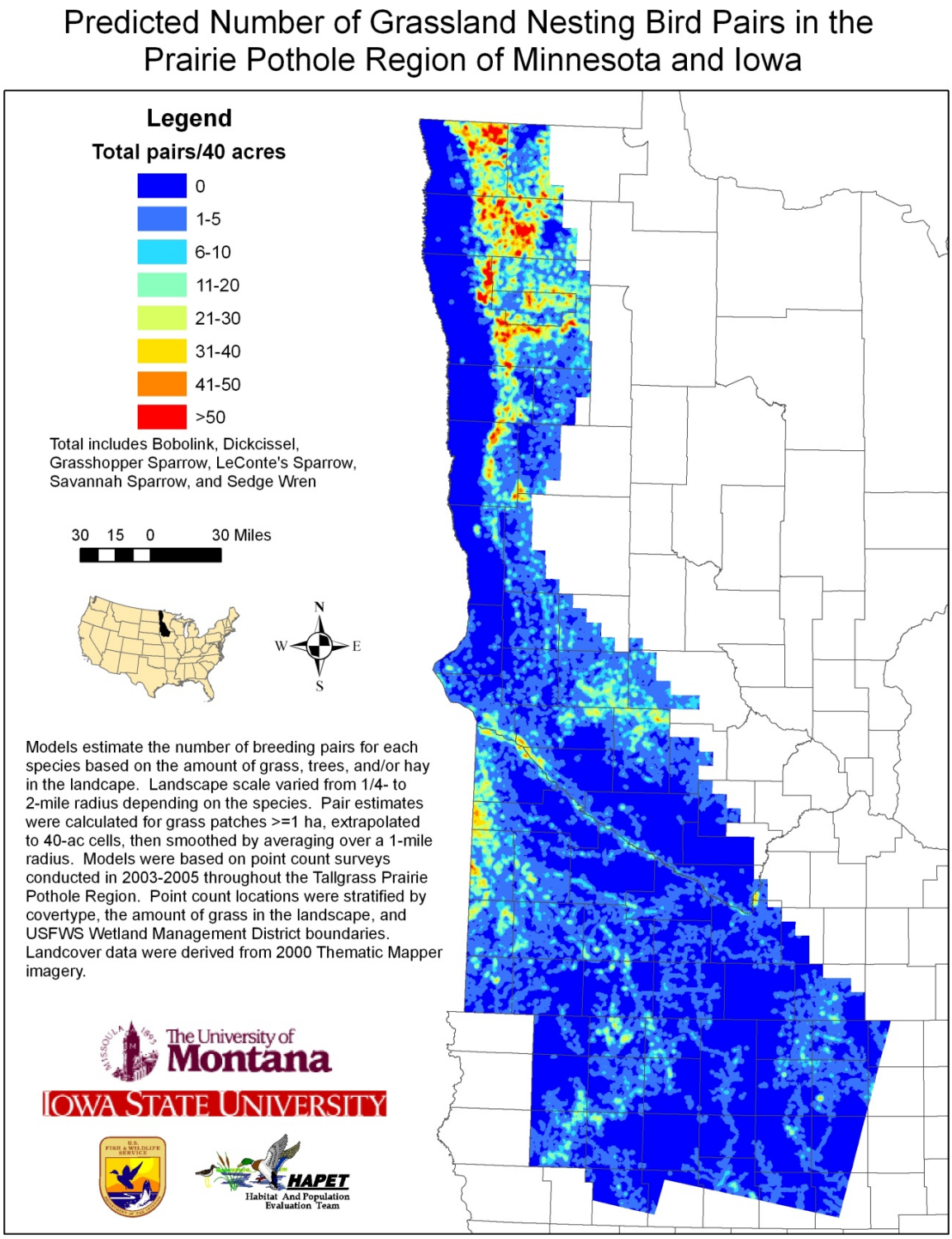
Mitigation

Stoneray submitted a draft Bird and Bat Conservation Strategy (BBCS) in lieu of an Avian and Bat Protection Plan (ABPP) November 1, 2013. The final plan will be required to include information on formal and informal monitoring, construction and operation training and reporting protocol. Applicants propose to minimize impacts to birds and bats through siting, timing of construction and avoidance of habitat. Siting turbines away from bird habitat (grasslands, riparian areas and wetlands), identified flyways and bat feeding areas (forests, riparian corridors and wetlands) reduces impacts to avian and bat species. The project will maintain a 3 x 5 RD setback from all public lands adjacent to the project boundary. Construction timing to avoid the avian breeding season also reduces impacts to bird species.

[56] National Wind Coordinating Collaborative. *Wind Turbine Interactions with Birds, Bats, and their Habitats: a Summary of Research Results and Priority Questions*. Spring 2010 http://www.nationalwind.org/publications/bbfactsheet.aspx

[57] Bird and Bat Conservation Strategy, Burns & McDonnell, November 1, 2013, eDockets no. 201311-93194-01

Figure 4. Predicted Nesting Grassland Bird Pairs



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 employing turbines with a relatively higher cut-in speed or by using SCADA system controls to increase cut-in speed.[58] Curtailment of turbines has been found to effectively reduce bat fatalities by as much as 80 percent.[59]

Generic 100 MW LWECS

Because impacts to wildlife would depend upon specific site characteristics, it is difficult to assess wildlife impacts for a generic 100 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. For example, as shown in **Figure 4**, compared to the rest of the Prairie Pothole region in Minnesota and Iowa, the Project area shows a low to moderate population density of grassland nesting birds (including Bobolink, Dickcissel, Grasshopper Sparrow, LeConte's Sparrow, Savannah Sparrow, and Sedgewren).

38.5 MW Biomass Plant

A 38.5 MW biomass plant would likely have fewer impacts on avian and bat species than the Stoneray Wind Farm. The biomass plant would be constructed on an approximately 60 acre site. This acreage would be removed from use as wildlife habitat. However, the land used for the project would likely be agricultural land; such land is relatively poorer habitat for wildlife. Impacts from operation of the plant are anticipated to be minimal. Emissions from the plant (e.g., hazardous air pollutants) could, through impacts to the environment, impact wildlife. The extent of this impact is uncertain.

6.4.5 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.[60] 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.[61]

Stoneray Wind Farm

During the site review for the BBCS, Burns & McDonnell made a number of observances of state-managed species with the Project area, as noted in **Table 7**.

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[58] 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.

[59] National Wind Coordinating Collaborative. *Wind Turbine Interactions with Birds, Bats, and their Habitats: a Summary of Research Results and Priority Questions*. Spring 2010 http://www.nationalwind.org/publications/bbfactsheet.aspx

[60] For more information on Minnesota County Biological Surveys, see http://www.dnr.state.mn.us/eco/mcbs/index.html

[61] For more information on the Minnesota Natural Heritage Information System Database, see http://www.dnr.state.mn.us/eco/nhnrp/nhis.html

Table 7. State Managed Species within the Project Area[62]

Species or Community Type	Federal Status	State Status	Occurrences
Calcareous Fen Community	None	State monitored	1
Marsh Arrow-Grass	None	State monitored	1
Dry Hill Prairie Community (Southern)	None	State monitored	1
Northern Grasshopper Mouse	None	State monitored	1
Upland Sandpiper	None	State monitored	1
Plains Topminnow	None	Special concern	7
Regal Fritillary	None	Special concern	1
Topeka Shiner	Endangered	Special concern	3

Additionally, two candidates for federal listing, the Dakota Skipper and Poweshiek Skipperling, have been recorded within the Project area. The federally threatened Western Prairie Fringed Orchid was not observed but is considered likely to occur within the area. Federally protected Bald and Golden eagles have not been recorded within the Project area.[63]

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."

Generic 100 MW LWECS
A generic 100 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.

[62] BBCS at 2-8 to 2-9
[63] SPA at 42

38.5 MW Biomass Plant

A 38.5 MW biomass plant would likely have fewer impacts to rare and unique natural resources. 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.

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. The larger area already hosts a number of commercial wind farms, including the Chanarambie Wind Farm which is partially inside the boundaries of the proposed Stoneray Wind Farm.

Table 8. Demographic and Economic Characteristics of the Project Area

Description	Pipestone County	Rock Twn	Burke Twn	Murray County	Cameron Twn	Chanarambie Twn	Minnesota
Population, 2000[64]	9,895	184	246	9,165	151	223	4,919,492
Population, 2010[65]	9,596	182	209	8,725	137	206	5,303,925
Population, 2012[66]	9,394	170	203	8,573	131	202	5,368,972
Percent Population Change, 2000-2012	-5.1	-7.6	-17.5	-6.5	-13.2	-9.4	9.1
Persons per Square Mile, 2012[67]	20.2	4.8	5.9	12.2	3.7	6.3	67.4
Median Household Income[68] (Dollars)	42,217	49,500	65,139	47,833	55,625	51,875	58,476
Persons below Poverty[69] (Percent)	11.3	1.1	2.2	9.9	5.5	3.7	11.0

[64] 2000 U.S. Census
[65] 2010 U.S. Census
[66] Minnesota State Demographer 2012 Population Estimates
[67] Land area only, Minnesota State Demographer
[68] U.S. Census Bureau 2007-2011 American Community Survey 5-Year Estimates
[69] *Id.*

The Project area is within two counties that have been experiencing significant declines in population over the last several decades. Pipestone County population peaked in the 1950s at approximately 14 thousand people, while Murray County population peaked in the 1940s at approximately 15.1 thousand people,[70] with each decreasing in population approximately 30 to 40 percent from their highest levels in the middle of the last century. Even though the population decline has continued into the new millennium, household incomes in the Project area remain relatively competitive with state averages (see **Table 8**).

The Applicant estimated the population and households within and around the project area in their Site Permit Application[71] using 2010 U.S. Census data (see **Table 9**).

Table 9. Population and Residences in Project Area

County	Population	Residences
Within 5 Miles (including the Project Area)		
Murray	1054	435
Pipestone	1438	570
Within the Project Boundary		
Murray	61	21
Pipestone	331	75

6.5.1 Aesthetic Impact and Visibility Impairment

The large size and high-tech appearance of wind turbines causes them to stand out against the backdrop of the open, rural landscapes in which they are often sited. Additionally, due to their 400-foot height, they can be seen for long distances. Visual impairment would not be an issue with this Project because wind turbines do not generate or emit by-products as a result of generation activities. This section discusses visual changes, shadow flicker, and perceptions of aesthetics of the proposed Project.

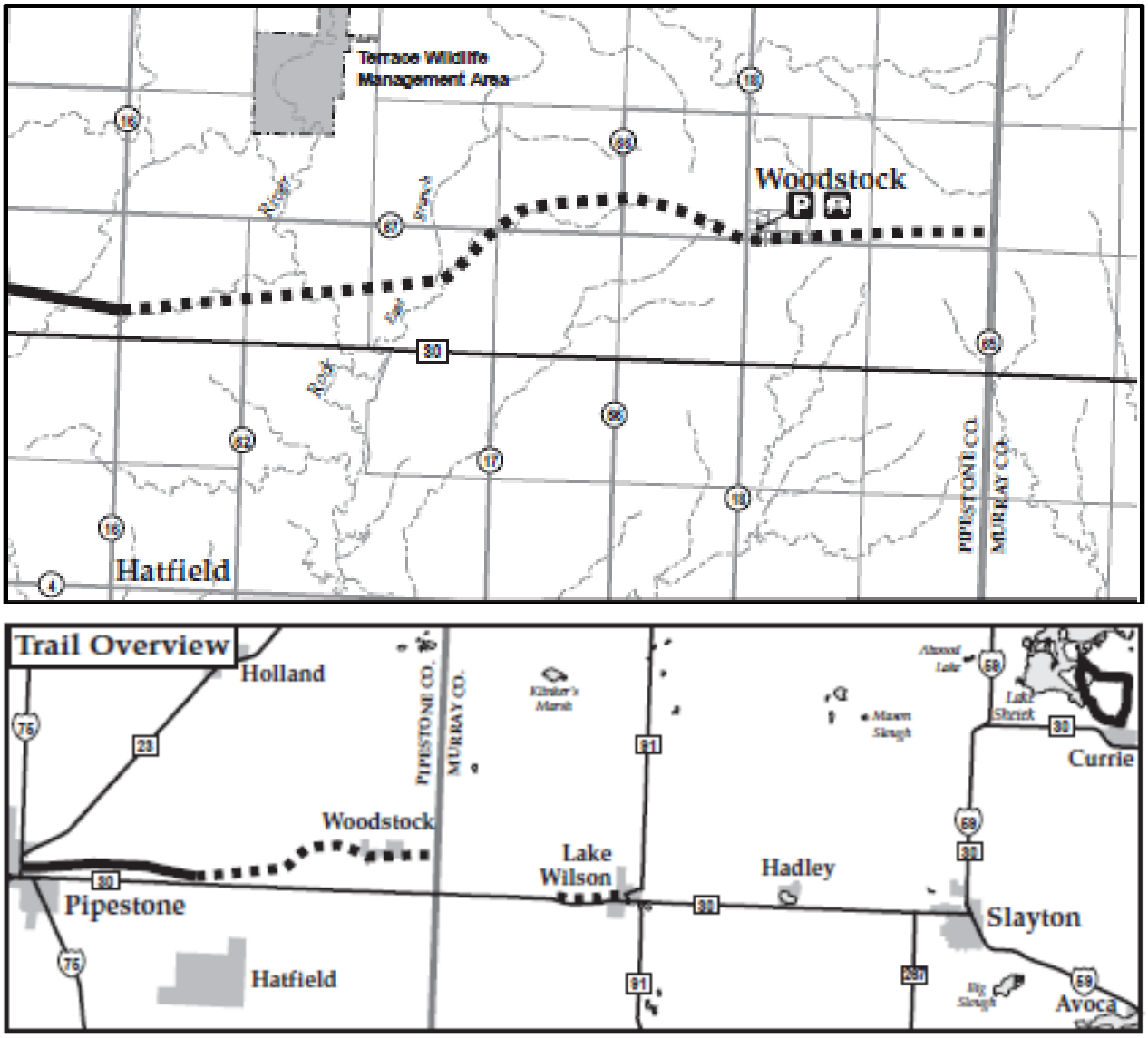
Stoneray Wind Farm

The Stoneray Wind Farm would alter the current landscape through the introduction of large wind turbines. The Project would also create shadow flicker. 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. Stoneray Wind Farm would be located in a predominantly rural, agricultural area characterized by gently undulating topography. The area is already characterized by numerous wind installations.

[70] U.S. Census Bureau
[71] SPA at 13

Developing a method to assess aesthetics of wind projects is difficult. Current methods of assessing visual impacts include viewshed mapping, photographic simulations, and video animation.[72] 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.

Figure 5. Casey Jones State Trail[73]



[72] Visual Considerations: Public Perceptions, Regulatory Environment and Assessment Methods in the Eastern U.S., http://www.nationalwind.org/assets/blog/Allen-NWCC_2009.pdf.
[73] http://files.dnr.state.mn.us/maps/state_trails/casey_jones.pdf

There are five state wildlife management areas in and near the Project (see **Table 6**), which 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. The area also hosts a portion of the Casey Jones State Trail (**Figure 5**):

> The trail consists of three segments. The longest segment is 13 miles of natural-surfaced, former railroad grade between the city of Pipestone and the Pipestone/Murray county line. A second, small, natural-surfaced segment runs west 1.5 miles from the city of Lake Wilson. The third portion of the trail is a 6 mile, paved loop between Lake Shetek State Park and the city of Currie. Horseback riding is not allowed on this portion of the trail.
>
> The trail connects points of natural interest, such as remnants of tallgrass prairie, wooded ravines, Lake Shetek and the sloughs around it, which are remnants of the glacial landscape that once covered southwestern Minnesota. Historical and cultural sites around the area include sites associated with Laura Ingalls Wilder in Walnut Grove, railroad artifacts in Currie and Tracy, wind towers, and the pipestone quarries in the Pipestone National Monument.[74]

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. In the case of the Casey Jones State Trail, the Draft Site Permit requires a turbine setback of 250 feet from the trail (similar to the setback required from public roads).

Setbacks from individual turbines, as embodied by Minnesota's general permit standards, mitigate visibility impacts.[75] Wind turbines must be set back from non-participating properties 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 Stoneray Wind Farm are shown in **Table 1**. Additional setbacks may be required to meet Minnesota noise standards.[76] Turbines are designed to be a uniform off-white color to blend in with the horizon and reduce visibility impacts. Lighting will be restricted by FAA guidelines and is similar to that for other tall structures in rural areas, so mitigation is not expected to be necessary.

Generic 100 MW LWECS

A generic 100 MW LWECS located elsewhere in Minnesota would have similar visual impacts and mitigation strategies. The number of people experiencing the visual impacts could potentially be greater if locating the Project in a less rural area of Minnesota. Impacts could be mitigated by utilizing wind turbines capable of generating more energy.

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[74] http://www.dnr.state.mn.us/state_trails/casey_jones/index.html

[75] Commission Order Establishing General Permit Standards, http://energyfacilities.puc.state.mn.us/documents/19302/PUC%20Order%20Standards%20and%20Setbacks.pdf.

[76] Minnesota Rule Chapter 7030 at all residential receivers (homes). Residential noise standard NAC-1, L50 50 dBA during overnight hours.

For example, a 100 MW Project consisting of 1.5 MW turbines requires 67 turbines; a similar Project consisting of 3.0 MW turbines requires 37 turbines. The larger turbines would create a larger individual "eyeprint," but the smaller number of turbines would likely create a relatively smaller visual impact for the Project.

38.5 MW Biomass Plant

A 38.5 MW biomass plant would likely impact visual aesthetics in the immediate area of the facility and in the surrounding area depending on the height of the stack plume.

A biomass plant would be industrial in nature with many buildings, conveyors, biomass piles, and a boiler stack. The building housing the boiler is likely to be at least 100 feet tall. The conveyors and biomass piles could range from 30 to 50 feet in height. Buildings, conveyors, and biomass piles would likely be lighted to allow for nighttime operation. Lighting would also be necessary for wood fuel loading/unloading points, truck scales, and vehicle parking areas.

The estimated height for the boiler stack is approximately 150 feet. Particulate matter control devices would capture most of the particulates from the boiler exhaust gas stream. Thus, the majority of the plume from the boiler stack would be water vapor. This plume may be seen during cold weather conditions, but would likely be virtually clear in warm weather. In cold weather, the plume may impair visibility. If taller than 200 feet, the boiler stack may require FAA lighting, similar to wind turbines.

Mitigation

Mitigation of visual impacts could be accomplished through siting of the biomass plant. The plant could be located in an industrial location allowing it to blend in with other industry and be located away from aesthetically valuable resources. However, the biomass plant would need to be located in an area where biomass is readily available in large quantities. Vegetative screening (trees, shrubs) could be used to partially block views of industrial buildings, silos, conveyors and boiler stack.

6.5.2 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.

There is not a Minnesota "light standard" that addresses potential impacts of shadow flicker, i.e. there is not a descriptive or numeric standard that would categorize a certain amount of flicker as acceptable or unacceptable. No other states have adopted such a standard. However, other countries have examined the issue and have adopted standards. 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.[77] It is unclear whether this is a worst-case scenario (e.g., clear skies every day) or an actual-case scenario (e.g., weather representative of the Project area).
- Belgium has adopted the German norm, adding a requirement for modeling in an EIA.[78]
- Denmark recommends a maximum of 10 hours/yr. assuming average cloud cover in the Project area.[79]
- France has adopted no standard but requires shadow flicker modeling.[80]
- The Netherlands have adopted a yearly maximum of 5 hours and 40 minutes assuming clear skies.[81]
- The State of Victoria, Australia, has adopted a shadow flicker standard of 30 hours/yr.[82]

Stoneray Wind Farm

Shadow flicker would occur as a result of the proposed Project. Areas most likely to experience shadow flicker would occur to the east and west of turbines. The number of hours per year during which shadow flicker could occur lessens as distance from the wind turbine increases, even for residences east and west of turbines. A discernable shadow forms and dissipates 15 to 45 minutes from sunrise or sunset depending on cloud cover.

Table 10. Potential Shadow Flicker Exposure on Homes over the Course of a Year

Shadow Flicker Exposure	Number of Homes			
	GE 1.7-100	V110-2.0	SWT-2.3-108	SWT-3.2-113
Under 10 minutes	43	53	52	59
Up to 25 total hours	58	52	54	53
25-50 total hours	20	13	17	13
50-100 total hours	13	14	11	12
More than 100 total hours	5	7	5	2

[77] Spatial Planning of Wind Turbines, European Actions for Renewable Energy (PREDAC), http://www.cler.org/info/IMG/pdf/WP8_ANG_guide.pdf.
[78] *Id.*
[79] *Id.*
[80] *Id.*
[81] *Id.*
[82] Policy and planning guidelines for development of wind energy facilities in Victoria, p. 47, http://www.dpcd.vic.gov.au/__data/assets/pdf_file/0016/112750/Policy-and-planning-guidelines-for-development-of-wind-energy-facilities-in-Victoria-July-2012.pdf

The Applicant modeled the four anticipated turbine types to estimate potential shadow flicker impact. The following assumptions were used to prepare a conservative estimate under a worst-case scenario: 1) the sun was assumed to always be shining from sunrise to sunset (i.e., no cloud cover, no rainy days, etc. that would reduce flicker effects); the turbines were assumed to always be operating (i.e., constantly spinning, and no downtime due to very low or very high wind speeds); and the turbine rotors were assumed to always be perpendicular to the individual homes. **Table 10** summarizes the results.[83]

Mitigation
Computer modeled predictions on the amount of expected shadow flicker at locations within or near a wind farm can be used to minimize shadow flicker within and adjacent the Project area using micrositing of wind turbines and maintaining designated setbacks from participating and non-participating landowners. Additional mitigation measures include siting turbines to utilize vegetative screening, planting vegetative screening or installing blinds. These additional mitigation measures could be considered on a case-by-case basis. Models for curtailment may also be implemented.

Generic 100 MW LWECS

Depending on surrounding landscape and topography, a generic 100 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.

38.5 MW Biomass Plant

A biomass plant would not cause shadow flicker due to the lack of exterior moving parts that could cast alternating shadows.

6.5.3 Turbine lighting

Large electric generating facilities would generally have some type of lighting at the facility to ensure safe operation of the facility. Tall structures, such as wind turbines and emissions stacks would also require lighting to make the facility visible to airplanes.

Stoneray Wind Farm

Wind turbines, per Federal Aviation Administration (FAA) requirements and because of their height, would be lighted.[84] Generally, turbines have flashing white lights during the day and red lights during the evening. Turbine lighting would be consistent with other lighted towers on the landscape, such as communication towers.

Generic 100 MW LWECS

A generic 100 MW LWECS located elsewhere in Minnesota would have lighting impacts similar to the proposed Project.

[83] SPA at 19-20
[84] FAA Advisory Circular AC 70/7460-2K, http://rgl.faa.gov/REGULATORY_AND_GUIDANCE_LIBRARY/RGADVISORYCIRCULAR.NSF/0/22990146db0931f186256c2a00721867/$FILE/ac70-7460-2K.pdf.

38.5 MW Biomass Plant

If taller than 200 feet, the boiler stack for a 38.5 MW Biomass plant would require FAA lighting similar to wind turbines.

6.5.4 Noise

Large electric generation facilities generate noise. Potential human impacts due to noise include hearing loss, stress, annoyance, and sleep disturbance.[85] 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").

Table 11. Minnesota Noise Standards by Area Classification[86]

Noise Area Classification[87]	Daytime		Nighttime	
	L_{50}[88]	L_{10}	L_{50}	L_{10}
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

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).

[85] World Health Organization. *Occupational and Community Noise* http://www.who.int/mediacentre/factsheets/fs258/en/.
[86] Minnesota Rule 7030.0040, https://www.revisor.leg.state.mn.us/rules/?id=7030.0040. Standards expressed in dB (A).
[87] Minnesota Rule 7030.0050, https://www.revisor.leg.state.mn.us/rules/?id=7030.0050. The noise area classification is based on the land use activity at the location of the receiver (listener).
[88] Minnesota Rule 7030.0020, https://www.revisor.leg.state.mn.us/rules/?id=7030.0020. "L_{50}" means the sound level, expressed in dB(A), which is exceeded 50 percent of the time for a one hour survey. "L_{10}" means the sound level, expressed in dB(A), which is exceeded ten percent of the time for a one hour survey.

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 11** lists Minnesota's noise standards by area classification.

Stoneray Wind Farm

The operation of wind turbines would 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).[89] 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.[90] Impacts due to these sound characteristics are subjective, i.e., human sensitivity, especially to low frequency sound, is variable. However, in general, low frequency sounds may cause annoyance and sleep disturbance.[91]

The Applicant modeled the highest predicted sound level at any residential receiver for each wind turbine option (see **Table 12)**. These numbers assume all sources would be operating at maximum power output simultaneously in a downwind direction. In real-world situations, it is anticipated that there would be no exceedances of the MPCA rules at any of the residential receivers for any of the wind turbine options.[92]

Table 12. Noise Modeling Results at Receiver

Turbine Model	Maximum Modeled Sound Level (dBA)
GE 1.7-100	48.1
Vestas V110	48.4
Siemens SWT-2.3	46.6
Siemens SWT-3.2	47.0

[89] 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.
[90] *Id.*
[91] *Id.*
[92] SPA at 17

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.[93] For rural residential areas in Pipestone and Murray counties, 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. Turbines would not be anticipated within 1,000 feet of any home according to the Applicant. 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.

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.[94]

Generic 100 MW LWECS
A generic 100 MW LWECS would have noise impacts and mitigation similar to the Stoneray Wind Farm. Depending on location, surrounding vegetation, topography, and turbine selection, impacts from noise could be more or less than those expected of the proposed Project.

38.5 MW Biomass Plant
A 38.5 MW biomass plant would create noise during operation from a variety of sources including the turbine/boiler building, conveyor system, hammer mill and bale choppers, front end loaders, and idling trucks. Based on noise studies, the plant would need to be located approximately 2,100 feet from a residence to the meet the daytime L_{50} standard of 60 dB(A), and approximately 6,200 feet from a residence to meet the nighttime L_{50} standard of 50 dB(A). These are conservative estimates – they are based on maximum equipment operation and have not been adjusted for possible noise shielding.

Mitigation
Sound (noise) from the biomass plant could be mitigated by siting. A study would likely be required to ensure that noise standards are met for all local residents. Enclosure of heavy equipment would reduce noise impacts. Vegetative screening, planted to lessen visual impacts, would also reduce potential noise levels. Fuel windrows could provide noise attenuation. Hours of operation, e.g., for fuel delivery or heavy equipment operation, could be managed to reduce noise impacts and help meet the standards.

6.5.5 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.

[93] Minn. Rules 7030.0040, Noise Standards, https://www.revisor.leg.state.mn.us/rules/?id=7030.0040
[94] 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

Stoneray Wind Farm

The proposed Project would be located in Pipestone and Murray counties in southwest Minnesota. Population in each of the counties has dropped between 2000-2010, continuing a decades long trend, which could be expected to depress residential values. On the other hand, household income is higher in the Project area than in the counties as a whole, even though the area sits among large wind developments (**Table 8** summarizes the demographics and housing characteristics in the area.)

The impacts on property values due to the Project would be 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.[95]

Six counties in southern Minnesota (Dodge, Jackson, Lincoln, Martin, Mower and Murray counties) with large wind energy conversion systems responded to a Stearns County survey asking about impacts on property values as a result of wind farms.[96] 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. [97]

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 can be mitigated by siting turbines away from residences.

Generic 100 MW LWECS

A generic 100 MW LWECS would have property value impacts similar to the Stoneray Wind Farm.

38.5 MW Biomass Plant

A 38.5 MW biomass plant would potentially negatively impact property values near the plant site and possibly along roads used to transport biomass. However, as with other alternatives, impacts on property values are difficult to quantify because of the many factors that influence a property's market value. For example, if biomass for the plant were supplied by neighboring land parcels, these parcels might experience an increase in property value.

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[95] The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis, December 2009, http://apps1.eere.energy.gov/news/progress_alerts.cfm/news_id=19924
[96] Stearns County Board of Commissioners Meeting, June 8, 2010.
[97] Results were based on limited data.

Mitigation
Because the plant would be sited at a single location, compared to multiple turbine locations, property value impacts could be mitigated by siting, such as in an area zoned to accommodate industrial use.

6.5.6 Local Economy

Short-term and long-term economic benefits would result from the construction of the Stoneray Wind Farm. 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. 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.

Stoneray Wind Farm
Applicants estimate that construction of the Project will require approximately 150 to 200 short-term construction jobs. During the operations phase of the project, Applicants anticipate that approximately 5-15 permanent positions will be created to operate the Project.[98]

Based on a production tax of $0.0012 per kWh produced, wind energy production taxes would provide an estimated $427,000 annually to the county and to townships within the Project.[99] Additionally, payments to landowners would provide income that could add to the local economy.

Generic 100 MW Wind Project
Economic benefits would be similar to those of the proposed Project.

38.5 MW Biomass Plant
A biomass plant would likely pay property tax, which would benefit local government revenues, but would not pay the Wind Energy Production Tax.

6.6 Infrastructure

A generation Project of this size has to consider potential impacts to existing infrastructure, such as transportation and communication. Wind farms, and their associated transmission facilities, need to add to the overall infrastructure without disrupting the existing system.

6.6.1 Associated Electrical Facilities

Wind generation facilities typically require construction of electrical facilities such as collector and feeder lines and a substation to connect to the transmission grid. The required facilities are lower voltage electric infrastructure (typically 34.5 kV). These lines, covered in the Site Permit, collect power generated by the wind turbines and supply the Project substation which connects to the grid.

[98] SPA at 28
[99] *Id.* at 29

Electric and magnetic 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.

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 (e.g., 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.[100] Thus, stray voltage can exist at any house or farm which uses electricity, independent of whether there is a transmission line nearby.

Stoneray Wind Farm

The Stoneray Wind Farm would construct a Project substation and site it in proximity to the existing Chanarambie Substation[101] that ties into the existing Xcel Energy 115 kV line. The location of the Project substation would be in Section 6 of Chanarambie Township in Murray County. There are no major network transmission upgrades anticipated to interconnect the Project to the grid.

Stoneray Wind Farm would collect the electrical power generated by turbines through a 34.5 kV collection system to the Project substation. Applicants anticipate that collector lines would be buried underground between turbines; collection lines may occasionally require an above-ground junction box where lines where cables need to be spliced together.

[100] Stray Voltage, NDSU Extension Publication #108, http://www.ag.ndsu.edu/extension-aben/epq/files/epq108.pdf.
[101] SPA at 9

Collector lines would generally continue underground when they reach public roads or the edge of farm fields. In certain cases, such as bedrock conditions, conflict with existing underground utilities or infrastructure, permits provide for overhead collector lines to be constructed along public rights of way.

The project is not expected to impact existing transmission or distribution facilities in or near the project. Construction impacts would include impacts related to land clearing and materials transport.

The electric collector and feeder lines and transformers associated with the project will create some EMF. Electrical fields from the collector lines would be relatively small compared to high voltage transmission lines. Because most of the collector lines would be buried, the ground provides additional shielding from electric fields. Although the ground does not provide the same shield for magnetic fields, the current passing through the collector is relatively small.

The project would not create stray voltage because the project does not connect directly to residences or farms in the area and does not change on-farm electrical service.

Mitigation
Siting the Project substation near the point of interconnection to the power grid eliminates the need for new electric transmission poles and lines and associated impacts. Construction impacts could be mitigated by minimizing the amount of land cleared for the substation. Visual impacts could be mitigated by placing collector lines underground, while aesthetic impacts from overhead feeder lines can be mitigated through design and pole placement.

Generic 100 MW LWECS
The Stoneray Wind Farm is unusual in not requiring additional transmission facilities. A generic 100 MW LWECS would generally require transmission facilities to an interconnection point. Impacts from the associated transmission lines would include impacts due to construction and operation. Construction impacts would include impacts related to land clearing and materials transport. Operation impacts would include impacts related to EMF, noise and visibility. The primary impact would be the length and voltage of the transmission line required to interconnect the wind Project with the transmission grid. A relatively longer line or higher voltage would create greater construction and operation impacts.

38.5 MW Biomass Plant
A 38.5 MW biomass plant would have transmission facilities similar to the generic LWECS; however, an electrical collection system and Project substation would not be required. The plant would include a transformer at the plant to transform the voltage to transmission levels and a transmission line between the plant and a substation where the power would enter the grid.

Potential impacts and mitigation strategies would be similar to those for any energy project. Again, the primary impact would be the length and voltage of the transmission line required to connect the biomass plant to the transmission grid. A relatively longer line or higher voltage would increase construction and operation impacts.

6.6.2 Roads

An established transportation network of state, county and township roads exists in the Project area. County and township roads generally follow section lines. Private roads, mostly used for agricultural purposes, are also common. There are two primary traffic routes through the Project area: Minnesota State Highway 30 is a two-lane paved highway running east-west and Pipestone County Highway 18 is a two lane paved highway running north-south. Within the Project area road surfaces vary, and gravel roads are common. Traffic volumes in the area are fairly light. The Annual Average Daily Traffic (AADT) counts are approximately 1,350 vehicles per day along SH 30 and 770 per day along CH 18 where they intersect.[102] Along other county roads in the area, AADTs are generally below 150 vehicles per day.

Stoneray Wind Farm
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, similar projects have estimated an additional 200-250 vehicle trips per day. Since current traffic levels on the roadways in the Project area are below roadway capacities, construction traffic would be perceptible but similar to seasonal variations in traffic, such as autumn harvest. Construction is not anticipated to result in adverse traffic impacts. Operation and maintenance activities would not noticeably increase traffic in the area.

There would be impacts to local roads. 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. No additional asphalt or other paving is anticipated. Any temporary modifications to the existing road system would need to be restored following construction.

Constructing the Project would require approximately 14[103] miles of gravel access roads, depending on the size of turbine selected and final design. 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 would be 16 feet wide with a low profile to allow cross travel by farm equipment.

Mitigation
Construction is not anticipated to result in adverse traffic impacts. Operation and maintenance activities would not noticeably increase traffic in the area. Permits issued by the Commission require permittees to notify local and state authorities of the roads to be used for project construction. Permits also require permittees to make arrangements with state or local governments having jurisdiction over roads for any build-up or repair of roads subject to extra wear and tear.

[102] Mn/DOT, Traffic Forecasting & Analysis, 2012
[103] SPA at 9

Generic 100 MW
Impacts would be similar to those of the proposed project. Depending on location, impacts could greater on road systems, particularly on roads with higher daily use. Mitigation would be similar, and permittees would be required to make arrangements with state and local road authorities for repair of roads used during project construction.

38.5 MW Biomass Plant
A 38.5 MW Biomass plant would also impact road systems. Impacts during construction would include increased traffic and an increase in use by heavy equipment. For the lifetime of the Project, fuel (biomass) would be delivered to the facility. The fuel handling and receiving operations are expected to be truck-traffic (typically multi-axle or semi-combination vehicles) operating on a 24-hour per day, 7-day per week basis. The frequency of trucks is dependent on the demand of materials and the available payload of each specific vehicle. An average flow of three to five semi-combination vehicles per hour is anticipated. Peak fuel receiving is anticipated to occur between the hours of 6:00 AM and 5:00 PM. The origin of loaded trucks and destination of empty trucks depends upon the location of the fuel source.

6.6.3 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 generation facility in the Project area.

Stoneray Wind Farm
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.[104] 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.

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 Stoneray Wind Farm 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. 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. Seven unique microwave beam paths intersect the Project area.[105]

[104] Post Digital Television Transition - The Evaluation and Mitigation Methods for Off-Air Digital Television Reception in-and-around Wind Energy Facilities; Comsearch, 2009, http://www.comsearch.com/files/Wind_Energy_White_Paper.pdf.
[105] SPA @ Appendix C-2

Radar
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 National Telecommunications and Information Administration (NTIA) coordinates government communication systems for all departments and agencies.[106] The Applicant did a preliminary review of the project area using the screening tool[107] developed by the US Department of Defense (DoD)to assess potential impacts to Long-Range and Weather Radar.

The Applicant found one FAA radar site located approximately six miles north of the Project site in Ruthton. Radar towers are located at the Pipestone Municipal Airport approximately seven miles west of the Project site. There is also a radar tower located at the Slayton Municipal Airport, which is approximately eight miles east of the Project site.[108] This preliminary screening revealed the Project may impact NEXRAD weather radar, Air Defense or Homeland Security radars. The DoD will formally commence a study following the filing of FAA 7460-1.

Telephone Service
Construction and operation of the proposed wind farm would not impact the telephone service in the Project area. Generally, construction, operation, and maintenance of a wind project does not impact cellular towers. Gopher One Call would be contacted prior to construction to locate and avoid all underground facilities. To the extent Project facilities cross or otherwise affect existing telephone lines or equipment, the Applicant would have to enter into agreements with service providers to avoid interference with their facilities.

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.

Local television stations generally originate from Sioux Falls, SD. The stations that place a predicted FCC primary service signal over the turbine area are listed in **Table 13**.

[106] For more information on the National Telecommunications and Information Administration, see http://www.ntia.doc.gov/about.html.
[107] US Federal Aviation Administration, DOD Preliminary Screening Tool, https://oeaaa.faa.gov/oeaaa/external/gisTools/gisAction.jsp
[108] SPA at 22

Table 13. HDTV Stations Serving Project Area[109]

Call Sign	Network Affiliate	Channel	City of License	Power (KW)	Ant. Height (m HAAT)	Dist. (km)	Azimuth (°T)
KTTW	Fox	7	Sioux Falls, SD	7.5	217.6	66.7	214.6
KESD-TV	PBS	8	Brookings, SD	15.0	229	97.4	293.0
KELO-TV	CBS	11	Sioux Falls, SD	30	610	63.8	213.1
KSFY-TV	ABC	13	Sioux Falls, SD	22.7	610	63.8	213.1
KSMN*	PBS	15	Worthington, MN	200	290	17.0	132.2
KCSD-TV	PBS	24	Sioux Falls, SD	80.9	75	64.9	223.3
KWSD**	CW	36	Sioux Falls, SD	36.9	230	66.7	214.6
KDLT-TV	NBC	47	Sioux Falls, SD	1000	608	66.0	213.6

*Has CP to increase power to 1000 KW ERP
**Has CP to increase power to 400 KW ERP

GPS

Global positioning systems (GPS) use satellite signals to determine locations on the earth's surface and are commonly used to guide agricultural operations.[110] Because GPS uses multiple digital satellite signals, interference with the signals or subsequent uses is not anticipated. Obstruction of any one satellite signal would require direct line-of-sight obstruction due to a wind turbine. Such an obstruction would be temporary (i.e., there is concurrent GPS receiver movement, satellite movement, and wind turbine blade movement such that the obstruction should be resolved).

Mitigation

According to the draft permit for the Project, the Applicant would be required to design a plan for conducting an assessment of television signal reception and microwave signal patterns in the Project area. The assessment would provide data that can be used in the future to determine whether the turbines and associated facilities are the cause of disruption or interference of television reception or microwave patterns in the event residents should complain about such disruption or interference after the turbines are placed in operation.

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

Land Mobile Stations. Wind turbines should not adversely affect the signals of land mobile stations if the turbines are placed at least 400 meters (one-quarter mile) from these stations.

Broadcast Facilities. Satellite, cable service or receiver upgrades would mitigate negative impacts on broadcast facilities if impacts cannot be avoided through turbine placement. Establishment of a program to respond to interference complaints would help determine necessary mitigation efforts. Impacts on broadcast facilities as a result of the Project are not yet known.

AM/FM Facilities. No impacts or disruptions are anticipated.

[109] SPA at Appendix C-2
[110] Precision Farming Tools: Global Positioning Systems (GPS), Virginia Cooperative Extension; http://www.pubs.ext.vt.edu/442/442-503/442-503.html.

Generic 100 MW LWECS

A generic 100 MW LWECS would have communications impacts similar to the Stoneray Wind Farm 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.

38.5 MW Biomass Plant

A 38.5 MW biomass plant would have fewer or no impacts on communications than the proposed Project. A biomass plant would be shorter than the Project's wind turbines and sited in one location.

6.6.4 Wireless Broadband Internet

It is unknown if there are impacts to wireless broadband internet signals due to operation of a wind project. No literature exists that shows effects of wind turbines on broadband internet signals. In an earlier project,[111] 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.

Stoneray Wind Farm

If there were a problem, specific turbines in the Project area could be moved to ensure no interference with wireless broadband internet signals, or residential antennae could be relocated as well.

Generic 100 MW LWECS

A generic 100 MW LWECS would have impacts similar to the Stoneray Wind Farm.

38.5 MW Biomass Plant

It is unlikely a 38.5 MW biomass plant 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.

6.7 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.[112]

[111] Environmental Report, Elm Creek II Wind Project at 30

[112] The distance between turbines necessary for effective operation is approximately 6 rotor diameters (RD) on the non-prevailing wind axis and 10 RD on the prevailing wind axis. Accordingly, Minnesota requires setbacks of 3 x 5

Stoneray Wind Farm

Wind capacity varies across Minnesota. Extensive wind measurements have been taken and analyzed by the Minnesota Department of Commerce.[113] Local data collection suggests the mean annual wind speeds at 80 meters at 8.2 meters per second (18.3 mph).[114] Power generation by the Project depends not only on wind speed (how much energy it contains), but also the frequency of attaining optimal wind speeds. Wind turbines generate power only when the wind is blowing. This frequency 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. The Stoneray Wind Farm is estimated to have a capacity factor ranging from 42 to 47 percent.[115]

Generic 100 MW LWECS

To be economically feasible, a 100 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 Stoneray Wind Farm. As shown in **Map 2**, 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 begun to be proposed throughout the state. The availability of productive, undeveloped wind resources in Minnesota remains high.

38.5 MW Biomass Plant

A combination of wood chips and agricultural biomass would be the primary fuel sources for a 38.5 MW biomass plant. A 38.5 MW biomass plant would use approximately 40,000 tons of wood, wood wastes, and agricultural biomass materials per month.

It is possible that rail could be used for delivery of fuel to the plant, depending on its location. However, the most likely method of delivery for woody and agricultural biomass fuel would be semi-trailer trucks. Trucks would likely deliver wood and agricultural biomass by loads of 20 tons or greater. The biomass facility would operate 24 hours a day, but fuel delivery would be between the hours of 6 and 6. The total number of daily truck trips is estimated to be approximately 100. The origin of the biomass trucks and the total trip length required for delivery would depend on the location of the biomass source relative to the biomass plant.

A back-up fuel source would be required for the biomass plant, to assist with plant start-up and to sustain the plant temporarily when the biomass fuel supplies are low. Natural gas would likely be used as the backup fuel. The construction of a natural gas pipeline would be required to deliver the natural gas to the biomass plant. Potential impacts to the environment related to fuel for a biomass plant include possible degradation of the environment due to biomass removal (increased soil erosion and productivity due to removal of agricultural biomass and loss of wildlife habitat), air pollution due to biomass transport and the impacts associated with building a natural gas pipeline.

RD for each turbine. See, Commission Order Establishing General Permit Standards, http://energyfacilities.puc.state.mn.us/documents/19302/PUC%20Order%20Standards%20and%20Setbacks.pdf.

[113] Wind Resource Analysis Program 2002, http://www.state.mn.us/mn/externalDocs/Commerce/WRAP_Report_110702040352_WRAP2002.pdf.

[114] SPA at 48

[115] *Id.* at 55

Mitigation
Impacts related to harvesting for a biomass plant could be mitigated by using guidelines for biomass harvesting. [116] These guidelines minimize impacts to natural resources. Siting the plant in a location that reduces biomass transportation would reduce the impacts to air quality associated with ground transportation. The Minnesota Forest Resource Council has developed woody biomass harvest guidelines that reduce impacts to wildlife habitat.[117] If harvesting guidelines are used to mitigate impacts to natural resources and wildlife, suppliers of biomass fuels would need to follow biomass harvest guidelines.

6.8 Agriculture

Large generation facilities in agricultural areas may have impacts on cropland and livestock.

6.8.1 Cropland

Wind farms placed in cultivated areas do take a limited amount of acreage out of production. However, crop and wind farming are generally compatible uses.

Stoneray Wind Farm
Approximately 95 percent of the Project area is classified as agricultural land, including pasture (19 percent) and grains and forage cropland (76 percent). [118] Approximately 36 acres of farmland would be removed from agricultural production for access roads, turbine pads or associated facilities. [119] 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. However, the Applicant does not anticipate placing turbines on these lands.[120]

Livestock farming consists mainly of beef cattle, hogs, dairy and sheep. Corn and soybeans are the major crops, with some oats, flax and wheat as grown as well. [121] Farming activities would continue on the land surrounding turbines and access roads. Impacts to drain tile in the Project area are not anticipated, however, any damages sustained as a result of Project construction would be repaired according to agreement with the landowner.

Generic 100 MW Wind Farm
Impacts to farming at a generic wind farm would be similar to those of the proposed Project, if placed in a predominantly agricultural area.

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[116] See Minnesota DNR Guidelines for Woody Biomass, 2007. http://www.dnr.state.mn.us/forestry/biomass/resources.html
[117] Forest Biomass and Biofuels Harvest, http://www.frc.state.mn.us/initiatives_policy_biofuels.html.
[118] SPA at 6
[119] *Id.* at 33-34
[120] *Id.*
[121] SPA at 36

38.5 Biomass Plant
Impacts to farming from a biomass plant would be minimal. It is likely that such a facility would not remove land from agricultural production and no mitigation would be necessary.

6.8.2 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. Impacts from noise and shadow flicker are discussed in Section 6.5.

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. A comprehensive review of this research is presented in a report to the Ontario Energy Board (Literature Review and Synthesis of Research Findings on the Impact of Stray Voltage on Farm Operations, 2008, Prepared by Douglas J. Reinemann, Ph.D.). [122]

Stoneray Wind Farm
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 electrical collection system proposed for the Stoneray Wind Farm 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.

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.

[122] See eDockets 08-1233 (Doc. Id. 201000-55392-01).

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

Generic 100 MW LWECS
A generic 100 MW LWECS located elsewhere in Minnesota would have impacts to livestock similar to the Stoneray Wind Farm.

38.5 MW Biomass Plant
A 38.5 MW biomass plant would have fewer impacts to livestock than those of the proposed Project. Biomass plant operations would create noise and lighting that could impact livestock health. The biomass plant would also have an associated transmission line that produces induced voltage. However, the plant could be sited away from livestock operations to minimize health impacts. The biomass plant would be a concentrated impact that can be sited away from livestock. Wind turbines represent a diffuse impact that exists within landscapes utilized by livestock.

6.9 Aviation

Large electric generation facilities have the potential to impact aviation. This section discusses potential impacts to aviation from the operation of a generation facility in the Project area.

Stoneray Wind Farm
Due to their height, wind turbines have the potential to impact aviation. Wind turbines in the Stoneray Wind Farm will require notice to and evaluation by the Federal Aviation Administration (FAA)[124] and the Minnesota Department of Transportation (MN DOT).[125]

There are no public airports within the Project boundary. The Pipestone Municipal Airport is located 5.75 miles west of the Project; the Slayton Municipal Airport is located 8 miles to the east. Three other small airports are situated within ten miles of the project.[126]

Wind turbines could impact some local aviation operations, such as aerial crop dusting. Pilots making such applications would have their attention divided between aircraft systems, spraying requirements, weather conditions, and obstructions. Additionally, when operating, wind turbines can create turbulence wakes which would make aircraft operation difficult or can effect drifting of the product while spraying.

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[123] *Id.* See also, Stray Voltage, Public Service Commission of Wisconsin, http://psc.wi.gov/utilityinfo/electric/strayvoltage.htm.
[124] FAA Advisory Circular AC 70/7460-2K, HTTP://RGL.FAA.GOV/REGULATORY_AND_GUIDANCE_LIBRARY/RGADVISORYCIRCULAR.NSF/0/22990146DB0931F186256C2A00721867/$FILE/AC70-7460-2K.PDF
[125] Minnesota Department of Transportation, Tall Towers, Minnesota Structure Height Regulations, http://www.dot.state.mn.us/aero/avoffice/talltowers.html.
[126] SPA at 35

However, MET towers could offer a significantly more dangerous obstacle to agricultural aviation. They are very difficult to see in different lighting conditions and from a distance. Many times they bypass FAA regulation because many are less than 200 feet tall (FAA lighting regulations would apply to taller MET towers). Additionally, temporary MET towers may be guyed structures with wires extended out from the base upwards of 150 feet.

Concerns have been raised about the impacts of wind farms on emergency air transport. Officials at the Mayo Clinic in Rochester, Minnesota, have noted that impacts on helicopter operations due to wind projects in the area have been insignificant.[127]

Mitigation

Potential impacts to aviation can be mitigated by proper siting of the Project and adherence to FAA and Mn/DOT regulations. The existence of all wind towers is registered, and they are highly visible objects. Siting turbines in a linear pattern could improve safety; but siting needs to accommodate a large number of factors, such as wind rights, property setbacks and environmental avoidance. However, aerial crop applications are typically made during low wind conditions. In these conditions, wind turbines would not be turning or creating turbulence wakes.

As a condition of the Minnesota LWECS Site Permit (see Section 4.11), all permanent MET towers must be free-standing structures (not guyed) and marked as required by the FAA. In addition, Murray County's Renewable Energy Ordinance requires aviation warning be painted on meteorological towers of less than 200 feet.[128]

Generic 100 MW LWECS

A generic 100 MW LWECS located elsewhere in Minnesota would very likely have aviation impacts similar to the Stoneray Wind Farm or any other project located in an agricultural setting. The impact could be greater if the local counties have not adopted safety ordinances.

38.5 MW Biomass Plant

A 38.5 MW biomass plant would have less aviation impacts than the Stoneray Wind Farm. A biomass plant would be significantly shorter and located on a single site. Thus, its potential to disrupt aviation would be minimal.

[127] Mayo: Turbines do not hamper medical helicopters, Rochester Post-Bulletin, May 18, 2010
[128] Murray County Renewable Energy Ordinance, Section 9, Subd. 1

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 in the Stoneray Power Partners, LLC Application.

7.1 Stoneray Wind Farm

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 at EDF Renewable Energy's own Chanarambie Substation, without the need to build additional transmission facilities. Stoneray Power Partners, LLC had a MISO Large Generator Interconnection Agreement for a previously permitted iteration of this Project. They have relinquished that agreement in favor of pursuing a new agreement.

The proposed Project is feasible and available to be implemented upon achieving a new interconnection agreement.

7.2 Generic 100 MW wind Project

An alternative to the proposed Stoneray Wind Farm in Pipestone and Murray counties 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 (see **Figure 2**). Such a Project could be a 100 MW Project or a combination of smaller dispersed Projects. Several feasible Projects are being evaluated in Minnesota. At the time this report was prepared, 70 MW are in construction in two projects. Thirteen other projects with a total nameplate capacity of 1,086.5 MW have valid LWECS site permits[129] but have not yet commenced construction or filed pre-construction documents. In addition to wind resource availability, access to transmission interconnection is also important for a project to be viable; transmission access has been a constraint in the development of wind energy in Minnesota.

7.3 38.5 MW biomass plant

A 38.5 MW biomass plant is feasible but not likely available. Currently there is a biomass plant of this size in Minnesota.[130] Many factors could limit the availability of a 38.5 MW biomass plant, including equipment, financing, and consistently available biomass fuels.

7.4 No-build alternative

The no build alternative is feasible and available.

[129] The Commission revoked permits for four projects in 2013, with a total capacity of 278 MW. Generally these projects had voluntarily surrendered their permits due to interconnection or other difficulties.
[130] The Fibrominn plant in Benson has an output of 55 MW and uses turkey litter as a fuel source, http://www.fibrowattusa.com/Projects/fibrominn/

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.[131] 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.[132] 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.

[131] Minn. Statute 216B.1691
[132] Presentation (RE Integration and Transmission Study)

8 Permits

The Stoneray Wind Farm would require permits and approvals from entities other than the Minnesota Public Utilities 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 14**.

Table 14. Potential and Required Permits and Approvals[133]

Agency	Permit/ Approval	Need for Permit/ Approval
Federal		
U.S. Army Corps of Engineers (USACE)	Review and Approval of Wetland Delineations	Required to determine extent of USACE jurisdiction, quantify impacts, or document avoidance.
	Federal Clean Water Act Section 404 Permit(s)	Project may require a USACE Regional General Permit or an Ind. Permit depending on amount and type of wetland impact proposed. Permit from USACE required if wetlands are jurisdictional and not avoidable.
Environmental Protection Agency (Region 5)	Spill Prevention Control and Countermeasure (SPCC) Plan	May be required if turbine commissioning or construction activities will require oil storage in excess of 1320 gallons. May be required for O&M facility or if an oil storage tank is planned for this Project.
Lead Federal Agency	Federal Section 106 Review	Section 106 of the National Historic Preservation Act (NHPA) may be invoked by a Federal Agency if the Project requires federal land, funding, or permits.
Federal Aviation Administration	Form 7460-1 Notice of Proposed Construction or Alteration (Determination of No Hazard)	Determination of No Hazard to Air Navigation needed for each structure over 200 feet tall via form 7460-1.
	Notice of Actual Construction or Alteration (7460-2)	Notify FAA of construction via Form 7460-2.

[133] SPA at 58, plus other identified potential authorizations from similar projects

Agency	Permit/ Approval	Need for Permit/ Approval
State		
Minnesota Public Utilities Commission	Large Wind Energy Conversion System (LWECS) Site Permit	Required under Minnesota Statute Section 216F.03 for a LWECS that generates 5 MW or more of electricity.
	Certificate of Need (CN)	A CN is required under Minnesota Statute Section 216B.243 for a LWECS unless the project meets exemption criteria set forth within Minnesota Statutes.
Minnesota State Historic Preservation Office (SHPO)	Class I Literature Review / Class III Cultural Field Survey. Cultural and Historic Resources Review and Review of State and National Register of Historic Sites and Archeological Survey	May be required for MN LWECS Site Permit compliance. Consultation with SHPO is recommended. Should Section 106 of the National Historic Preservation Act (NHPA) be triggered, consultation will be mandatory.
Minnesota Pollution Control Agency	Section 401 Water Quality Certification	Individual Section 401 Water Quality Certification or Waiver is required under the Federal Clean Water Act (CWA) for projects that require an Individual Section 404 Permit from the USACE to ensure that authorized activities do not violate state water quality standards.
	National Pollutant Discharge Elimination System Permit (NPDES) — PCA General Storm water Permit for Construction Activity (MN) R100001)	Coverage under the PCA General Storm water Permit for Construction Activity is required for projects that disturb more than one acre of land.
Minnesota Department of Transportation	Utility Agreements and Permits	Minnesota Statute Section 161 requires a permit to place utility facilities on trunk highway rights-of-way.
	Oversize/Overweight Permit for State Highways	Under Minnesota Statute Section 169, a permit is required for hauling construction equipment and materials that exceed height and weight limits on U.S., Interstate, and state highways through Minnesota.

Agency	Permit/ Approval	Need for Permit/ Approval
	Access Driveway Permits for Mn/DOT Roads (TP-1721)	Permit for temporary or permanent accesses and temporary widening of access points.
Minnesota Department of Natural Resources	License for crossing Public Lands and Waters (Minn. Stats. 84.415)	Required for wind farm facilities that cross or locate on State administered Public Lands or Waters.
	Public Waters Work Permit (Minn. Stats. 103G)	Any construction activities that impact waterways, including wetlands, applies to public waters that are identified on DNR public waters maps.
Minnesota Board of Water and Soil Resources	Wetland Conservation Act Approval	For wetland impacts. Ranges from an exemption for small or temporary impacts to a permit and mitigation for greater impacts.
Local		
Counties	Road Agreements	Oversize/overweight permits and road repair agreement (may combine with townships)
	Access Road Permits	Required to start construction
	Approval of Wetland Delineations	Onsite review of wetlands delineation in compliance with Wetland Conservation Act
	Construction Site Permit	Required to start construction of operations and maintenance facility
Townships	Access Road Permits	Required to start construction
	Road Agreements	Oversize/overweight permits and road repair agreement (may combine with County)

Appendix A. Environmental Scoping Decision

In the Matter of the Application of Stoneray Power Partners, LLC for a Certificate of Need for a 105 MW Wind Project in Pipestone and Murray Counties
PUC Docket No. IP-6646/CN-13-193

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 Stoneray Power Partners, LLC Application for a Certificate of Need for the proposed 105 Megawatt (MW) Stoneray Wind Farm (Project) in Pipestone and Murray counties. Stoneray Power Partners, LLC is a wholly-owned subsidiary of EDF Renewable Energy (formerly enXco).

A final decision on turbine selection and design has not been made, but the Project will consist of turbines with a rated capacity between 1.7 and 3.2 MW in such number and combination as to yield up to 105 MW. Facilities associated with the project include a project substation, collector and feeder lines, access roads, meteorological towers and an operations and maintenance building.

The Project is located around the community of Woodstock, with most of the project site in Rock and Burke townships in Pipestone County and with portions of the project in Chanarambie and Cameron townships in Murray County. There are currently 29,500 acres within the project boundary, with approximately 14,500 acres under site control. Chanarambie Power Partners, LLC, another EDF Renewable Energy subsidiary, holds easements on approximately 3,500 additional acres of private land with the Project area. Electricity from the Project would be delivered into the Chanarambie Substation and distributed into the grid using the existing 115 kV transmission lines.

The project requires a Certificate of Need (CN) and a Site Permit for the wind farm from the Minnesota Public Utilities Commission (Commission). The CN (CN-13-193) and the site permit (WS-13-216) are being considered by the Commission in separate dockets.

On April 29, 2013, Stoneray Power Partners, LLC filed a Certificate of Need Application with the Commission for the Stoneray Wind Farm. On July 24, 2013, the Commission issued an order accepting the Application as substantially complete and authorizing an informal review process. 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 August 14, 2013, in Lake Wilson to receive comments on the scope of the environmental report. Approximately 45 persons attended the meeting. A public comment period followed the meeting; the comment period closed on August 30, 2013. Four residents commented during the Public Meeting. Two written comments were received during the comment period.

The Comments at the meeting included questions on where turbines would be located (which landowners would be selected for siting); would transmission build be required (in this case a connection to the grid already exists with Chanarambie Substation); where does the power from the project go (a final off-take agreement is not yet in place); and are there government subsidies for the producer (in this case, the developer intends to time the Project to take advantage of the expiring Production Tax Credit).

Two state agencies submitted written comments. The Minnesota Pollution Control Agency submitted a reminder that a Construction Stormwater Permit is required for the Project, and that a new permit became official on August 1, 2013, with more stringent requirements for permanent stormwater treatment. The Minnesota Department of Natural Resources (DNR) submitted notes on the Casey Jones State Trail, biodiversity sites, updating threatened and endangered species lists, bat monitoring and Blanding's turtles. DNR noted its concurrence that the Project as planned is a low risk site for bird and bat fatality. DNR submitted additional comments on the Draft Site Permit.

No member of the public or any state agency recommended system or project alternatives to be considered in the Environmental Report.

The proposed project is intended to produce renewable energy in furtherance of Minnesota's renewable energy objectives. Accordingly, alternatives examined in the ER will be limited to "eligible energy technologies" that support these objectives (Minnesota Statute 216B.1691). These alternatives will include: (1) a generic 100 MW wind generation project sited elsewhere in Minnesota, (2) a 38.5 MW biomass plant, 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 named and 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

<u>Stoneray Wind Farm</u>

1.0 Project Description [Minn. Rule 7849.1500, subp. 1, A]

2.0 Alternatives to be Evaluated [Minn. Rule 7849.1500, subp. 1, B]

2.1 No-build Alternative
2.2 A Generic 100 MW Wind Project
2.3 A 38.5 MW Biomass Plant
2.4 Other Renewable Energy Sources

3.0 Human and Environmental Impacts and Mitigation of Project and Evaluated Alternatives [Minn. Rule 7849.1500, subp. 1, C, D,E]

3.1 Emissions [Minn. Rule 7849.1500, subp. 2, A]
3.2 Hazardous air pollutants and VOCs [Minn. Rule 7849.1500, subp. 2, B]
3.3 Aesthetic Impacts and Visibility impairment [Minn. Rule 7849.1500, subp. 2, C]
3.4 Ozone formation [Minn. Rule 7849.1500, subp. 2, D]
3.5 Fuel availability and delivery [Minn. Rule 7849.1500, subp. 2, E]
3.6 Associated transmission facilities [Minn. Rule 7849.1500, subp. 2, F]
3.7 Water appropriations [Minn. Rule 7849.1500, subp. 2, G]
3.8 Wastewater [Minn. Rule 7849.1500, subp. 2, H]
3.9 Solid and hazardous wastes [Minn. Rule 7849.1500, subp. 2, I]
3.10 Noise [Minn. Rule 7849.1500, subp. 2, J]
3.11 Property Values
3.12 Communication Signals
3.13 Wildlife
3.14 Natural Environment
3.15 Agriculture

4.0 Feasibility and availability of alternatives [Minn. Rule 7849.1500, subp. 1, F]

4.1 No-build alternative
4.2 100 MW wind project
4.3 38.5 MW biomass plant
4.4 Stoneray Wind Farm

5.0 Required Permits [Minn. Rule 7849.1500, subp. 1, G]

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 December 2013. 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 6th day of September 2013

STATE OF MINNESOTA
DEPARTMENT OF COMMERCE
DIVISION OF ENERGY RESOURCES

William Grant, Deputy Commissioner