Environmental Report

Prairie Wind Energy Project

In the Matter of the Application of Prairie Wind Energy, LLC
for a Certificate of Need for an up to 100 MW
Large Wind Energy Conversion System in Otter Tail County

PUC Docket No. IP-6844/CN-10-429

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Minnesota Department of Commerce

Responsible Governmental Unit	Project Proposer
Minnesota Department of Commerce	**Prairie Wind Energy, LLC**
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Abstract

On November 29, 2010, Prairie Wind Energy, LLC filed a Certificate of Need application with the Minnesota Public Utilities Commission for the Prairie Wind Energy Farm. The Applicant is proposing to construct an up to 100 megawatt large wind energy conversion system in Otter Tail County.

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 (DOC) must prepare an Environmental Report for the Project (Minn. Rules 7849.1200).

DOC Energy Facility Permitting staff is responsible for preparing the Environmental Report. This Environmental Report has been prepared as per Minnesota Rules 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 Mike Kaluzniak, Minnesota Public Utilities Commission, 121 7th Place E., Suite 350, Saint Paul, MN 55100, phone: (651) 201-2257, email: mike.kaluzniak@state.mn.us.

Information about this Project can be found on the Commission's energy facilities permitting website: http://energyfacilities.puc.state.mn.us/Docket.html?Id=30591, or obtained by contacting David Birkholz, Energy Facility Permitting, 85 7th Place East, Suite 500, St. Paul, Minnesota 55100, phone: (651) 296-2878, email: 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 "**10"** and number "**429**".

Preparer: David Birkholz

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1 Introduction

On November 29, 2010, Prairie Wind Energy, LLC (Applicant or PWE), filed a Certificate of Need (CN) application with the Minnesota Public Utilities Commission (Commission) for the Prairie Wind Energy Project (Project). The Applicant is proposing to construct a 100 megawatt (MW) large wind energy conversion system (LWECS) in Otter Tail County.

Project Overview

The Project consists of wind turbines and associated structures, which include access roads, electrical connection lines, transformers, meteorological towers, communication lines, an operations and maintenance building and a substation to connect the Project to an existing GRE 115kV transmission line located adjacent to the Project site. PWE currently anticipates that the Project would consist of 41 2.4 MW Nordex N117 turbines yielding a total nameplate capacity of 98.4 MW.

The Project is in southeastern Otter Tail County, Minnesota, approximately one mile from the community of Parkers Prairie, Minnesota. Most of the Project is located west of State Highway (SH) 29 and north of SH 235 in the townships of Parkers Prairie and Elmo. Other townships within the Project footprint include Effington and Folden. PWE currently has approximately 8,000 acres under lease for the Project, and the total Project area is 23,921 acres.

A power purchase agreement (PPA) has not been signed for the Project. It is anticipated by the Applicant that future financial arrangements would be structured to retain C-BED status. As proposed, the Project is expected to achieve commercial operation by December 31, 2012.

As an independent power producer, Prairie Wind Energy plans to sell the power generated by the Project to one or more utilities to satisfy the Renewable Energy Standards defined in Minnesota Statutes, Section 216B. 1691. Accordingly, alternatives examined in this Environmental Report (ER) are limited to technologies that support Minnesota's Renewable Energy Standards objective. 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: Project Alternatives
Section 5: The No build alternative
Section 6: Potential Human and Environmental Impacts of the Project and Alternatives
Section 7: Availability and Feasibility of Alternatives
Section 8: Additional 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 applications submitted by Prairie Wind Energy, LLC, to the Commission:

Application for Certificate of Need, 100 MW Prairie Wind Energy Project, November 29, 2010[1]
Application for Site Permit, 100 MW Prairie Wind Energy Project, May 5, 2011.[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 Certificate of Need, Prairie Wind Energy Project, (CN Application or CNA), November 29, 2010.
[2] Application for Site Permit, Prairie Wind Energy Project (Site Permit Application or SPA), May 5, 2011.

2 Regulatory Framework

The Project is a large wind energy conversion system as defined in the Wind Siting Act (Minn. Stat. 216F). Upon completion, the Project would produce up to 100 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 November 29, 2010, the applicant submitted a Certificate of Need application to the Commission. On February 2, 2011, 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 Facility Permitting (EFP) staff, and (4) a public hearing conducted by an administrative law judge (ALJ). Based on the ALJ's hearing report and 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 EFP 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, EFP 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.

EFP staff held a public information and scoping meeting on April 19, 2011, in Parkers Prairie to receive comments on the scope of the Environmental Report. Approximately 150 persons attended the meeting, with nine people commenting. A public comment period followed the meeting, closing on May 10, 2011. Thirty comments from 26 people were received during the comment period, including comments from the Minnesota Department of Transportation (Mn/DOT).

Concerns that were raised at the public meeting and in written comments were potential impacts to property values and local tax implications, impact on farm land, aerial crop applications and easements for associated collector lines. Questions were raised concerning setbacks from property lines, aesthetics, wildlife, and wildlife habitat. Impacts from noise, shadow flicker, stray voltage, and electric and magnetic fields were also raised. A number of people questioned the state requirement for renewable energy Projects and the potential increase in energy costs to the consumer. Other commentors welcomed the potential economic, tax and employment benefits.

Mn/DOT expressed concerns about transportation of oversized materials and equipment on public roads, and acquiring local permits for using road rights-of-way.

Based on the scoping comments received and the rules governing the scope of an ER (Minn. Rule 7849.1500), the Department of Commerce Deputy Commissioner issued a scoping decision on May 19, 2011 (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 EFP 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-10-438). 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 EFP Project contact list. Interested persons can sign up for the Prairie Wind Energy Project project list online at: http://www.energyfacilities.puc.state.mn.us/Docket.html?Id=30591.

People may also join the Project mailing list by contacting EFP State Permit Manger David Birkholz, phone: (651) 296-2878, email: david.birkholz@state.mn.us.

3 Description of the Proposed Project

Prairie Wind Energy, LLC, a Minnesota limited liability company formed in 2007, is responsible for the oversight and management of the Project, along with construction, operations and maintenance. PWE is owned by eight individual Minnesota residents, many of whom live within the Project area.

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, an operations and maintenance building and a substation to connect the Project to an existing GRE 115kV transmission line located adjacent to the Project site.

PWE currently anticipates that the Project would consist of 41 2.4 MW Nordex N117 turbines yielding a total nameplate capacity of 98.4 MW. The Applicant however requests authority for a total nameplate capacity of 100 MW, allowing the final number and size of the turbines to be dictated by the terms of a Power Purchase Agreement (PPA) between PWE and an off-taker, current market conditions, turbine availability and the terms of the final Site Permit for the Project. The hub height of the turbines is expected to be 91 meters, and rotor diameters of 117 meters.

Table 1. Nordex N117 Turbine Specifications[3]

Category	Metric
Nameplate Capacity	2.4 MW
Hub Height	91 m (303.5 ft)
Rotor Diameter	117m (383.8 ft)
Total Height	151m (494.5 ft)
Swept Area	10,751 m^2 (115,722 ft^2)
Cut-in Wind Speed	3 m/s (6.7 mph)
Cut-out Wind Speed	20 m/s (44.73 mph)
Rated Wind Speed	11 m/s (24.6 mph)
Rotor Speed	12 rpm
Distance to 50 db(A) Noise Level	200 m (656 ft)

The Project would require additional facilities beyond the turbines. Those facilities include:

- gravel access roads;
- underground conductors installed between turbines;
- 34.5 kV underground or, if necessary, overhead feeders to collect power from underground conductors installed between turbine strings;

[3] Source: PWE Site Permit Application (SPA), May 5, 2011, at 6

- installation of a Supervisory, Control And Data Acquisition (SCADA) system;
- construction of a substation adjacent to an existing Great River Energy 115kV transmission line located in Section 10 of Parkers Prairie Township, Otter Tail County, Minnesota;
- construction of an Operation and Maintenance facility; and
- one or two additional meteorological towers (two are currently located in the project area).

The turbines would be mounted on steel towers manufactured according to ANSI (American National Standards Institute) and IEC (International Electrotechnical Commission) standards. Access to the tower, which would include an elevator and a ladder with a man-lift, would be through a locked door in the base of the tower. The turbines would include a Condition Monitoring and Predictive Maintenance system to help identify technical problems and reduce the down-time for individual turbines.

Power would be collected through either underground or overhead power collection system, which would aggregate power at a substation to be built as part of the Project. The substation would connect to a GRE-owned 115kV transmission line.

A SCADA system would be installed to monitor turbine availability and conditions. This system would alert personnel of faults and allow remote operation of turbines. It would also record turbine performance and assist with utility-shutdown needs.

PWE also intends to construct an operations and maintenance facility within the Project Site. PWE intends to work with neighboring wind facilities to make this operations and maintenance facility available to multiple projects, thereby decreasing costs for all projects involved. [4]

3.2 Project Location

The Project is in southeastern Otter Tail County, Minnesota, approximately one mile from the community of Parkers Prairie, Minnesota. Most of the Project is located west of State Highway (SH) 29 and north of SH 235 in the townships of Parkers Prairie and Elmo. Other townships within the Project footprint include Effington and Folden. Table 1 identifies the townships and sections within the Project boundary.

Table 2. Project Location

Name	Sections	Township	Range
Parkers Prairie Township	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 14, 15, 16, 17, 18, 19, 20, 21	T131N	R37W
Elmo Township	16, 17, 18, 19, 20, 21, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35	T132N	R37W
Effington Township	1, 12, 13, 24	T131N	R38W
Folden Township	25, 36	T132N	R38W

[4] This facility may also be used for the previously-permitted Glacial Ridge 20MW facility in Southeast Pope County and the Bear Creek 47.5 MW facility located in Southwest Todd and Eastern Otter Tail counties.

PWE currently has approximately 8,000 acres under lease for the Project, and the total Project area is 23,921 acres.

3.3 Project Cost and Schedule

The total Project-installed capital costs are estimated to be approximately $232 million, including wind turbines, associated electrical and communication systems, and roads. Ongoing operations and maintenance costs and administrative costs are estimated to be approximately $5.8 million per year, including royalties to landowners for wind easement rights and property taxes. As proposed, the Project is expected to achieve commercial operation by December 31, 2012.

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 Prairie Wind Energy 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 is intended to produce renewable energy in furtherance of Minnesota's renewable energy standard. Accordingly, alternatives considered here are technologies eligible to be counted toward these objectives.[5]

Alternatives evaluated include: (1) a 100 MW wind generation plant (LWECS) 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 a 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 Prairie Wind Energy Project, sited in Otter Tail County.

4.2 38.5 MW Biomass Plant

One alternative renewable energy source to the proposed Project would be a biomass plant of equivalent 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.[6] 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.

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

The biomass alternative considered in this ER would likely burn a combination of woody and agricultural biomass, such as corn stover, with natural gas as a backup fuel. A similar plant, the 38.5 MW NGPP Minnesota Biomass, LLC, electric generation facility, has undergone environmental review in Minnesota (2003) and provides data on potential impacts.[7] The Prairie Wind Energy Project would have a nameplate capacity of 100 MW, with an estimated capacity factor of 38-40[8] percent. The 38.5 MW biomass alternative examined in this ER provides the equivalent energy generation as the proposed Project.[9]

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.

[7] EQB Docket No. 03-67-EAW-NGP Biomass [hereafter Minnesota Biomass EAW]; see http://energyfacilities.puc.state.mn.us/Docket.html?Id=4452

[8] SPA at 6

[9] 100 MW x 0.38 = approx. 38.5 MW. The biomass alternative, because it has natural gas backup, is assumed for analysis purposes to have a capacity factor of 1.0. Scheduled and unscheduled maintenance would make the effective capacity factor slightly less than 1.0.

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 Prairie Wind Energy Project are discussed here.

5.1 Impacts

At least three categories of impacts can be identified if the Prairie Wind Energy Project 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.[10] Minnesota utilities forecast the need for 4,800 to 6,700 MW of additional renewable generation by the year 2025 to meet this objective. If the Prairie Wind Energy Project 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 (Map 2: Wind Resources in Minnesota). 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 Prairie Wind Energy Project is not built, there would be a loss of economic benefits in the Project area. Landowners would lose lease payments over the operational life of the Project. Local governments would lose wind energy production tax revenues estimated at $400,000[11] annually. The Prairie Wind Energy Project is expected to generate approximately 150 temporary construction jobs and up to 15 permanent operational jobs.[12] These employment opportunities and their associated income would be lost if the Project is not built.

Replacement with a Non-Renewable Resource

If the Prairie Wind Energy Project is not built, the electrical power it would have produced may need to be replaced, possibly with a non-renewable energy resource.[13] Prairie Wind Energy Project would produce approximately 339,579[14] megawatt-hours annually (MWh/yr). Though the impacts associated with non-renewable sources vary, it is possible to estimate, as an example, the impact of replacing the Prairie Wind Energy Project MWh/yr output with natural gas or, less likely, coal energy. However,

[10] Minn. Statute 216B.1691
[11] SPA at 40
[12] SPA at 39
[13] 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
[14] SPA at 79

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 Prairie Wind Energy Project 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

This section discusses the potential human and environmental impacts of the Prairie Wind Energy Project and Project alternatives. 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 have the potential to emit air pollutants during construction and operation.

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.[15]

Prairie Wind Energy Project

The Prairie Wind Energy Project would emit no criteria pollutants during operation. A minimal amount of these pollutants would be produced during construction, largely due to the operation of heavy machinery and equipment. Transmission lines, under certain conditions, produce limited amounts of ozone and nitrogen oxide emissions. Emissions of these pollutants would be minimal.

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 Prairie Wind Energy Project.

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.[16] Nitrous oxides (NO_x) are greenhouse gases that cause ozone and related respiratory illnesses.[17] Carbon dioxide (CO_2) is a greenhouse gas that contributes to climate change and associated impacts.[18] Mercury can cause impaired neurological development in children.[19] Inhalation of particulate matter causes and

[15] What Are the Six Common Air Pollutants?, http://www.epa.gov/air/urbanair/.
[16] Health and Environmental Impacts of SO_2, http://www.epa.gov/air/urbanair/so2/.
[17] Health and Environmental Impacts of NO_x, http://www.epa.gov/air/nitrogenoxides/.
[18] Climate Change 2007: Synthesis Report, Summary for Policymakers, An Assessment of the Intergovernmental Panel on Climate Change (IPCC), http://www.ipcc.ch/.
[19] Health Effects, http://www.epa.gov/mercury/effects.htm.

contributes to human respiratory illness.[20] Table 3 provides potential emission rates and annual emissions of criteria pollutants associated with a 38.5 MW biomass plant.[21]

Table 3. Criteria Pollutants

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[22]	1.11 E05[23]
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.

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

[20] Health and Environment, http://www.epa.gov/air/particlepollution/health.html.
[21] Adapted from Minnesota Biomass EAW, http://energyfacilities.puc.state.mn.us/Docket.html?Id=4452.
[22] 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.
[23] 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.

reduction system on the biomass boiler.[24] Particulate matter emissions could be reduced by 90 percent with add-on devices such as a multi-cyclone and dust collector.[25]

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.[26]

Prairie Wind Energy Project

The Prairie Wind Energy Project 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. Impacts from construction would be minimal and localized and would include dust due to earth moving and emissions from diesel-powered construction equipment. Air pollution emissions would not occur as a result of this Project.

Mitigation

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 have HAP and VOC emissions similar to the Prairie Wind Energy Project.

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 (see section 4). 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

[24] Minnesota Biomass EAW.
[25] Id.
[26] About Air Toxics, http://www.epa.gov/ttn/atw/allabout.html;

metro area.[27] 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. [28]

Table 4. Hazardous Air Pollutants and Volatile Organic Compounds

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 Rules 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.[29]

Prairie Wind Energy Project
The Prairie Wind Energy Project 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 have ozone formation similar to the proposed Project.

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.

[27] Summary of Results for the 2002 National-Scale Assessment, http://www.epa.gov/ttn/atw/nata2002/risksum.html.
[28] Adapted from Minnesota Biomass EAW, http://energyfacilities.puc.state.mn.us/Docket.html?Id=4452.
[29] Ozone, http://www.epa.gov/Ozone/. Air Quality – Ozone, http://www.health.state.mn.us/divs/eh/air/ozone.htm.

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.

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.

Prairie Wind Energy Project
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 Prairie Wind Energy Project.

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)[30] 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.

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

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.

Prairie Wind Energy Project

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 Prairie Wind Energy Project.

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 Surface and Ground Waters

Surface geology in the Project Area consists of glacial deposits associated with the Des Moines Lobe and Wadena Lobe, both continental glaciers associated with the last ice age. Bedrock in Otter Tail County is covered by 200 to more than 400 feet of glacial deposits.[31]

There are two aquifers that run through parts of the Project site. One aquifer has an elevation of approximately 1340 – 1430 feet and the second aquifer has an elevation of approximately 1260 – 1360 feet. The aquifers in Otter Tail County consist of a complex network of surficial and buried deposits of sand and gravel.[32]

[31] Otter Tail County, http://www.co.otter-tail.mn.us/gis/soilsurvey07geologic.php
[32] Minnesota Geological Survey. *Regional Hydrogeologic Assessment Otter Tail Area, West Central Minnesota*.1999.

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

Mitigation
Wind turbine locations would not impact the use of existing water wells. Agencies such as the MDNR, Minnesota Pollution Control Agency and Minnesota Department of Health would also be contacted as necessary to determine appropriate actions to protect local groundwater resources.

Generic 100 MW Wind Project
Impacts would be similar or reduced depending on site location and geological material of the Project.

38.5 MW Biomass Plant
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.

6.3 Solid and Hazardous Wastes

Large electric generation facilities have the potential to generate solid and hazardous wastes. This section discusses potential impacts from such wastes.

Prairie Wind Energy
The proposed Project would create solid and hazardous wastes. Solid wastes would be generated 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. Lubricants and fluids would be stored at the operation and maintenance building.

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]

Mitigation
Solid wastes would be disposed of according to solid waste plans in Otter Tail County. Hazardous wastes would need to be handled appropriately and leaks or spills would 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).[34]

[33] Volatile Organic Compounds (VOCs) in Minnesota's Ground Water, http://www.pca.state.mn.us/water/groundwater/gwmap/voc-fs.pdf.
[34] 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 Prairie Wind Energy.

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, 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 MPCA 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. (Note: impacts and mitigations for all of 6.4 are included at the end of this section as opposed to at the end of each part, which is the pattern elsewhere in this document.)

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 (see Map 4).[35] Ecological land classifications are used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features. The Project site is located within the Hardwood Hills subsection of the Eastern Broadleaf Forest Province of the Minnesota Department of Natural Resources Ecological Classifications System. The Hardwood Hills subsection is defined by steep slopes, high hills and lakes formed in glacial end moraines and outwash plains. The Project site is mostly flat with sporadic wetlands, sparsely populated with trees other than at building sites. Presettlement vegetation included maple-basswood forests interspersed with oak savannas, tallgrass prairies, and oak forests. However, much of this region is currently farmed.[36]

6.4.2 Soils

The majority of the soil within and adjacent to the Project Area is Dorsett-Corliss complex. Dorsett consists of loamy mantle over sandy and gravelly outwash deposits. Corliss consists of sandy and gravelly outwash deposits. The next largest complex is the Verndale-Abbeylake. Verndale consists of

[35] See MN DNR Ecologcial Classification System, http://www.dnr.state.mn.us/ecs/index.html
[36] Id.

loamy mantle over sandy outwash deposits and Abbeylake consists of sandy outwash deposits. All of these soil complexes are well to excessively drained.[37]

6.4.3 Wetlands and Waterways

The Project is located in the Upper Mississippi River Basin, Redeye Watershed. PWE states in its Site Permit Application that it is not aware of any outstanding resource value waters within the Project Area. [38] There are no designated wildlife lakes in or adjacent to the Project Area.[39]

Wetlands located within the proposed Project Area were identified from reviewing National Wetland Inventory (NWI) Maps developed by the USFWS.[40] Table 5 identifies the National Wetland Inventory types and acreage within the Project area.[41]

Table 5. NWI Wetland Type and Acreage

National Wetland Index Name	Attribute	Count of Wetlands	Acres in Project
Lake	L1UBH	15	806.4
	L1UBHh	1	20.7
	L2UBG	1	0
Freshwater Emergent Wetland	PEM/FO1C	1	0.1
	PEM/FO6C	1	2.5
	PEM/SS1C	22	80.2
	PEM/SS1Cd	7	74.4
	PEM/UBF	5	28.6
	PEMA	168	50.5
	PEMAd	29	9.9
	PEMB	5	16.7
	PEMC	477	390.8
	PEMCd	99	248.2
	PEMCx	1	0.1
	PEMF	126	447.6
	PEMFd	33	125.3
	PFO1/EMCd	1	6.4
	PFO1A	1	0.1

[37] Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/
[38] SPA at 43
[39] Minnesota Department of Natural Resources, Wildlife Lake Designation. http://www.dnr.state.mn.us/wildlife/shallowlakes/designation.html
[40] SPA at 44
[41] Wetland acreage calculated using USFWS NWI data

National Wetland Index Name	Attribute	Count of Wetlands	Acres in Project
Freshwater Forested/Shrub Wetland	PFO1C	64	28.9
	PFO1Cd	9	5.6
	PFO2Bg	1	43.8
	PFO6/SS1Bg	1	21.6
	PFO6/SS1C	3	19
	PFO6Bg	1	175.9
	PFO6C	6	24.5
	PFO6Cd	2	25.6
	PSS1/EMBdg	1	209.5
	PSS1/EMC	13	61.7
	PSS1/EMCd	2	18.2
	PSS1A	3	0.9
	PSS1B	2	12.8
	PSS1C	95	74.7
	PSS1Cd	16	16.5
Freshwater Pond	PUB/EMF	17	54.8
	PUB/EMFd	2	4.6
	PUBF	48	30.9
	PUBFd	3	1.5
	PUBFx	3	0.7
	PUBG	28	135.1
	PUBGx	12	2.5
	PUBH	1	0.7
	PUBKGx	2	10.6

6.4.4 Wildlife

Wildlife within the Project site consists of birds, mammals, fish, reptiles, amphibians, and insects, both resident and migratory, which utilize the area habitat for forage, breeding and/or shelter. The resident species are representative of Minnesota game and nongame fauna which are associated with upland grass and farmlands with few wetland and forested areas. The majority of migratory wildlife species are birds including waterfowl, raptors and songbirds. There are no Migratory Waterfowl Feeding and Resting Areas (MWFRA) within or adjacent to the Project site.[42] There are no Important Bird Areas (IBA) within or adjacent to the Project site.[43]

[42] Minnesota Department of Natural Resources, Migratory Waterfowl Feeding and Resting Areas. http://www.dnr.state.mn.us/wildlife/shallowlakes/mwfra.html
[43] Audubon, Minnesota's Important Bird Area Program, http://iba.audubon.org/iba/viewState.do?state=US-MN

Other animals expected to occur within the Project site include, but are not limited to, jackrabbits, chipmunks, woodchucks, squirrels, mice, muskrat, fox, raccoons, minks, badgers, skunks, coyote, and deer. These species use the food and cover available from agricultural fields, grasslands, woods, wetland areas, and wooded ravines. White-tailed deer, an economically important species, also enjoy agricultural crops and use farm woodlots, wooded ravines and intermittent stream bottoms for shelter.
Reptile and amphibian species, which are likely present within the Project site include: Great Plains Toad, Canadian Toad, Northern Leopard Frog, Western Chorus Frog, American Toad, Wood Frog, common snapping and western painted turtles, various salamanders, the northern prairie skink lizard and the various snakes.

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 (see Table 6) surrounding the Project area provide important wildlife habitat in a landscape dominated by agricultural uses, particularly for resident and migratory birds. These include Wildlife Management Areas (WMA) and Waterfowl Production Areas (WPA).

Table 6. Areas within Five Miles of the Project

Name	Direction	Distance from Project Boundary (mi)	Acres
WMA			
Almora	N	Adjacent	164
Eastern	E	2.31	1,027
Elmo	N	0.49	1,508
Folden	W	1.25	320
Hartfiel	S	3.3	63
Inman (Wunderlich)	N	2.5	1352
Miltona	S	2.22	107
Schulke	S	2.67	38
Sixteen	W	2.72	119
Wrightstown	E	3.11	221
WPA			
Starkey	In Project	In Project	94.2
Baumann	N	1.5	489.3
Riedel	SE	2.2	142.0
Downing	SE	2.81	99.9
Rokes	N	3.78	604.1

[44] National Wind Coordinating Committee, Spring 2010.

Birds

Studies have been conducted throughout the Midwest in an attempt to quantify bird and bat mortality due to wind turbines. 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.[45] 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.[46] 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.[47] 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

Recent studies indicate a broad range in the number of bat fatalities across the U S as a result of wind development, with the highest fatalities occurring in the eastern U.S. In the Midwest, post-construction studies completed in Iowa, Minnesota and Wisconsin confirm a wide range of fatality rates. The highest bat fatalities were found at the 145 MW Blue Sky Green Field wind facility in Wisconsin, with bat fatalities at 40 bats/turbine/year. Fatalities range from 1 to 8 bats/turbine/year across most of the upper Midwest. Avian and bat studies conducted at the Buffalo Ridge, Minnesota, found an average of 1-3 bat fatalities/turbine/year. Projects in areas with similar habitat and cover types would likely have similar fatality rates, depending on migration patterns, known resting and foraging areas, and potential for bat hibernacula.

Bats typically utilize forests, riparian corridors, and wetlands as feeding habitat due to higher nocturnal insect densities. The Iowa wind farm study estimated bat fatality rates between 6 and 9 bats per turbine per year.[48] A Buffalo Ridge study estimated bat fatality rates at 2.2 bats per turbine per year.[49]

Given the high proportion of agricultural land and low amounts of forested areas in the Project area, tree-roosting bat habitat would appear to be limited. 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. [50] There is also a small spike in bat fatalities during the spring migration. Bat fatality rates would likely be within the 1-8/bats/turbine/year range based on existing data, but could be higher. It is unknown whether this number of fatalities significantly impacts bat populations.

[45] Bird and Bat Behavior and Mortality at a Northern Iowa Windfarm, (Jain 2005) http://www.batsandwind.org/pdf/Jain_2005.pdf.
[46] Id.
[47] Avian Monitoring Studies at the Buffalo Ridge, Minnesota Wind Resource Area: Results of a 4-Year Study, http://energyfacilities.puc.state.mn.us/documents/AvianMonitoringBuffaloRidge.pdf [hereafter Buffalo Ridge Studies].
[48] Bird and Bat Behavior and Mortality at a Northern Iowa Windfarm, Jain, 2005 http://www.batsandwind.org/pdf/Jain_2005.pdf.
[49] Bat Interactions with Wind Turbines at the Buffalo Ridge, Minnesota Wind Resource Area, November 2003, http://my.epri.com/portal/server.pt?space=CommunityPage&cached=true&parentname=ObjMgr&parentid=2&control=SetCommunity&CommunityID=404&RaiseDocID=000000000001009178&RaiseDocType=Abstract_id.
[50] National Wind Coordinating Committee, Spring 2010.

6.4.5 Rare and Unique Natural Resources

The Minnesota County Biological Survey (MCBS) 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 MCBS systematically collects, interprets, and delivers baseline data on the distribution and ecology of rare plants, rare animals, and native plant communities.[51] The NHIS database provides information on Minnesota's rare plants, animals, native plant communities, and other rare features. The NHIS is continually updated as new is the most complete source of data on Minnesota's rare or otherwise significant species, native plant communities, and other natural features.[52]

The NHIS the red-shouldered hawk (*Buteo lineatus*), a state-listed species of special concern, has been documented in nearby woodlands. The U.S. Fish and Wildlife Service notes no incidence of endangered or threatened species.

Prairie Wind Energy
Impacts to wildlife in the Project area 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 5 birds/turbine/year and 1 to 8 bats/turbine/ per year. As a condition of their Site Permit, Prairie Wind Energy, LLC would also submit an Avian and Bat Protection Plan for the Project, which would include fatality monitoring and reporting.

Mitigation
Impacts to ground animals are expected to be minimal and mitigation is not required. Impacts to birds and bats could be mitigated by siting. Siting turbines away from bird habitat (grasslands, riparian areas) and bat feeding areas (forest, riparian areas) would reduce bird and bat mortalities. Birds and bats fly less in windy conditions. Wind turbines operate in windy conditions and require a minimum wind speed ("cut-in" speed, Table 1). Curtailment of turbines has been found to effectively reduce bat fatalities by as much as 80 percent. 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.[53]

The following measures would 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 MCBS "Sites of Biodiversity Significance" ranked as "Outstanding," "High," or "Medium."

[51] For more information on Minnesota County Biological Surveys, see http://www.dnr.state.mn.us/eco/mcbs/index.html
[52] For more information on the Minnesota Natural Heritage Information System Database, see http://www.dnr.state.mn.us/eco/nhnrp/nhis.html
[53] Effectiveness of Changing Wind Turbine Cut-In Speeds to Reduce Bat Fatalities at Wind Facilities, April 2009, http://www.batsandwind.org/pdf/curtailment_2008_final_report.pdf.

Generic 100 MW LWECS

A generic 100 MW LWECS located elsewhere in Minnesota would have wildlife impacts similar to or potentially less than the Prairie Wind Energy Project assuming the Project is located in an area with similar cover type and habitat type.

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.

38.5 MW Biomass Plant

A 38.5 MW biomass plant would have wildlife impacts similar to the Prairie Wind Energy Project, but fewer impacts on avian and bat species. 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.

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 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 or perceived effects on nearby residences, including impacts to human, community, and social environments. According to U.S. Census Bureau statistics, Otter Tail County has a relatively stable population and relatively low population densities compared to the state average. Table 7 summarizes the demographics in Otter Tail County.[54]

Table 7. Demographic Characteristics of Otter Tail County

Description	Otter Tail County	Minnesota
Population, 2000	57,159	4,919,492
Population, 2010	57,303	5,303,925
Percent population change, 2000-2010	.3	7.8
Persons per square mile, 2010	28.9	66.6
Median Household Income (dollars), 2009	42,011	55,621

[54] Compiled from U.S. Census Bureau data, http://www.census.gov/.

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.

Prairie Wind Energy
The Prairie Wind Energy Project 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. Prairie Wind Energy would be located in a predominantly rural agricultural area characterized by gently undulating topography.

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.[55] 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.

Within five miles of the Project boundary are state wildlife management areas (WMAs) and a number of waterfowl production areas (WPAs) 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. Lake Carlos State Park is nine miles south of the Project and should not be impacted.

The proposed Project would not impact or otherwise impair visibility. Unlike other types of generation facilities that produce by-products and emissions that may diminish or reduce visibility, wind turbines do not produce emissions.

Mitigation
Mitigation of impacts to aesthetic and visual resources and shadow flicker 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.

[55] Visual Considerations: Public Perceptions, Regulatory Environment and Assessment Methods in the Eastern U.S., http://www.nationalwind.org/assets/blog/Allen-NWCC_2009.pdf.

Setbacks from individual turbines, as embodied by Minnesota's general permit standards, mitigate visibility impacts.[56] 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 setback distances for the Prairie Wind Energy are shown in Table 2. Additional setbacks may be required to meet Minnesota noise standards.[57] These setbacks minimize the visibility of the wind turbines and shadow flicker. Finally, turbines are designed to be a uniform off-white color to blend in with the horizon and reduce visibility impacts.

Lighting required by the FAA is similar to that for other tall structures in rural areas, and 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. Impacts could potentially be greater if locating the Project in a less rural area of Minnesota; and such a location would also need wind resources equivalent to or greater than those in Otter Tail. Impacts could be mitigated by utilizing wind turbines capable of generating more energy. 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. The PWE Project is already utilizing 2.4 MW turbines, reducing the number of turbines.

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. Shadow flicker would not be an issue due to the absence of rotating exterior parts.

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

[56] Commission Order Establishing General Permit Standards, http://energyfacilities.puc.state.mn.us/documents/19302/PUC%20Order%20Standards%20and%20Setbacks.pdf.
[57] Minnesota Rules Chapter 7030 at all residential receivers (homes). Residential noise standard NAC-1, L50 50 dBA during overnight hours.

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

Shadow flicker is the intermittent change in light intensity due to rotating wind turbine blades casting shadows on the ground. Shadow intensity, or how "light" or "dark" a shadow appears at a specific receptor (usually a home), will vary with distance from the turbine. The closer a receptor is to a turbine, the more turbine blades block out a larger portion of 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 proposed a standard such that shadow flicker does not exceed 30 hours/yr. or 30 minutes/day at a receptor.[58] 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).[59]
- Belgium has adopted the German standard.[60]
- Denmark recommends a maximum of 10 hours/yr. assuming actual weather conditions in the Project area.[61]
- France has adopted no standard but requires shadow flicker modeling.[62]
- The Netherlands have adopted a yearly maximum of 5 hours and 40 minutes assuming clear skies.[63]
- The State of Victoria, Australia, has adopted a shadow flicker standard of 30 hours/yr.[64]

Prairie Wind Energy

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.

[58] Spatial Planning of Wind Turbines, European Actions for Renewable Energy (PREDAC) [hereafter Spatial Planning Report], http://www.cler.org/info/IMG/pdf/WP8_ANG_guide.pdf.
[59] Shadow Flicker Assessment – Honeywood, Final Report, p. 5, http://www.eolectric.com/assets/honeywood/pdf/en/appendix%20k.pdf.
[60] Spatial Planning Report, p. 21.
[61] Id.
[62] Id.
[63] Id.
[64] Policy and planning guidelines for development of wind energy facilities in Victoria, p. 26, http://www.sustainability.vic.gov.au/resources/documents/WindEnergyGuidelines.pdf.

Mitigation
Computer models can predict the amount of expected shadow flicker at locations within or near a wind farm. This information 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

Prairie Wind Energy Project
Wind turbines, per Federal Aviation Administration (FAA) requirements and because of their height, would be lighted.[65] 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.

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

6.5.4 Noise

Large electric generation facilities generate noise. 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.

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

Finally, sounds can be constant or intermittent. The perceived loudness of a sound depends on all of these characteristics.

A sound meter is used to measure loudness. The meter sums up the sound pressure levels for all frequencies of a sound and calculates a single loudness reading. This loudness reading is reported in decibels, with a suffix indicating the type of calculation used. For example, "dB(A)" indicates a loudness reading using an A-weighted calculation (or "scale").

The State of Minnesota has promulgated noise standards designed to ensure public health and minimize citizen exposure to inappropriate sounds. The rules for permissible noise vary according to land use, i.e., according to their noise area classification (NAC). In a residential setting, for example, noise restrictions are more stringent than in an industrial setting. Rural residential homes are considered NAC 1 (residential), while agricultural land and agricultural activities are classified as NAC 3 (industrial). The rules also distinguish between nighttime and daytime noise; less noise is permitted at night. Sound levels are not to be exceeded for 10 percent and 50 percent of the time in a one-hour survey (L_{10} and L_{50}) for each noise area classification.

Potential human impacts due to noise include hearing loss, stress, annoyance and sleep disturbance.[66] Table 9 lists Minnesota's Noise Standards by noise area classification.

Table 8. Minnesota Noise Standards[67]

Noise Area Classification[68]	Daytime		Nighttime	
	L_{50}[69]	L_{10}	L_{50}	L_{10}
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

Prairie Wind Energy

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

[66] Occupational and Community Noise, World Health Organization, http://www.who.int/mediacentre/factsheets/fs258/en/.
[67] Minnesota Rules 7030.0040, https://www.revisor.leg.state.mn.us/rules/?id=7030.0040. Standards expressed in dB (A).
[68] Minnesota Rules 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).
[69] Minnesota Rules 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.

turbine blades).[70] 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.[71] 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.[72]

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 Rules 7030.[73] For rural residential areas in Otter Tail County, this means sound levels must meet an L_{50} standard of 50 dB(A). The distance that turbines are setback from residences would depend on the type and size of turbine. Setback distances to the 50 dB(A) level for turbines under consideration for this Project are shown in Table 1. The setback distance for the 2.4 MW turbine is 656 feet. 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 Rules 7030 must still be met. This may require additional setbacks. Setback requirements are enforced by site permits issued by the Commission for wind farms. The Commission continuously reviews public health setbacks related to wind farms to determine if they remain appropriate and reasonable.[74]

Generic 100 MW LWECS

A generic 100 MW LWECS would have noise impacts and mitigation similar to the Prairie Wind Energy Project. Depending on location, surrounding vegetation, and 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.

[70] 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.
[71] Id.
[72] Id.
[73] Minn. Rules 7030.0040, Noise Standards, https://www.revisor.leg.state.mn.us/rules/?id=7030.0040
[74] 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, http://www.puc.state.mn.us/puc/energyfacilities/012254#windhealth.

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 meet daytime and nighttime standards.

6.5.5 Property values

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

Prairie Wind Energy
The proposed Project would be located in Otter Tail County in west central Minnesota. Population in the county held steady between 2000-2010, but household income is less than the statewide average. (Table 7 summarizes the demographics and housing characteristics of Otter Tail County.)

The impacts on property values due to the Project are 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. Applicants are attempting to preserve agricultural land value in this heavily irrigated area by utilizing corners of farmland covered by center-pivot irrigation systems.[75]
The Renewable Energy Policy Project (REPP) conducted a statistical analysis to determine the extent to which property values are influenced in the vicinity of wind Projects.[76] Ten communities in the United States were studied within a five mile radius of a wind Project. The study found that property values were not negatively impacted within the viewshed of a wind Project. Lawrence Berkeley National Laboratory recently completed a nationwide study on the potential impacts of wind Projects on property values.[77] Results indicate that property values near wind Projects are not negatively impacted and that home buyers and sellers consider a property's scenic vista when determining a sale/purchase price.

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[78]. To date, it appears that neither properties hosting turbines nor those adjacent to those properties in the counties listed, are negatively impacted by the presence of wind farms. [79]

[75] SPA at 37
[76] The Effect of Wind Development on Local Property Values, May 2003, http://www.repp.org/articles/static/1/binaries/wind_online_final.pdf.
[77] The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis, December 2009, http://www1.eere.energy.gov/windandhydro/pdfs/wind_power_Projects_residential_property_values.pdf.
[78] Stearns County Board of Commissioners Meeting, June 8, 2010.
[79] Results were based on limited data.

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 Prairie Wind Energy.

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 Prairie Wind Energy, 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.

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 Prairie Wind Energy Project. Short-term economic benefits would occur as a result of construction jobs generated by the Project and additional expenditures in the local economy. 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.

Prairie Wind Energy
Based on a production tax of $0.0012 per kWh produced, wind energy production taxes would provide over $400,000 annually to the county and to townships within the Project. 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 existing system.

6.6.1 Associated transmission facilities

Electrical generation facilities typically require construction of transmission facilities such as transmission lines and substations to connect to the transmission grid. This section discusses these associated transmission facilities and their potential impacts.

Transmission lines over 100 kilovolts and longer than 1,500 feet are defined as "high voltage transmission lines" and subject to regulation by the Commission[80]. Wind generation facilities also require construction of lower voltage electric infrastructure (typically 34.5 kV), referred to as feeder and collector lines. These lines, covered in the Site Permit, collect power generated by the wind turbines and supply the Project substation before connecting to the transmission grid.

Prairie Wind Energy
The Prairie Wind Energy Project would construct a Project substation and site it in proximity to a new Great River Energy (GRE) Graven Lake Substation that will tie into the existing GRE 115 kV line. The location of the Project substation would be in Township 131N, Range 37W, Section 10. There are no major network transmission upgrades anticipated to interconnect the Project to the grid.[81]
The Prairie Wind Energy Project would collect the electrical power generated by individual turbines through a 34.5 kV underground collection system. Collector lines would be buried underground between turbines and carry power to interconnection points. Overhead feeder lines would carry power to the Project substation. Impacts of the overhead lines would be equivalent to a typical distribution line.

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 Prairie Wind Energy Project 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 electromagnetic fields (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

[80] Minn. Statute 216E.01, subdivision 4. Under Minn. Statute 216E.05, high voltage transmission lines between 100 and 200 kV may be permitted by local governments.
[81] SPA at 10, 11

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 the 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. State Highway (SH) 29 traverses the eastern portion of the Project area and SH 235 the southern portion. Within the Project area road surfaces vary and gravel roads are common.

Traffic volumes in the area are moderate. The highest existing Annual Average Daily Traffic (AADT) counts are approximately 4,300 vehicles per day along SH 29 and 1,300 per day along SH 235 where they intersect.[82] Along county highways, AADTs are often below 500 vehicles per day.

Constructing the Project would require approximately 12[83] 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. Roads would be approximately 16 to 33 feet wide and low profile to allow cross-travel by farm equipment. Efforts would be made by the applicant to minimize land-use disruptions.

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, it is anticipated that there would be an additional 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 Project area.

Prairie Wind Energy Project
Construction of the proposed Project would increase traffic slightly during construction. Additionally, 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 be restored following construction.

[82] Mn/DOT, 2009
[83] SPA at 65

A system of access roads would be constructed along turbine strings or arrays. These roads would be constructed in accordance with state and local requirements. Access roads would be 16 feet wide and with a base sufficient for use during inclement weather.

Turbine assembly would also require the construction of a 40-foot-by-120 ft gravel crane pad extending from the access road to the turbine foundation. All temporary construction areas would be restored following construction, including grading to natural contours, seeding and dressing, as necessary.

Generic 100 MW
Impacts would be similar to those of the proposed Project. Depending on location, impacts could be greater on road systems, particularly on roads with higher daily use.

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 and/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 due to the operation of a large generation facility in the Project area.

Prairie Wind Energy Project
Wind turbines can cause interference with electronic communications by obstructing the reception of communication signals. Wind turbines do not impact digital signals (e.g., digital television, internet, cell phones), unless the turbines directly obstruct the signal, such as being located in the line-of-sight.[84] 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 Prairie Wind Energy Project are anticipated to be minimal.

[84] Post Digital Television Transition - The Evaluation and Mitigation Methods for Off-Air Digital Television Reception in-and-around Wind Energy Facilities; http://www.comsearch.com/files/Wind_Energy_White_Paper.pdf.

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. One unique microwave beam path intersects the Project area. Turbines would be sited to avoid microwave beam paths.

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. [85] The applicant contacted the NTIA for input from federal agencies. NTIA indicated no federal agencies identified any concerns with the Project regarding blockage of their radio frequency transmission.[86] Construction and operation of the proposed wind Project would still need to be in accordance with all associated federal and state permits and laws, as well as industry construction and operation standards. Due to the impacts expected, mitigation measures are not anticipated.

Telephone Service
Construction and operation of the proposed wind farm would not impact the telephone service in the Project area. 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 enter into agreements with service providers to avoid interference with their facilities.

Television
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. Local television stations are listed in Table 9.

Table 9. Digital Television Signals in the Project Area[87]

Project Area Zip Code	Call Sign	Network	Signal Strength
Vining	KVVR	Fox	Strong
Vining	KCCO	CBS	Weak
Vining	KCCW	CBS	No Signal
Vining	KSAX	ABC	No Signal
Vining	KAWB	PBS	No Signal
Henning	KVRR	Fox	Strong
Henning	KCCO	CBS	Weak
Henning	KCCW	CBS	Weak
Henning	KAWB	PBS	Weak

[85] For more information on the National Telecommunications and Information Administration, see http://www.ntia.doc.gov/about.html.
[86] SPA at Appendix C
[87] Federal Communications Commission: http://www.fcc.gov/mb/engineering/maps/

Project Area Zip Code	Call Sign	Network	Signal Strength
Henning	KSAZ	ABC	Weak
Henning	KFME	PBS	No Signal
Henning	WDAY	ABC	No Signal
Parkers Prairie	KSAX	ABC	Strong
Parkers Prairie	KCCO	CBS	Strong
Parkers Prairie	KAWB	PBS	Weak
Parkers Prairie	KVRR	FOX	Weak
Parkers Prairie	KCCW	CBS	Weak
Parkers Prairie	KWCM	PBS	No Signal

GPS

Global positioning systems (GPS) use satellite signals to determine locations on the earth's surface and are commonly used to guide agricultural operations.[88] 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 would 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 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.

[88] 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 Prairie Wind Energy Project depending on a variety of factors such as the proximity of homes in relation to the Project, number of turbines, and the number of communication facilities and types in the area.

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

During the Environmental Report Scoping period, a person questioned the possibility of impacts to wireless broadband internet signals due to operation of the Project. No literature exists that shows effects of wind turbines on broadband internet signals.

Prairie Wind Energy Project

In an earlier project,[89] EFP 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. 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 Prairie Wind Energy Project.

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. This section discusses the availability of fuel for the proposed Project and alternatives.

Prairie Wind Energy Project

The Prairie Wind Energy Project relies 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

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

downstream. To operate effectively, turbines must be setback from other turbines to compensate for this turbulence known as wake loss.[90]

Wind capacity varies across Minnesota. Extensive wind measurements have been taken and analyzed by the Minnesota Department of Commerce.[91] Local data collection suggest the mean annual wind speeds at 91 meters at 7.24 meters per second (mps) (16.2 mph).[92] 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.[93] 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 Prairie Wind Energy Project is estimated to have a capacity factor in this range.[94]

Generic 100 MW LWECS

A generic 100 MW LWECS would utilize the wind resources as the proposed Project. To be economically feasible, a 100 MW LWECS sited elsewhere in Minnesota would need to be sited in area with sufficient wind resources to meet generation projections. The availability of productive, undeveloped wind resources in Minnesota remains high. Impacts on the wind resource would be similar to those for the Prairie Wind Energy Project.

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 be used as a backup fuel. The construction of a natural gas pipeline would be required to deliver the natural gas to the biomass plant.

[90] 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 RD for each turbine. See, PUC Order Establishing General Permit Standards, http://energyfacilities.puc.state.mn.us/documents/19302/PUC%20Order%20Standards%20and%20Setbacks.pdf.
[91] Wind Resource Analysis Program 2002, http://www.state.mn.us/mn/externalDocs/Commerce/WRAP_Report_110702040352_WRAP2002.pdf.
[92] SPA at 57
[93] See Table 1 of this ER which includes "Cut-in Wind Speeds", i.e., the minimum wind speed necessary for the turbine to operate.
[94] SPA at 71

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.

Mitigation
Impacts related to harvesting for a biomass plant could be mitigated by using guidelines for biomass harvesting. [95] 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.[96] 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.

Prairie Wind Energy Project
Approximately 51 percent of the Project area is cultivated, with another 15 percent of the area in pasture and hay. Approximately 127 acres of farmland would be removed from agricultural production. This includes the construction of access roads, turbine pads, and the operations and maintenance facility. [97] Farmland preservation programs such as the federal Conservation Reserve Program (CRP) and Minnesota's Reinvest in Minnesota (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.

Agriculture is the primary land use in this area of Otter Tail County. Livestock farming consists mainly of turkeys, beef and dairy. Corn, soybeans, alfalfa, potato, kidney beans and small grains are the major crops in this part of south east Otter Tail County. [98] Farming activities would continue on the land surrounding turbines and access roads. Impacts to drain tile in the Project area is not anticipated; however, any damages sustained as a result of Project construction would be repaired according to agreement with the landowner.

[95] See Minnesota DNR Guidelines for Woody Biomass, 2007. http://www.dnr.state.mn.us/forestry/um/biomass/index.html
[96] Forest Biomass and Biofuels Harvest, http://www.frc.state.mn.us/initiatives_policy_biofuels.html.
[97] SPA at 47
[98] *Id.* at 36

Generic 100 MW Wind Farm
Impacts to farming at a generic wind farm would be similar to those of the proposed Project.

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. This section discusses potential impacts to livestock due to the operation of a generation facility in the Project area. 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 and 6.2 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.). [99]

Prairie Wind Energy
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 Prairie Wind Energy Farm is designed to be "a separately derived system" as defined in the National Electric 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. The Project does envision connection to the grid via a new 115 kV line.

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

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.

Mitigation
Mitigation of potential stray voltage impacts would include that all safety requirements are met during the construction and operation of the Project.

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

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 could have an associated transmission line that produced stray or 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.

Prairie Wind Energy Project
Due to their height, wind turbines have the potential to impact aviation. Wind turbines in the Prairie Wind Energy Project will require notice to and evaluation by the Federal Aviation Administration (FAA)[100] and the Minnesota Department of Transportation (MN DOT).[101]

There are no public airports within the Project boundary. Henning (05Y) airport is the only public airport within 10 miles of the Project site and is located approximately four miles northwest of the Project.[102]

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.

[100] FAA Advisory Circular AC 70/7460-2K, HTTP://RGL.FAA.GOV/REGULATORY_AND_GUIDANCE_LIBRARY/RGADVISORYCIRCULAR.NSF/0/22990146DB0931F186256C2A00721867/$FILE/AC70-7460-2K.PDF
[101] Minnesota Department of Transportation, Tall Towers, Minnesota Structure Height Regulations, http://www.dot.state.mn.us/aero/avoffice/talltowers.html.
[102] 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.[103]

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. Aircraft would also typically be flying below the level of the blades to avoid dissipation of an application.

Otter Tail County has adopted safety regulations[104] for MET towers to address their specific concerns. The ordinance requires MET towers to be registered with the Mn/DOT Aeronautics Division, including latitude, longitude and height. The regulations also specify that all MET towers must be painted in seven equal alternating bands of aviation orange and white; beginning with orange at the top of the tower, and ending with orange at the base. Finally the guy wires must be clearly marked as specifically directed in the ordinance.

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.

Generic 100 MW LWECS

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

38.5 MW Biomass Plant

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

[103] Mayo: Turbines do not hamper medical helicopters, Rochester Post-Bulletin, May 18, 2010, http://www.postbulletin.com/newsmanager/templates/localnews_story.asp?z=2&a=452955.
[104] Otter Tail County Wind Energy Conversion System Ordinance, February 15, 2011

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 Prairie Wind Energy Application.

7.1 Prairie Wind Energy

The Project is located in a rural area with a primarily farm-based economy. The farmland in the Project area requires irrigation through center-pivot systems. This results in less-productive "corners" of farmland that do not receive irrigation. PWE plans to utilize such corners wherever possible in order to minimize impacts to productive farmland. Area farmers also frequently employ aerial crop spraying. Aerial spraying has been used in several wind project areas.

The Project would take advantage of economies of scale by utilizing 40 turbines to create a nameplate capacity of 100 MW. The size of the Project allows its per kilowatt hour cost to be very competitive. PWE also intends to work with two neighboring facilities, both of which are still in the planning stages, to utilize a single operations and maintenance facility. The Project is also located next to an existing 115kV Great River Energy transmission line. Based on interconnection studies conducted to date, PWE does not expect to bear significant network upgrade costs to interconnect to the transmission system.

The proposed Project is feasible and available to be implemented.

7.2 Generic 100 MW wind Project

An alternative to the proposed Prairie Wind Energy Project in Otter Tail is a large energy conversion system sited elsewhere in Minnesota. Such a Project could be a 100 MW Project or a combination of smaller dispersed Projects. Several feasible Projects are being evaluated 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.[105] 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, but would not further Minnesota's renewable energy objectives.

[105] The Fibrominn plant has an output of 55 MW and uses turkey litter as a fuel source, http://www.fibrowattusa.com/Projects/fibrominn/

8 Permits

The Prairie Wind Energy Project would require permits and approvals from entities other than the Minnesota Public Utilities Commission. Federal, state, and local permits or approvals that have been identified for construction and operation of the proposed Project are listed below in Table 10.

Table 10. Potential and Required Permits and Approvals[106]

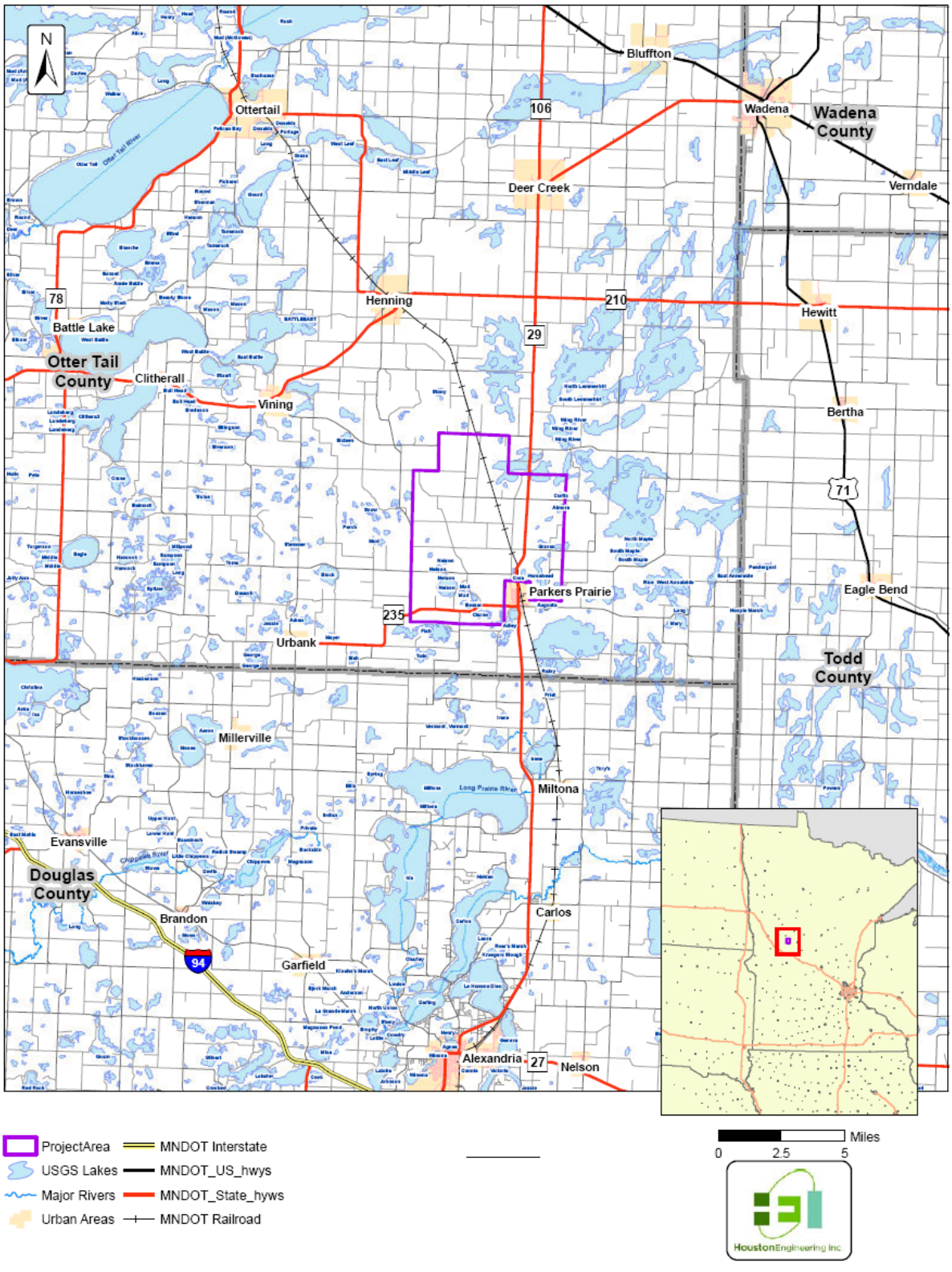
Agency	Permit/Approval	Description	Status
Federal Permits			
US Fish and Wildlife Service (USFWS)	Threatened and Endangered Species – Section 7 Consultation	Determination of effect on federally listed species	Not anticipated
Federal Aviation Administration (FAA)	Form 7460-1, Notice of Proposed Construction or Alteration	Required if construction or alteration is within 6 miles of public aviation facility and for structures higher than 200 ft	Ongoing
U.S. Army Corps of Engineers (USACE)	Section 404 Permit	Complete an application under the Clean Water Act for impacts to wetland and waters of the U.S.	As required following MPUC Site Permit Issuance
U.S. Department of Agriculture (USDA)	Conservation Reserve Program (CRP) Coordination	Coordinate with the USDA regarding Project facilities in CRP parcels	As required following MPUC Site Permit Issuance
	USDA Loan Coordination	Coordinate with the USDA regarding Project facilities in parcels under USDA loans	To be filed if necessary
Native American Tribes	Section 106 Consultation	Determination of effect on Native American cultural resources	Not anticipated
State of Minnesota Permits			
Minnesota Public Utilities Commission (MPUC)	Certificate of Need	Application required for Large Energy Facility	In process.
Minnesota State Historic Preservation Office (SHPO) and Office of State Archaeologist (OAS)	Section 106 Consultation (not anticipated), consultation per Minnesota Wind Siting Act (anticipated)	Determination of effect on archaeological and historical resources	Ongoing review.
Minnesota Pollution Control Agency (MPCA)	General NPDES Permit for Stormwater Discharges Associated with Construction Activities	Stormwater permit required for construction activities	SWPPP will be prepared and NOI will be submitted prior to construction
	Section 401 Water Quality Certification	Impacts to waters of US (USACE Section 404 permit)	As required following MPUC Site Permit Issuance
	Small Quantity Hazardous Waste Generator License	Generation more than 100 pounds of hazardous waste each year	As required following MPUC Site Permit Issuance

[106] SPA at 73-5

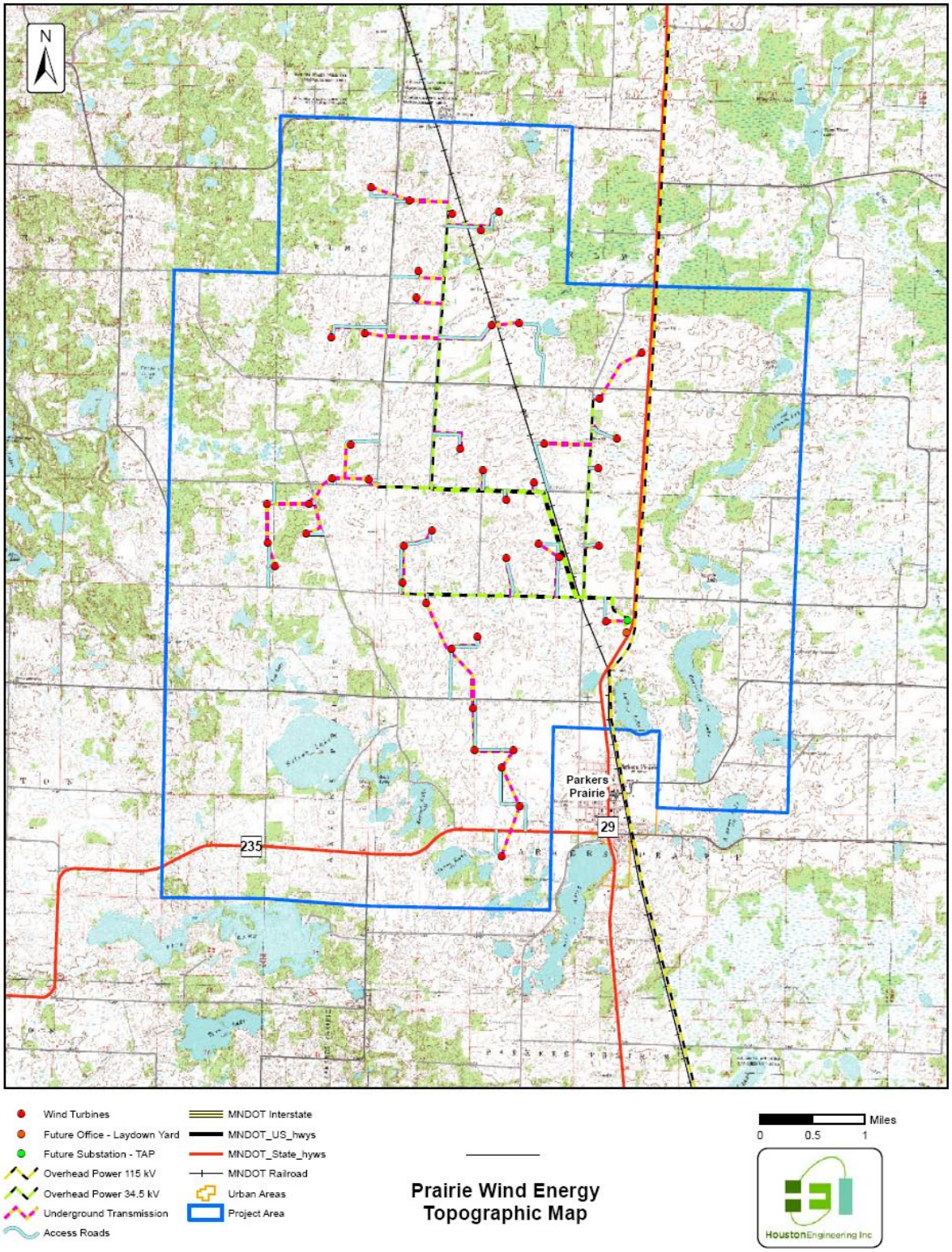
Agency	Permit/Approval	Description	Status
	Temporary and Permanent Soil Erosion and Sediment Control Plans	Plans will be incorporated into final plans and specifications for Project	To be submitted prior to construction and maintained until disturbed areas have been re-vegetated
	Small Quantity Generator Permit	Necessary if any used lubricating oil will be accumulated and temporarily stored on the site	Can be obtained within 45 days after Project is placed in operation, if necessary
Minnesota Department of Natural Resources (DNR)	Public Water Works Permit	Any construction activities that impact DNR public waters	As required following MPUC Site Permit Issuance.
	License to Cross Public Land and Waters	Siting facilities on, or crossing over, any State administered Public Lands or Waters	As required following MPUC Site Permit Issuance.
	Wetlands Survey	Determination of effects on public waters and wetlands by tower and road placement	Ongoing process.
Minnesota Board of Water and Soil Resources (BWSR)	Wetland Conservation Act Approval	Any construction activities that impact wetlands	As required following MPUC Site Permit Issuance
Minnesota Department Health	Well Construction Notification	Installation of private well(s) or O&M building	As required following MPUC Site Permit Issuance
	Plumbing Plan Review	Plumbing system for O&M building	Will be obtained prior to construction
Minnesota Department of Transportation (MNDOT)	Highway Access Permit	Permit required for any access roads abutting state roads	As required following MPUC Site Permit Issuance
	Utility Access Permit	Permit required for any utility crossing or use within state road ROW	As required following MPUC Site Permit Issuance
	Oversize and Overweight Permit	Permit required for heavy equipment transport over state roads during construction	As required following MPUC Site Permit Issuance
	Tall Structure Permit	Permit for wind turbines and other tall structures	As required following MPUC Site Permit Issuance
	Routing Permit for Power Lines	Permit required for any utility crossing of county roads	As required following MPUC Site Permit Issuance
Local Permits			
Otter Tail County	Driveway Permit	Permit required for access roads abutting county roads	As required following MPUC Site Permit Issuance
	Utility Permit	Permit required for any utility crossing of county roads	As required following MPUC Site Permit Issuance
	Moving Permit	Permit required for heavy equipment transport over restricted county highways during construction	As required following MPUC Site Permit Issuance

Agency	Permit/Approval	Description	Status
	Individual Septic Tank Systems (ISTS) Permit	Connection to existing or approval of onsite sewage and water (O&M building)	If necessary, will be obtained prior to construction
	Utility permit for Ditch Crossings	Any construction activities that impact a County Judicial Ditch	As required following MPUC Site Permit Issuance
	Wetland Conservation Act Compliance	Set back of 300 feet is required, but no permit needed	As required following MPUC Site Permit Issuance
Townships	Township Road Access	Possible permit or approval required for township road access	As required following MPUC Site Permit Issuance
Canadian Pacific Railroad (CPR)	Determination of process and permits for working within railroads right-of-way	The Project is working with CPR personnel	Ongoing

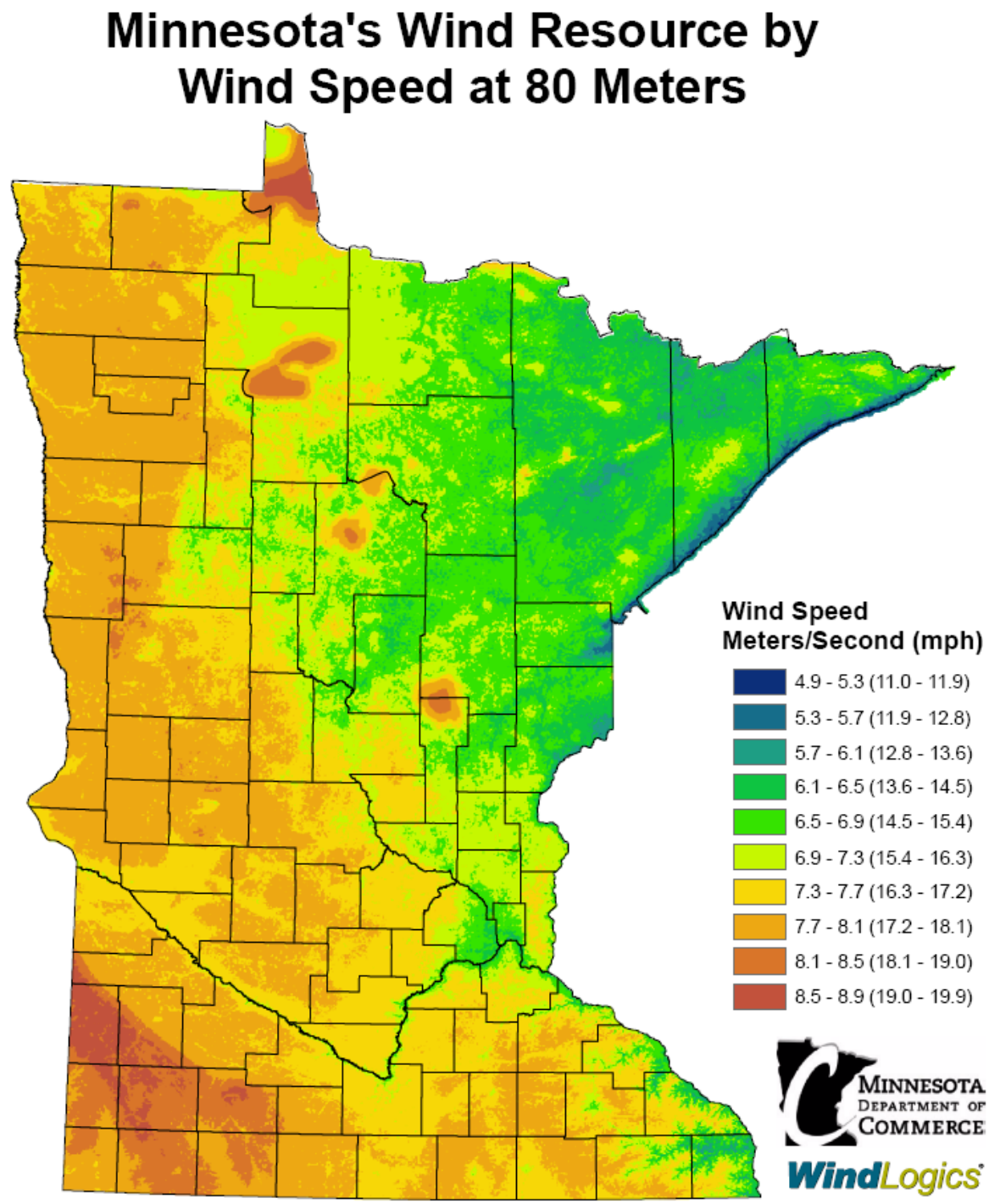
Map 1. Project Vicinity



Map 2. Project Area



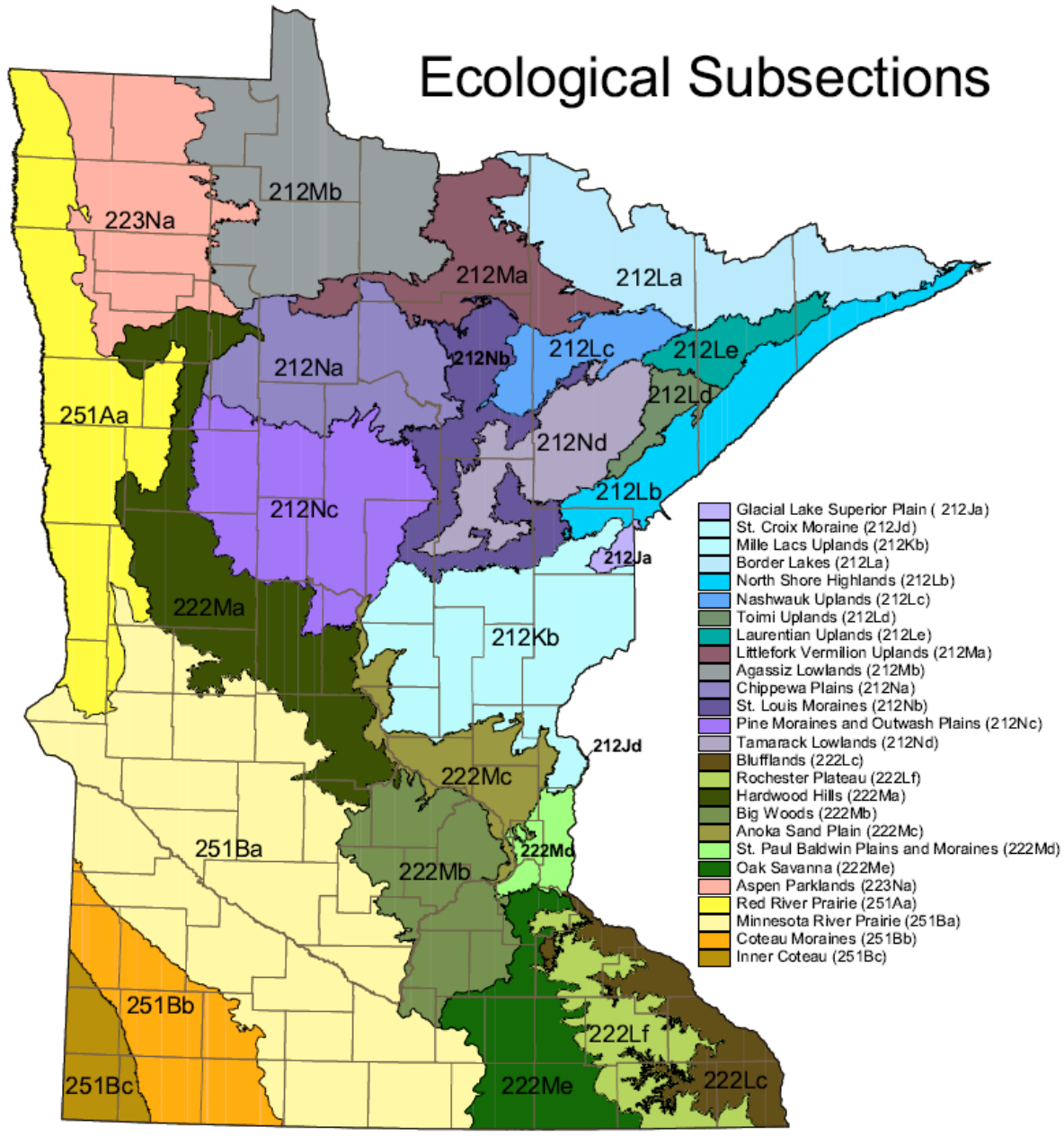
Map 3. Wind Resource



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

Map 4. Ecological Subsections



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September, 2000

Division of Forestry
Ecological Land Classification Program

Appendix A. Environmental Scoping Decision

In the Matter of the Application by Prairie Wind Energy LLC, for a Certificate of Need for the 100 MW Prairie Wind Energy Project in Otter Tail County

ENVIRONMENTAL REPORT SCOPING DECISION

PUC Docket No. IP-6844/CN-10-429

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 Prairie Wind Energy LLC, Application for a Certificate of Need (CN) for the proposed 100 Megawatt (MW) Prairie Wind Energy Project in Otter Tail County.

A final decision on turbine selection and design has not been made, but the project will consist of turbines with a rated capacity between 2.3 and 2.4 MW in such number and combination as to yield up to 100 MW. Facilities associated with the project include gravel access roads, an operation and maintenance building, meteorological towers, a Sonic Detection and Ranging (SODAR) unit, and an electrical collection system.

The Project is located in Otter Tail County approximately one mile from the community of Parkers Prairie, west of State Highway (SH) 29 and north of SH 235, with most of the Project site in the townships of Parkers Prairie and Elmo. Other townships within the Project site include Effington and Folden, also in Otter Tail County. There are currently 23,921 acres within the Project boundary, with approximately 8,000 acres under site control. Electricity from the Project would be delivered into the Graven Substation and distributed using the existing 115 kV transmission line that traverses the Project.

The project requires a Certificate of Need and a Site Permit for the wind farm from the Minnesota Public Utilities Commission (Commission). The CN (CN-10-429) and the site permit (WS-10-438) are being considered by the Commission in separate dockets.

On November 29, 2010, Prairie Wind Energy, LLC, filed a certificate of need application with the Commission for the Prairie Wind Energy Project. On February 11, 2011, the Commission issued an order accepting the application as complete and authorizing an informal review process. The proposed project is a large wind energy facility (Minn. Stat. § 216B.2421). As such, it requires the Minnesota Department of Commerce to prepare an environmental report for the project (Minn. Rules 7849.1200).

A public meeting was held on April 19, 2011, in Parkers Prairie to receive comments on the scope of the environmental report. Approximately 150 persons attended the meeting, with

nine people commenting. A public comment period followed the meeting, closing on May 10, 2011. Thirty comments from 26 people were received during the comment period.

Concerns that were raised at the public meeting and in written comments were potential impacts to property values and local tax implications, impact on farm land, aerial crop applications and easements for associated collector lines. Questions were raised concerning setbacks from property lines, aesthetics, wildlife, and wildlife habitat. Impacts from noise, shadow flicker, stray voltage, and electric and magnetic fields were also raised. A number of people questioned the state requirement for renewable energy projects and the potential increase in energy costs to the consumer. Other commentors welcomed the potential economic, tax and employment benefits.

Of these concerns, issues not specifically addressed elsewhere will be reviewed in Section 3.11.

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 (Minn. Stat. § 216B.1691). These alternatives 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, consulted with the Energy Facility Permitting staff, and in accordance with Minnesota Rules 7849.1400 and 7849.1500, I hereby make the following scoping decision:

MATTERS TO BE ADDRESSED

Prairie Wind Energy Project

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

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

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 Visibility impairment (including aesthetic and shadow flicker) [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 Other Issues, including effects on Real Estate, Wireless Broadband Internet and Aerial Spraying

4.0 Mitigation measures [Minn. Rule 7849.1500, subp. 1, E]

4.1 No-build alternative
4.2 100 MW wind project
4.3 38.5 MW biomass plant
4.4 Prairie Wind Energy Project

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

5.1 No-build alternative
5.2 100 MW wind project
5.3 38.5 MW biomass plant
5.4 Prairie Wind Energy Project

6.0 A list of permits required for the project. [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

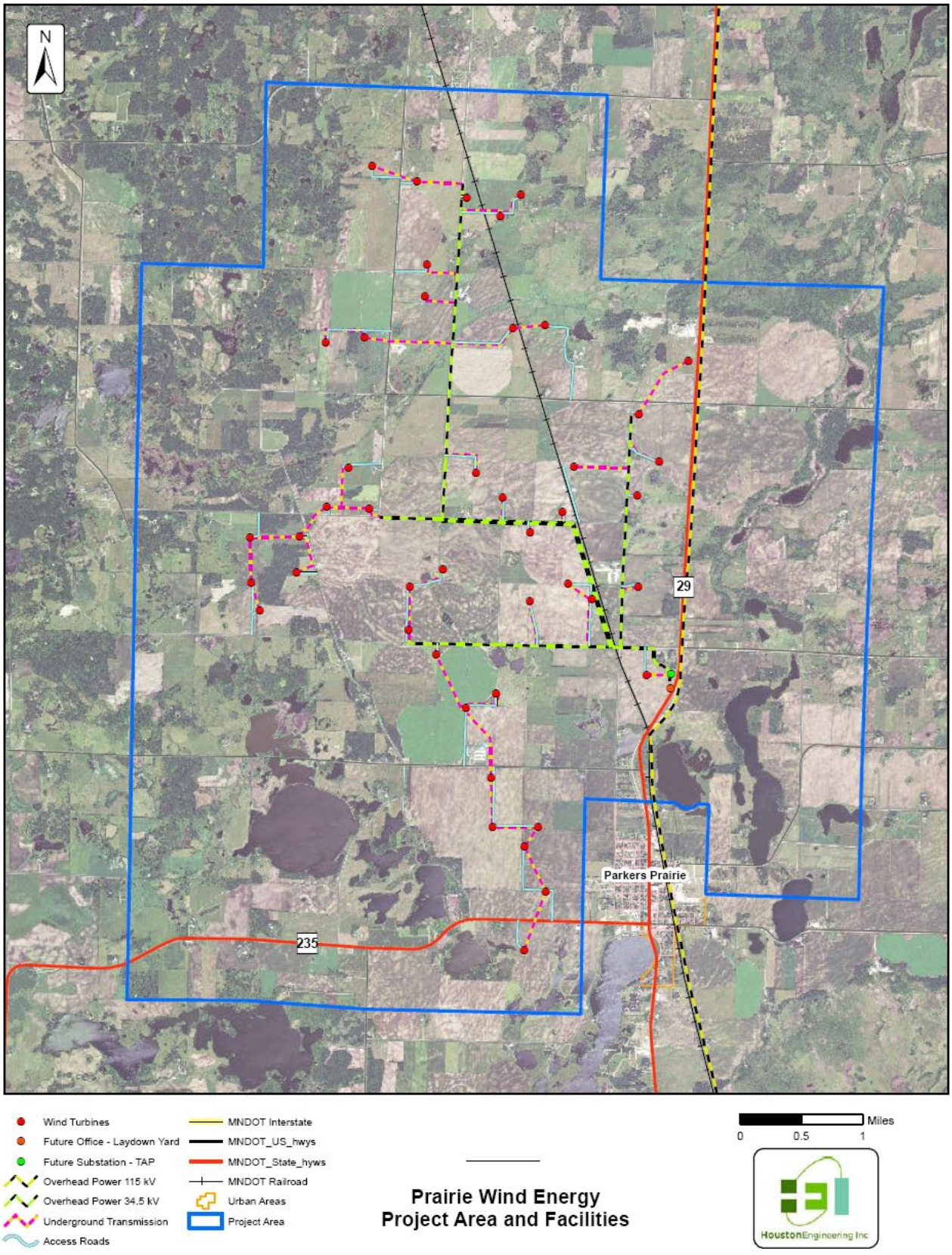
SCHEDULE

The environmental report will be completed in July 2011. 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 19th day of May 2011

STATE OF MINNESOTA
DEPARTMENT OF COMMERCE

William Grant, Deputy Commissioner
Division of Energy Resources



Prairie Wind Energy Project Area and Facilities