November 2019

Minnesota Public Utilities Commission

Certificate of Need Application for a Large Wind Energy Conversion System and 345 kV Transmission Line

Plum Creek Wind Farm

Cottonwood, Murray, & Redwood Counties, Minnesota

Docket #: IP-6997/CN-18-699

GERONIMO ENERGY
a nationalgrid company

PLUM CREEK WIND FARM

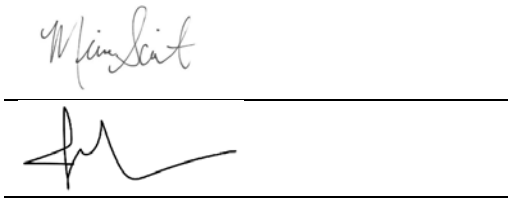
Plum Creek Wind Farm

Certificate of Need Application

Docket No. IP-6997/CN-18-699

November 12, 2019

Prepared for
Plum Creek Wind Farm, LLC
7650 Edinborough Way, Suite 725
Edina, MN 55435

Project Name:	Plum Creek Wind Farm
Project Location:	Cottonwood, Murray, and Redwood Counties; the Wind Farm footprint is approximately 73,000 acres in portions of Germantown, Highwater, Ann, and Westbrook Townships in Cottonwood County; Holly, Murray, Dovray, and Des Moines River Townships in Murray County; and North Hero and Lamberton Townships in Redwood County; and the Transmission Line will cross portions of Cottonwood and Redwood Counties.
Applicant:	Plum Creek Wind Farm, LLC
Authorized Representatives:	Ms. Melissa Schmit and Ms. Jenny Monson-Miller
Signatures:	
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ACRONYMS

2016 Quad Report	Minnesota Department of Commerce, *Energy Policy and Conservation Quadrennial Report 2016*
ADLS	Aircraft Detection Lighting System
ABPP	Avian and Bat Protection Plan
AMP	Ampere
APLIC	Avian Power Line Interaction Committee
Application	CN Application
ARMER	Allied Radio Matrix for Emergency Response
Applicant or Plum Creek	Plum Creek Wind Farm, LLC
AWWI	American Wind Wildlife Institute
Biennial Report	2019 Biennial Transmission Projects Report
BMP	Best Management Practice
BOP	Balance of Plant
BWSR	Board of Water and Soil Resources
Cadna-A	Computer Aided Design for Noise Abatement
CN	Certificate of Need
Commission	Minnesota Public Utilities Commission
CSAH 5	County State Aid Highway 5
dB(A)	A-weighted decibels
DC	Direct Current
Department	Minnesota Department of Commerce
DOE	U.S. Department of Energy
ECS	Ecological Classification System
EIA	U.S. Energy Information Administration
Exemption Request	Request for Exemption from Certain Certificate of Need Application Content Requirements
FAA	Federal Aviation Administration
Geronimo	Geronimo Energy, LLC
Hz	Hertz
IPP	Independent power producer
IRP	Integrated Resource Plan
kV	Kilovolt
kW	Kilowatt
kWh	Kilowatt hour
LCOE	2018 Lazard Levelized Cost of Energy
LEGF	Large Electric Generating Facility
LHVTL	Large High Voltage Transmission Line
LVRT	Low Voltage Ride Through
LWECS	Large Wind Energy Conversion System
m	Meters
MDPS	Minnesota Department of Public Safety
Minn. R.	Minnesota Rules
Minn. Stat.	Minnesota Statutes

MISO	Midcontinent Independent System Operator, Inc.
MNDNR	Minnesota Department of Natural Resources
MnDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MVP	Multi-Value Project
MW	Megawatt
NHIS	National Heritage Information System
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
PPA	Power Purchase Agreement
Project	Plum Creek Wind Farm
Project Area	73,000 acres in portions of Germantown, Highwater, Ann, and Westbrook Townships in Cottonwood County; Holly, Murray, Dovray, and Des Moines River Townships in Murray County; and North Hero and Lamberton Townships in Redwood County where the Wind Farm is proposed to be located
Project Location	Project boundaries identified in Figure 1
PWI	Public Area Waters Inventory
Receptor	Alternating changes in light intensity at a given stationary location as a result of shadow flicker caused by wind turbines.
RES	Renewable Energy Standard
Rules	Minnesota Rules
SHPO	Minnesota State Historic Preservation Office
SOBS	Sites of biological significance
SWPPP	Stormwater Pollution Prevention Plan
Transmission Line	The approximately 31 mile 345 kV high voltage transmission line proposed to interconnect the Wind Farm to the transmission grid as shown on Figure 4.
Transmission Line Study Area	The area studied for potential Transmission Line routes as shown in Figure 2
TWh	Terawatt hours
USACE	United States Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WEPT	Wind Energy Production Tax
Wind Farm	Up to 414 MW large wind energy conversion system
WNS	White Nose Syndrome

Minnesota Rule	Required Information	Application Section(s)	Exemption Requested
7849.0120	**Criteria – Probable result of denial would be an adverse effect upon the future adequacy, reliability, or efficiency of energy supply to the applicant, the applicant's customers, or to the people of Minnesota and neighboring states**	4.1	--
A(1)	Accuracy of the applicant's forecast	6.0	Yes
A(2)	Effects of applicant's existing or expected conservation programs and state and federal conservation programs	8.0	Yes
A(3)	Effects of promotional practices on demand	3.2.2	Yes
A(4)	Ability of current and planned facilities, not requiring certificates of need, to meet future demand	5.2.1.8	No
A(5)	Effect of proposed facility in making efficient use of resources	4.2, 5.3.1.8	No
7849.0120	**Criteria – A more reasonable and prudent alternative has not been demonstrated**	4.2	--
B(1)	Appropriateness of size, type, and timing	4.2.1, 5.2	No
B(2)	Cost of facility and its energy compared to costs of reasonable alternatives	4.2.2, 5.2.2, 5.3.1	No
B(3)	Effects of the facility upon natural and socioeconomic environments compared to the effects of reasonable alternatives	4.3	No
B(4)	Expected reliability compared to reasonable alternatives	4.2, 5.2, 5.3.1	No
7849.0120	**Criteria – Facility will provide benefits to society**	3.2	--
C(1)	Relationship of proposed facility to overall state energy needs	3.1, 4.1, 4.3	No
C(2)	Effects of facility upon the natural and socioeconomic environments compared to the effects of not building the facility	4.3	No
C(3)	Effects of facility in inducing future development	4.3, 3.2.3	No
C(4)	Socially beneficial uses of the output of the facility, including to protect or enhance environmental quality	4.3, 3.2.1	No
D	Facility or suitable modification will not fail to comply with relevant policies, rules, and regulations of other state and federal agencies and local governments	4.4, 12.0	No
7849.0210	**Filing Fees and Payment Schedule**	2.4	No
7849.0240	**Need Summary and Additional Considerations**	3.0	--
Subp. 1	Need Summary – summary of major factors justifying need for facility	3.0, 3.1	No
Subp. 2(A)	Additional Considerations – Socially beneficial uses of the output of the facility, including to protect or enhance environmental quality	3.2.1, 4.3	No
Subp. 2(B)	Additional Considerations – Promotional activities that may have given rise to the demand for the facility	3.2.2	Yes
Subp. 2(C)	Additional Considerations – Effects of the facility in inducing future development	3.2.3, 4.3	No
7849.0250	**Proposed LEGF and Alternatives Application**	5.0	--
A(1)	Description – Nominal generating capability and effects of	5.1.1.1	No

Minnesota Rule	Required Information	Application Section(s)	Exemption Requested
	economies of scale on facility size and timing		
A(2)	Description – Anticipated operating cycle, including annual capacity factor	5.1.1.2	No
A(3)	Description – Type of fuel, reason for selection, projection of availability over life of facility, and alternative fuels	5.1.1.3	No
A(4)	Description – Anticipated heat rate	5.1.1.4	No
A(5)	Description – Anticipated areas where facility will be located	5.1.1.5	No
B(1)	Discussion of Alternatives – Purchased power	5.2.1.1	Yes
B(2)	Discussion of Alternatives – Increased efficiency of existing facilities	5.2.1.2	Yes
B(3)	Discussion of Alternatives – New transmission lines	5.2.1.3	Yes
B(4)	Discussion of Alternatives – New generating facilities of a different size and energy resource	5.2.1	Yes
B(5)	Discussion of Alternatives – Reasonable combination of alternatives	5.2.1.11	No
C	Proposed Facility and Alternatives	5.3	Yes
C(1)	Capacity cost in current dollars per kilowatt	5.3. 1.1	Yes
C(2)	Service life	5.3. 1.2	Yes
C(3)	Estimated average annual availability	5.3. 1.3	Yes
C(4)	Fuel costs in current dollars per kilowatt hour	5.3. 1.4	Yes
C(5)	Variable operating and maintenance costs in current dollars per kilowatt hour	5.3. 1.5	Yes
C(6)	Total cost in current dollars of a kilowatt hour provided by it	5.3. 1.6	Yes
C(7)	Estimate of its effect on rates system-wide and in Minnesota	5.3. 1.7	Yes
C(8)	Efficiency, expressed for a generating facility as the estimated heat rate	5.3. 1.8	Yes
C(9)	Majoring assumptions made in providing information in subitems (1) to (8), including projected escalation rates for fuel costs and operating and maintenance costs, as well as projected capacity factors	5.3	Yes
D	System Map	5.4	Yes
E	Other relevant information about the facility and alternatives that may be relevant to a determination of need	--	--
7849.0260	**Proposed LHVTL and Alternatives Application**	5.0	--
A(1)	Description – Design Voltage	5.1.2.1	No
A(2)	Description – Number, the sizes, and the types of conductors	5.1.2.2	No
A(3)	Description – expected losses under projected maximum loading and under projected average loading in the length of the transmission line and at terminals and substations	5.1.2.3	Yes
A(4)	Description – approximately length of the proposed transmission line and the portion of that length in Minnesota	5.1.2.4	No
A(5)	Description – approximate location of AC substations, which information shall be on a map of the appropriate	5.1.2.5	No

Minnesota Rule	Required Information	Application Section(s)	Exemption Requested
	scale		
A(6)	Description – list of all counties reasonably likely to be affected by construction and operation of the proposed line	5.1.2.6	No
B(1)	Discussion of Alternatives – New generation of various technologies, sizes, and fuel types	5.3.1.9	Yes
B(2)	Discussion of Alternatives – Upgrading of existing transmission lines or existing generating facilities	5.3.1.10	No
B(3)	Discussion of Alternatives – Transmission line with different design voltages or with different numbers, sizes, and types of conductors	5.3.1.11	No
B(4)	Discussion of Alternatives – Transmission lines with different terminals or substations	5.3.1.12	No
B(5)	Discussion of Alternatives – Double circuiting of existing transmission lines	5.3.1.13	No
B(6)	Discussion of Alternatives – DC transmission line	5.3.1.14	No
B(7)	Discussion of Alternatives – Underground transmission line	5.3.1.15	No
B(8)	Discussion of Alternatives – any reasonable combinations of the alternatives list in subitems (1) to (7)	5.3.1.16	No
C(1)	Discussion of Project and Alternatives – total cost in current dollars	5.3.1.17	No
C(2)	Discussion of Project and Alternatives – service life	5.3.1.18	No
C(3)	Discussion of Project and Alternatives – estimated average annual availability	5.3.1.19	No
C(4)	Discussion of Project and Alternatives – estimated annual operating and maintenance costs in current dollars	5.3.1.20	No
C(5)	Discussion of Project and Alternatives – estimate of its effect on rates systemwide and in Minnesota, assuming a test year beginning with the proposed in-service date	5.3.1.2113	Yes
C(6)	Discussion of Project and Alternatives – efficiency, expressed for a transmission facility as the estimated losses under projected maximum loading in the length of the transmission line and at the terminals or substations, or expressed for a generating facility as the estimated heat rate.	5.3.1.22	Yes
C(7)	Discussion of Project and Alternatives – major assumptions	5.3.1.23	No
D	System Map	5.4	Yes
E	Other relevant information about the facility and alternatives that may be relevant to a determination of need.	--	--
7849.0270	**Peak Demand and Annual Consumption Forecast**	6.0	Yes
Subp. 1	Scope – Application shall contain pertinent data concerning peak demand and annual electrical consumption within the applicant's service area and system	6.0	Yes
Subp. 2	Content of Forecast	6.0	Yes
Subp. 3	Forecast Methodology	6.0	Yes
Subp. 4	Data Base for Forecasts	6.0	Yes
Subp. 5	Assumptions and Special Information	6.0	Yes

Minnesota Rule	Required Information	Application Section(s)	Exemption Requested
Subp. 6	Coordination of Forecasts with Other Systems	6.0	Yes
7849.0280	**System Capacity**	7.0	Yes
7849.0290	**Conservation Programs**	8.0	Yes
7849.0300	**Consequences of Delay**	9.0	Yes
7849.0310	**Environmental Information – Provide environmental data in response to part 7849.0250, Item C, or 7849.0260, Item C, and information as requested in part 7849.0320 to 7849.0340**	10.0	No
7849.0320	**Generating Facilities**	11.0	No
A	Estimated range of land requirements, including water storage, cooling systems, and solid waste storage	11.1	No
B	Estimated amount of vehicular, rail, and barge traffic generated by construction and operation of facility	11.2	No
C	Fossil-fuel facilities – Fuel	11.3.1	No
D	Fossil-fuel facilities – Emissions	11.3.2	No
E	Water Use for Alternate Cooling Systems	11.4	No
F	Sources and types of discharges to water	11.5	No
G	Radioactive releases	11.6	No
H	Types and quantities of solid wastes in tons/year	11.7	No
I	Sources and types of audible noise attributable to facility operation	11.8	No
J	Estimated work force required for facility construction and operation	11.9	No
K	Minimum number and size of transmission facilities required to provide a reliable outlet for the generating facility	11.10	No
7849.0330	**Transmission Facilities**	5.2.1.10	Yes
7849.0340	**No-Facility Alternative**	5.2.1.9	Yes

1.0 EXECUTIVE SUMMARY

Plum Creek Wind Farm, LLC (Plum Creek or Applicant) submits this application for a Certificate of Need (CN) to the Minnesota Public Utilities Commission (Commission) pursuant to and in accordance with Minn. Stat. § 216B.243, and Minn. R. Ch. 7849. Plum Creek respectfully requests that the Commission issue a CN for the up to 414 megawatt (MW) large wind energy conversion system (the Wind Farm) and related 345 kilovolt (kV) transmission line (Transmission Line) (collectively the Wind Farm and Transmission Line are referred to as the Project). The Project is a "large energy facility" as defined in Minn. Stat. § 216B.2421, subd. 2(1).[1]

[1] Minnesota Statute Section 216B.2421, subdivision 2(1) defines a "large energy facility" as any electric power generating plant or combination of plants at a single site with a combined capacity of 50,000 kilowatts or more and transmission lines directly associated with the plant that are necessary to interconnect the plant to the transmission system. The Project is also a Large Wind Energy Conversion System (LWECS), as defined in Minn. Stat. § 216F.01, subd. 2.

2.0 INTRODUCTION

2.1 THE PLUM CREEK WIND FARM PROJECT

Plum Creek is an independent power producer (IPP) that proposes to construct and operate the Project. The power generated by the Project will be offered for sale to wholesale customers, including Minnesota utilities and cooperatives, and commercial and industrial customers that have identified a need for additional renewable energy or set clean energy goals.

The Project will be located in Cottonwood, Murray, and Redwood Counties. The Wind Farm footprint spans approximately 73,000 acres in portions of Germantown, Highwater, Ann, and Westbrook Townships in Cottonwood County; Holly, Murray, Dovray, and Des Moines River Townships in Murray County; and North Hero and Lamberton Townships in Redwood County (the Project Area). *See* Figure 1. Plum Creek has not made a final selection of wind turbine generators, but is proposing to utilize between 74 and 110 turbines, ranging from 2.8 to 5.6 MW in size. In addition to the wind turbines, the Project will consist of an electrical collection system, access roads, permanent meteorological towers, substation and interconnection facilities, an operation and maintenance facility, and other infrastructure typical of a wind farm.

The Project will also include a Transmission Line that is needed to interconnect the Wind Farm to the transmission grid. The Transmission Line will consist of approximately 31 miles of 345 kV transmission line located within Cottonwood and Redwood Counties, Minnesota. *See* Figure 4. The Transmission Line will interconnect at the existing Brookings to Hampton 345 kV transmission line, one of the lines designated by the Midcontinent Independent System Operator, Inc. (MISO) as a Multi-Value Project (MVP). Plum Creek plans to construct the Project on a schedule that facilitates an in-service date in 2022.

2.2 PROJECT OWNERSHIP

Plum Creek's parent, Geronimo Energy, LLC, a National Grid Company (Geronimo), is a utility-scale renewable energy developer headquartered in Edina, Minnesota, with satellite offices located in Minnesota, North Dakota, South Dakota, Illinois, Michigan, New York, and Colorado. Geronimo Energy has developed several operating wind farms and solar projects throughout the United States and currently has developed more than 2,500 MW of renewable energy projects that are under construction or operational. In Minnesota, Geronimo has developed more than 850 MW of renewable energy, including seven wind farms and 200 MW of solar energy. For example, Geronimo developed the Prairie Rose, Odell, Blazing Star, and Blazing Star 2 Wind Farms, which are in the same region as the Project. Prairie Rose is a 200 MW wind farm constructed in Rock and Pipestone Counties; Odell is a 200 MW wind farm constructed in Cottonwood, Jackson, Martin, and Watonwan counties; Blazing Star is a 200 MW wind farm currently under construction in Lincoln County; and Blazing Star 2 is a 200 MW wind farm in Lincoln County that will be under construction soon. Each project is expected to result in approximately $1.1 million in landowner payments, $40,000 in a community fund, and approximately $850,000 in tax revenue per year. Geronimo and its subsidiaries partner with community members to meet common goals while constructing new wind energy generation sources that benefit the state and the region.

2.3 PROJECT CONTACTS

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2.4 FILING FEES AND PAYMENT SCHEDULE (MINN. R. 7849.0210)

The total fee for the CN Application and the schedule for payment are shown in Table 1. The fee determination for the Project is based on a capacity of up to 414 MW, per the requirements of Minn. R. 7849.0210, subp. 1. The payment schedule is based on Minn. R. 7849.0210, subp. 2.

Table 1: Certificate of Need Application Schedule of Payments

Fee Calculation	Amount
Fee Calculation Equation	$10,000 + $50/MW
Due with CN Application	$7,675
Due 45 days after Application submittal date	$7,675
Due 90 days after Application submittal date	$7,675
Due 135 days after Application submittal date	$7,675
Total Calculated Fee	$30,700

2.5 EXEMPTION REQUEST

Minn. R. Ch. 7849 sets forth the data an applicant must provide in a CN application. An applicant may be exempted from providing certain information if the applicant requests an exemption in writing that shows that the data requirement is either unnecessary to determine the need for the proposed facility or may be satisfied by submitting another document. Minn. R. 7849.0200, subp. 6.

On November 9, 2018, Plum Creek submitted a Request for Exemption from Certain Certificate of Need Application Content Requirements (Exemption Request). In its Exemption Request, Plum Creek requested that the Commission grant its exemptions, pursuant to Minn. R. 7849.0200, subp. 6, from certain CN data requirements that are not necessary to determine the need for an independent power production facility or a renewable energy facility designed to satisfy the Renewable Energy Standard (RES) requirements set forth in Minn. Stat. § 216B.1691, or other clean energy standards.

On January 17, 2019, the Commission granted Plum Creek's Exemption Request.[2] Where appropriate in this Application, Plum Creek references the specific exemptions granted by the Commission.

[2] Order, *In the Matter of the Application of Plum Creek Wind Farm, LLC for a Certificate of Need for an up to 414 MW Large Wind Energy Conversion System and 345 kV Transmission Line in Cottonwood, Murray, and Redwood Counties, Minnesota*, Docket No. IP-6997/CN-18-699 (Jan. 17, 2019), eDockets Doc. ID 20191-149302-01.

3.0 NEED SUMMARY AND ADDITIONAL CONSIDERATIONS (MINN. R. 7849.0240)

3.1 NEED SUMMARY

The Project is needed to meet the growing demand for additional renewable resources needed to meet energy sector needs, consumer demand, and renewable and other clean energy requirements in Minnesota and neighboring states.

A review of utilities' integrated resource plans (IRPs), requests for proposals, and similar documents demonstrates that utilities will seek additional renewable generation resources in the next several years.[3] For example, Xcel Energy announced plans to reduce carbon emissions by 80 percent company-wide by 2030, and to provide 100 percent carbon-free electricity across its service territory by 2050.[4] To reach this goal, Xcel Energy plans to eliminate all coal generation on its system by 2030 and to add 4,000 MW of renewable energy.[5] Xcel Energy also plans to add approximately 1,200 MW of cumulative wind by 2034 to replace wind that is set to retire.[6] More broadly, retirements of coal-based generating units are expected across the MISO region, and renewable generation resources are expected to fill the resulting capacity needs.[7]

Wind is now economically competitive with energy generation from coal and gas sources,[8] and consumer preference for wind energy is also creating additional market demand.[9] This has resulted in a significant increase in corporate and industrial demand for wind energy and other renewable energy. In a 2015 survey of 150 commercial customers with revenues greater than $250 million, 84 percent indicated that they planned to actively pursue or consider

[3] Xcel Energy, Upper Midwest Resource Plan 2020-2034, at 5, 2020-2034 Upper Midwest Integrated Resource Plan Docket No. E002 /RP-19-368. *See also* Minnesota Power, 2015 Integrated Resource Plan (available at http://www.mnpower.com/Content/documents/Environment/2015-ResourcePlan.pdf) (approved by the Minnesota Public Utilities Commission on June 10, 2015); Otter Tail Power Company, Application for Resource Plan Approval 2017-2031 (available at https://www.otpco.com/media/838904/resource-plan.pdf).

[4] Xcel Energy, Upper Midwest Resource Plan 2020-2034, at 5.

[5] Xcel Energy, Upper Midwest Resource Plan 2020-2034, at 5.

[6] Xcel Energy, Upper Midwest Resource Plan 2020-2034, at 5.

[7] U.S. Energy Information Administration, *Annual Energy Outlook 2017*, at 22 (available at https://www.eia.gov/outlooks/aeo/pdf/0383(2017).pdf); NRDC Issue Paper, *Clean Energy and Efficiency Can Replace Coal For a Reliable, Modern Electricity Grid* (Mar. 2017) (available at https://www.nrdc.org/sites/default/files/clean-energy-replace-coal-modern-electricity-grid-ip.pdf).

[8] Coley Girouard, *The Numbers Are In and Renewables Are Winning On Price Alone*, Advanced Energy Perspectives (Dec. 5, 2018) (available at https://blog.aee.net/the-numbers-are-in-and-renewables-are-winning-on-price-alone); Dominic Dudley, *Renewable Energy Costs Take Another Tumble, Making Fossil Fuels More Expensive Than Ever*, Forbes.Com (May 29, 2019) (available at https://www.forbes.com/sites/dominicdudley/2019/05/29/renewable-energy-costs-tumble/#38ff0978e8ce).

[9] The Pew Research Center reports that 85 percent of Americans want to see an increase in the use of wind turbine farms as an energy source. Pew Research Center, *Majorities See Efforts to Protect the Environment as Insufficient* (May 14, 2018) (available at https://www.pewresearch.org/science/2018/05/14/majorities-see-government-efforts-to-protect-the-environment-as-insufficient/).

directly buying renewable energy.[10] More recent purchasing numbers bear out that prediction. According to a 2019 research report, corporate contracts accounted for 22 percent of 2018 power purchase agreements (PPAs) for renewables in the United States.[11] It has been estimated that in 2018 non-utility customers purchased more than 4,000 MWs of wind power capacity through long-term PPAs.[12] This more than doubled the number of contracts in the prior year for wind capacity from non-utility customers, with new buyers accounting for 45 percent of non-utility wind deals signed in 2018.[13] Further, the buyers are not just large corporations; smaller companies are entering into aggregated purchasing models and further driving additional market expansion.[14]

States around the region also have renewable energy standards that must be met. Eleven of the MISO states, including Minnesota, currently have either mandated or voluntary renewable portfolio standards or policies.[15] Pursuant to Minn. Stat. § 216B.1691, utilities in Minnesota are required to provide 25 percent of their total retail electric sales from eligible renewable resources by 2025. As shown on Table 2, the Legislature also established interim milestones to ensure that utilities make progress towards the "25 by '25" requirement.

Table 2: 25 by '25 Interim Milestones

Year	Non-Nuclear Utility Requirement	Xcel Energy Requirement
2016	17%	25%
2020	20%	30% (25% from wind)
2025	25%	30% (25% from wind)

On October 31, 2019, the Minnesota Transmission Owners jointly filed the 2019 Biennial Transmission Projects Report (the Biennial Report), which outlines the transmission upgrades

[10] John Powers, *The Rise of the Corporate Energy Buyer*, Renewable Choice Energy (available at https://infocastinc.com/market-insights/wind/the-rise-of-the-corporate-energy-buyer/).

[11] Emma Foehringer Merchant, *Corporate Renewables Procurement Accounted for Nearly a Quarter of All Deals in 2018* (Feb. 5, 2019) (available at https://www.greentechmedia.com/articles/read/corporate-renewables-procurements-quarter-ppa-2018).

[12] American Wind Energy Association, *Consumer demand drives record year for wind energy purchases* (Jan. 30, 2019) (available at https://www.awea.org/resources/news/2019/consumer-demand-drives-record-year-for-wind-energy).

[13] *Id.*; Emma Foehringer Merchant, *2018 Was Record Year for Corporate Clean Energy Contracts* (Jan. 31, 2019) (available at https://www.greentechmedia.com/articles/read/reports-confirm-a-record-year-for-corporate-clean-energy-contracts#gs.nxat51). *See also* Business Renewables Center, Corporate Renewable Deals 2014-2018 (available at https://businessrenewables.org/corporate-transactions/#wpcf7-f942-p471-o1).

[14] Emma Foehringer Merchant, *2018 Was Record Year for Corporate Clean Energy Contracts* (Jan. 31, 2019) (available at https://www.greentechmedia.com/articles/read/reports-confirm-a-record-year-for-corporate-clean-energy-contracts#gs.nxat51).

[15] *MTEP18 MISO Transmission Enhancement Plan*, at 182 (available at https://cdn.misoenergy.org/MTEP18%20Full%20Report264900.pdf (last visited Oct. 2, 2019)).

needed to support development of renewable energy resources needed to meet RES requirements. The Biennial Report indicated that "the Minnesota RES utilities have sufficient capacity acquired to meet the Minnesota [renewable energy standards] through 2030."[16] However, the Minnesota legislature has considered, but has not yet passed, legislation on multiple occasions in recent legislative sessions to increase Minnesota's renewable energy requirements requiring utilities to obtain additional electricity from renewable sources beyond that which is required by current RES, and to further reduce carbon from energy sources.[17] Accordingly, utilities will likely be preparing for requirements to reduce carbon from energy sources and an increase to the RES by seeking additional renewable energy sources above and beyond that which is currently required by the RES.

Likewise, Illinois requires certain utilities to obtain 25 percent of eligible sales from renewables by 2025.[18] Similarly, North Dakota has adopted the national "25 by '25" initiative, which establishes a goal of having not less than 25 percent of total energy consumed within the United States come from renewable resources by January 1, 2025.[19] Under current state standards, total United States renewable portfolio standard demand will increase from 290 terawatt hours (TWh) in 2018 to 540 TWh in 2030.[20] Given existing renewable energy capacity, an additional 180 TWh increase in renewable resources will be required to meet demand through 2030.[21]

Given the demand for renewable energy, a market exists for independently produced electricity generated from wind and other renewables, including the up to 414 MW Wind Farm to be generated by the Project.

3.2 ADDITIONAL CONSIDERATIONS

3.2.1 Socially Beneficial Uses of Energy Output

Energy produced by the Project will provide significant, numerous, and varied societal benefits. First, the Project will provide a large amount of renewable energy with minimal

[16] 2019 Biennial Transmission Projects Report at 157 (Oct. 31, 2019), MPUC Docket No. 19-205 at Document ID 201910-157051-01.

[17] *See, e.g.*, Hughlett, Mike, *Legislation Would Boost Standard for Renewable Energy*, Star Tribune (Feb. 27, 2017) (indicating that legislature considered H.F. No. 1772, a bill to increase RES to 50%) (available at http://www.startribune.com/legislation-would-boost-standard-for-renewable-energy/414886624/); Clean Grid Alliance, *Renewable Energy Developers Stand Ready to Help Minnesota Achieve New Clean Energy Milestones* (Feb. 5, 2019) (legislation introduced as H.F. No. 1671 proposed to increase RES to 85% by 2035 and establish a carbon-free standard by 2050) (available *at* https://cleangridalliance.org/press/48/renewable-energy-developers-stand-ready-to-help-minnesota-achieve-new-clean-energy-milestones). *See also* Clean Energy Act, H.F. No. 1956, introduced on Mar. 4, 2019.

[18] 20 Ill. Comp. Stat. sec. 3855/1-75(c)(1).

[19] *See* North Dakota Century Code. section 17-01-01; *see also* S.D.L.C 49-34A-101.

[20] Lawrence Berkeley Nat'l Lab., *U.S. Renewable Portfolio Standards 2018 Annual Status Report* (Nov. 2018), at 20 (available at http://eta-publications.lbl.gov/sites/default/files/2018_annual_rps_summary_report.pdf (last visited Oct. 2, 2019)).

[21] *Id.* at 21.

environmental impact. Further, regional and national security and energy reliability can be enhanced through the development of diversified generation resources such as wind.

The Project will also provide a supplementary source of income for the rural landowners and farmers on whose land the Project will be sited. The landowners in the Project footprint who host turbines will receive annual lease payments for each turbine sited on their property. With the range of current turbine nameplate capacity sizes, large-scale wind energy operations usually pay between $7,000 and $20,000 per turbine each year, in addition to any wind rights payments. Since only a portion of the land will be used for the Project, farming operations can continue largely undisturbed. Specifically, although the Project will be sited over an area spanning approximately 73,000 acres, less than one half of one percent of those acres will be removed from agricultural use over the life of the Project.

3.2.2 Promotional Activities Giving Rise to Demand

Plum Creek was granted an exemption from Minn. R. 7849.0240, subp. 2(B), which requires that each large electric generating facility (LEGF) CN application contain "an explanation of the relationship of the proposed facility to . . . promotional activities that may have given rise to the demand for the facility." Plum Creek has not engaged in promotional activities which could have given rise to the need for the electricity to be generated by the Project. Thus, such information is non-existent and, consistent with its determinations in past CN proceedings, the Commission granted an exemption to Plum Creek.

3.2.3 Effects of Facility in Inducing Future Development

The Project is not expected to directly affect development in Cottonwood, Murray, and Redwood Counties. However, additional wind energy infrastructure in the Project Area may nonetheless provide significant benefits to the local economy and local landowners. Landowners in the Project Area will benefit from annual lease payments. Additional wind energy infrastructure will also provide an additional source of revenue to the counties and townships in which the Project is sited. For instance, the Project is estimated to provide annual production tax revenues ranging from approximately $1,750,000 to $2 million. Plum Creek is committed to creating an independently run community fund and providing that fund with $80,000 annually. The fund will be administered by a local board independent from Plum Creek that will determine how to use the funds.

Approximately 250 personnel will be required for construction, and 11 to 15 permanent personnel will be needed for operation and maintenance of the Project. Plum Creek will use local contractors and suppliers for portions of the construction, as available. Total wages and salaries paid to contractors and workers in Cottonwood, Murray, and Redwood Counties will contribute to the total personal income of the region. Additional personal income will be generated for residents in the county and state by circulation and recirculation of dollars paid out by the Applicant for business expenditures and for state and local taxes. Expenditures made for equipment, fuel, operating supplies, and other products and services benefit businesses in the counties and the state. The Project has already created consulting, management, and environmental work.

At the same time the Project is providing income to local residents, it will also help contribute to making the energy those residents rely upon less susceptible to price volatility.[22] The development of wind energy technology now makes wind power's relative price competitive with new natural gas and coal generation.[23] The development of wind energy in Minnesota reduces dependence on turbulent fossil fuel markets and helps keep energy dollars in Minnesota.[24]

[22] U.S. Dept. of Energy, *Wind Vision: a New Era for Wind Power in the United States*, at xviii (March 2015) ("Increased wind power adds fuel diversity, making the overall electric sector 20% less sensitive to changes in fossil fuel costs.") available at: https://www.energy.gov/sites/prod/files/2015/03/f20/wv_executive_summary_overview_and_key_chapter_findings.pdf. U.S. Dept. of Energy, *2013 Wind Technologies Market Report*, at 62 (Aug. 2014) (stating that wind power can provide a "hedge against rising and/or uncertain natural gas prices") (available at https://www.energy.gov/eere/wind/downloads/2013-wind-technologies-market-report).

[23] Coley Girouard, *The Numbers Are In and Renewables Are Winning On Price Alone*, Advanced Energy Perspectives (December 5, 2018) (available at https://blog.aee.net/the-numbers-are-in-and-renewables-are-winning-on-price-alone); Dominic Dudley, *Renewable Energy Costs Take Another Tumble, Making Fossil Fuels More Expensive Than Ever*, Forbes.Com (May 29, 2019) (available at https://www.forbes.com/sites/dominicdudley/2019/05/29/renewable-energy-costs-tumble/#38ff0978e8ce). *See also* U.S. Dept. of Energy, *Wind Vision: a New Era for Wind Power in the United States*, at 21 (March 2015) ("[R]ecent wind PPA prices are quite competitive with natural gas fuel cost projections."); U.S. Energy Information Administration, *Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2015*, at Table 1 (June 2015).

[24] *See* U.S. Dept. of Energy, *Wind Vision: a New Era for Wind Power in the United States*, at xviii (March 2015) (noting benefits of decreased greenhouse gas emissions and air pollution arising from increased wind power) available at: https://www.energy.gov/sites/prod/files/2015/03/f20/wv_executive_summary_overview_and_key_chapter_findings.pdf.

4.0 COMPLIANCE WITH CERTIFICATE OF NEED CRITERIA (MINN. R. 7849.0120)

The Commission has established criteria to assess the need for an LEGF in Minn. R. 7849.0120. The Commission must grant a CN to an applicant upon determining that:

> A. [T]he probable result of denial would be an adverse effect upon the future adequacy, reliability, or efficiency of energy supply to the applicant, to the applicant's customers, or to the people of Minnesota and neighboring states;
>
> B. [A] more reasonable and prudent alternative to the proposed facility has not been demonstrated by a preponderance of the evidence on the record;
>
> C. [B]y a preponderance of the evidence on the record, the proposed facility, or a suitable modification of the facility, will provide benefits to society in a manner compatible with protecting the natural and socioeconomic environments, including human health; and
>
> D. [T]he record does not demonstrate that the design, construction, or operation of the proposed facility, or a suitable modification of the facility, will fail to comply with relevant policies, rules, and regulations of other state and federal agencies and local governments.

As discussed further below, the Project satisfies all four of the Commission's criteria for granting a CN for the Project.

4.1 THE PROBABLE RESULT OF DENIAL OF PLUM CREEK'S APPLICATION WOULD BE AN ADVERSE EFFECT ON THE ADEQUACY, RELIABILITY, AND EFFICIENCY OF THE REGIONAL ENERGY SUPPLY (MINN. R. 7849.0120(A))

The Project will provide up to 414 MW of nameplate capacity to meet the electricity needs of Minnesota and the region. Plum Creek plans to negotiate one or more PPAs with utilities and non-utility customers with a need to purchase additional renewable energy or, if necessary, to offer the Project's output for sale on the wholesale market. Denying the application would result in the loss of hundreds of MWs of electricity needed to satisfy state and regional demand and would deny utilities and other customers the opportunity to purchase clean, low-cost energy that will count toward satisfying renewable and/or other clean energy standards and goals.

As discussed in Section 3.1, there is a significant body of state legislative policy requiring utilities to obtain a certain percentage of their total energy resources from renewable energy,

which supports the need for reliable, efficient renewable resources, like the wind energy produced by the Project.[25]

While coal generation made up 73 percent of total generation in the MISO region in 2009, due to retirements, coal facilities are expected to supply only 36 percent of MISO demand by 2030.[26] Aging and retirement of energy generation units impacts regional energy operations, resulting in less available capacity than the past, which reduces both redundancy and overall energy offers to the MISO system.[27] This increases the risk of the energy system encountering issues in meeting real-time energy needs.[28] Due to its efficiency and low operating cost, renewable energy is expected to play a significant role in filling those energy needs.[29] If the Project is not constructed, it will not be available to help meet real-time energy needs.

4.2 NO MORE REASONABLE AND PRUDENT ALTERNATIVE TO THE PLUM CREEK WIND PROJECT HAS BEEN DEMONSTRATED (MINN. R. 7849.0120(B))

Minn. R. 7849.0120(B) requires a CN applicant to examine possible project alternatives so that the Commission can determine whether a more reasonable and prudent alternative exists. Applying the factors set forth in Minn. R. 7849.0120(B), the Project has many advantages when compared to other renewable alternatives. The 345 kV transmission line also is the most appropriate voltage to connect the Wind Farm to the electrical system while minimizing losses and providing capacity for future generation.

4.2.1 Size, Type, and Timing

When evaluating alternatives, the Commission examines whether the project is the appropriate size, whether it is the right type, and whether the timing is appropriate. With respect to other proposed wind projects, the Commission has concluded that the proper inquiry in

[25] *See, e.g.*, 20 Ill. Comp. Stat. sec. 3855/1-75(c)(1); N.D. Cent. Code. § 17-01-01; *see also* S.D.L.C 49-34A-101.

[26] NRDC Issue Paper, *Clean Energy and Efficiency Can Replace Coal for a Reliable, Modern Electricity Grid* (Mar. 2017) (available at https://www.nrdc.org/sites/default/files/clean-energy-replace-coal-modern-electricity-grid-ip.pdf). *See also* Xcel Energy, Upper Midwest Resource Plan 2020-2034, at 5, 2020-2034 Upper Midwest Integrated Resource Plan Docket No. E002 /RP-19-368 (planning for Minnesota-based retirements).

[27] MISO, *Resource Availability and Need Issues Statement Whitepaper* (Mar. 30, 2018) at 2, 5-6 (available at https://cdn.misoenergy.org/20180405%20RSC%20Item%2007%20RAN%20Issues%20Statement%20White%20Paper164746.pdf).

[28] MISO, *Resource Availability and Need Issues Statement Whitepaper* (Mar. 30, 2018) at 2, 5-6 (available at https://cdn.misoenergy.org/20180405%20RSC%20Item%2007%20RAN%20Issues%20Statement%20White%20Paper164746.pdf).

[29] U.S. Energy Information Administration, *Annual Energy Outlook 2017*, at 22 (available at https://www.eia.gov/outlooks/aeo/pdf/0383(2017).pdf); NRDC Issue Paper, *Clean Energy and Efficiency Can Replace Coal for a Reliable, Modern Electricity Grid* (Mar. 2017) (available at https://www.nrdc.org/sites/default/files/clean-energy-replace-coal-modern-electricity-grid-ip.pdf). *See also* Coley Girouard, *The Numbers Are In and Renewables Are Winning On Price Alone*, Advanced Energy Perspectives (Dec. 5, 2018) (available at https://blog.aee.net/the-numbers-are-in-and-renewables-are-winning-on-price-alone); Dominic Dudley, *Renewable Energy Costs Take Another Tumble, Making Fossil Fuels More Expensive Than Ever*, Forbes.Com (May 29, 2019) (available at https://www.forbes.com/sites/dominicdudley/2019/05/29/renewable-energy-costs-tumble/#38ff0978e8ce).

evaluating the size of the project is the appropriateness of the size of the project to the overall state and regional need for renewable energy. As demonstrated in Section 3.1, the regional need for renewable energy in the coming years far exceeds the amount of energy to be supplied by the Project. The 345 kV voltage transmission line is the appropriate size to efficiently deliver the energy from the Wind Farm and to provide capacity for future generation.

Regarding the type of facility, the Commission granted Plum Creek an exemption from Minn. R. 7849.0250(B) with respect to evaluating fossil fuel alternatives because such alternatives do not meet the Project's objective of providing energy that will satisfy the RES and other clean energy standards.

With respect to timing, the Project is expected to be on-line and operational by the end of 2022, depending on completion of regulatory approvals, securing a power purchaser, and the MISO interconnection process. Increasing the availability of low-cost renewable resources in this timeframe will help facilitate the replacement of retiring generators and further transition the generation fleet to cleaner, renewable energy resources.

4.2.2 Cost Analysis

The Project will generate electricity at a lower cost per kilowatt hour than would other possible renewable energy options, such as solar and biomass.[30] In addition, although Plum Creek has not yet secured PPAs for the sale of the energy to be produced by the Project, it is confident that it will be able to secure long-term purchasers at attractive prices and terms. Importantly, as an IPP, the risk of not securing PPAs or otherwise not selling the Project's output lies entirely with Plum Creek, and not with the State of Minnesota or ratepayers.

4.2.3 Potential Environmental and Socioeconomic Impacts

The purpose of this analysis is to compare the potential impacts of various renewable generation options. The Commission and the Department have previously concluded that the environmental impacts of a wind power project are minimal and significantly less than a fossil-fuel based facility. At the same time, the socioeconomic benefits of a utility-scale wind power project are considerable, as described in Section 4.3 below. For example, the Project will allow landowners to continue to use over 99 percent of the existing cropland for agricultural and other uses.

4.2.4 Reliability

The Project will be available at least 97 percent of the time, consistent with other utility-scale wind projects.

[30] *See* 2018 Lazard Levelized Cost of Energy (available at https://www.lazard.com/media/450784/lazards-levelized-cost-of-energy-version-120-vfinal.pdf) (accessed October 16, 2019) and Energy Information Agency, *Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2015* (predicting that in 2020, the cost per megawatt hour of wind energy would be lower than that of other renewable energy options) (available at https://www.eia.gov/forecasts/aeo/electricity_generation.cfm).

4.3 THE PLUM CREEK WIND PROJECT WILL BENEFIT SOCIETY IN A MANNER COMPATIBLE WITH THE NATURAL AND SOCIOECONOMIC ENVIRONMENTS (MINN. R. 7849.0120(C))

Minn. R. 7849.0120(C) requires a CN applicant to address whether the proposed project will benefit society in a manner that is compatible with protecting natural and socioeconomic environments, including human health. Applying the factors set forth in Minn. R. 7849.0120(C), the energy produced by the Project will provide significant, numerous, and varied societal benefits, with minimal negative impacts.

4.3.1 Overall State Energy Needs

As discussed in Section 3.1 above, utilities continue to require renewable energy to meet renewable and other clean energy standards and their own stated clean energy goals, in addition to the increasing demands for wind power to meet the needs of corporate and industrial consumers. Thus, the Project is compatible with Minnesota's energy needs.

4.3.2 Potential Environmental and Socioeconomic Impacts Compared to No-Build Alternative

Negative impacts to socioeconomic resources will be relatively minor. Only approximately 80 to 110 acres of agricultural land will be permanently removed from production for the Wind Farm, and the areas surrounding each turbine will still be able to be farmed. Similarly, the areas around each transmission pole can continue to be farmed. Less than one half acre of cultivated cropland will be impacted by transmission line structures. Project construction will not negatively impact leading industries within the Project Area. There is no indication that any minority or low-income population is concentrated in any one area of the Project.

One of the greatest attributes of wind energy is its minimal impact on the environment. The Project will not release carbon dioxide, sulfur dioxide, nitrogen oxides, mercury, or particulate matter. It will not require water for power generation and will not discharge wastewater containing any heat or chemicals during operation. It will produce energy without the extraction, processing, transportation, or combustion of fossil fuels. The Project will permanently impact less than one-quarter of one percent of the total acreage within the Project's boundaries and is designed as to minimize environmental impacts.

The development of wind energy has been and will continue to be important in diversifying and strengthening the economic base of Cottonwood, Murray, and Redwood Counties and in Minnesota. Local contractors and suppliers will be used for portions of construction. Wages and salaries paid to contractors and workers in Cottonwood, Murray, and Redwood Counties will contribute to the total personal income of the region. At least part of the wages paid to construction and operations Project workers will be circulated and recirculated within the county and the state. Expenditures made by the Applicant for equipment, fuel, operating supplies, and other products and services will benefit businesses in the county and the state. Landowners with turbines or other Project facilities on their land will receive annual lease payments for the life of the Project, and these payments will diversify and strengthen the local economy.

Long-term benefits to the counties' tax base as a result of the construction and operation of the Project will contribute to improving the local economy. For example, the Project will pay a wind energy production tax to the local units of government of $0.0012 per kWh of electricity produced, resulting in an annual wind energy production tax ranging from approximately $1,750,000 to $2 million.

Not building an electrical generation facility would result in no physical impact to the environment in Cottonwood, Murray, and Redwood Counties. However, not building the Project would also not provide an additional source of tax revenues to the county, an increase in the income stream to residences and businesses, or an increase in the amount of low-cost, clean, reliable renewable energy available to state or regional utilities and their customers. The Project will have a minimal impact on the physical environment, while simultaneously providing substantial benefits.

4.3.3 Inducing Future Development

Although the Project is not expected to directly affect development in Cottonwood, Murray, and Redwood Counties, the Project will provide significant benefits to the local economy and local landowners. Landowners in the Project Area will benefit from annual lease payments, and installation of wind energy infrastructure will increase the local tax base in the county and townships in which the Project is sited. The Project will also provide income opportunities for local residents through the creation of temporary construction and permanent operations and maintenance (O&M) positions.

4.3.4 Socially Beneficial Uses of Output

The Project will produce affordable, clean, renewable energy that will help meet energy demands and renewable and other clean energy standards. It will produce enough energy to meet the energy needs for over 1,000,000 average Minnesota households annually. In addition, the local economy will benefit from the landowner lease payments for turbine siting, production taxes, income from jobs created, and local spending.

4.4 The Plum Creek Wind Project is Consistent with Federal, State, and Local Rules and Policies (Minn. R. 7849.0120(D))

4.4.1 The Project is Consistent with Minnesota Energy Policy

The Project will provide a significant amount of renewable energy, which is consistent with Minnesota's policy to increase renewable energy use. Wind, as renewable energy, is a favored energy resource under Minnesota law. In addition, as discussed previously, the RES includes the "25 by '25" requirement, which mandates increased electric generation from renewable resources.[31] The state has also set a goal to reduce statewide greenhouse gas emissions across all sectors producing those emissions to a level at least 30 percent below 2005 levels by 2025, and to a level at least 80 percent below 2005 levels by 2050.[32] Adding new

[31] Minn. Stat. § 216B.1691, subd. 2a.

[32] Minn. Stat. § 216H.02.

sources of electric energy with no emissions, like wind energy, is essential to meeting these goals.

Further support for the conclusion that the Project is consistent with state energy policy can be found in the favorable tax treatment that wind energy facilities receive. The state legislature has exempted all real and personal property of wind energy conversion systems from property taxes.[33] Wind energy conversion systems, as well as the materials used to manufacture, install, construct, repair, or replace wind systems, are also exempt from state sales tax.[34]

4.4.2 The Project is Consistent with Applicable Minnesota Statutory Provisions

In addition to the criteria set forth in Minn. R. Ch. 7849, there are multiple statutory provisions that may apply to a CN application. As discussed below, the Project is consistent with these statutory requirements.

4.4.2.1 Renewable Preference

Minn. Stat. § 216B.243, subd. 3a provides a preference for renewable resources:

> The commission may not issue a certificate of need under this section for a large energy facility that generates electric power by means of a nonrenewable energy source, or that transmits electric power generated by means of a nonrenewable energy source, unless the applicant for the certificate has demonstrated to the commission's satisfaction that it has explored the possibility of generating power by means of renewable energy sources and has demonstrated that the alternative selected is less expensive (including environmental costs) than power generated by a renewable energy source. For purposes of this subdivision, 'renewable energy source' includes hydro, wind, solar, and geothermal energy and the use of trees or other vegetation as fuel.

Minn. Stat. § 216B.2422, subd. 4, is also applicable:

> The commission shall not approve a new or refurbished nonrenewable energy facility in an integrated resource plan or a certificate of need, pursuant to section 216B.243, nor shall the commission allow rate recovery pursuant to section 216B.16 for such a nonrenewable energy facility, unless the utility has demonstrated that a renewable energy facility is not in the public interest.

[33] Minn. Stat. § 272.02, subd. 22.

[34] Minn. Stat. § 297A.68, subd. 12.

The Project is consistent with Minnesota's preference for renewable energy and satisfies these statutory criteria by furthering available resources to meet this renewable energy preference.

4.4.2.2 Distributed Generation

Minn. Stat. § 216B.2426 states that:

> The commission shall ensure that opportunities for the installation of distributed generation, as that term is defined in section 216B.169, subdivision 1, paragraph (c), are considered in any proceeding under section 216B.2422, 216B.2425, or 216B.243.

Pursuant to Minn. Stat. § 216B.169, subd. 1(c), "distributed generation" references projects of less than 10 MW. Plum Creek assumes that it will need to compete with distributed generation alternatives if it seeks a PPA from a utility. Additionally, the Project's transmission opportunities and economies of scale make it an exceptional electric resource that will provide great benefits to the state and the local economy.

4.4.2.3 Innovative Energy Preference

Minnesota also requires the Commission to consider an innovative energy project[35] before authorizing construction or expansion of a fossil-fueled generation facility. Minn. Stat. § 216B.1694, subd. 2(a)(5). Because the Project is not a fossil-fuel facility, this requirement is not applicable.

4.4.2.4 RES Compliance

Minn. Stat. § 216B.243, subd. 3(10) requires the Commission to evaluate whether a CN applicant is in compliance with Minnesota's RES. Plum Creek, however, is not subject to the RES because it has no retail sales of electricity in Minnesota. Therefore, this requirement does not apply to the Project. The Project may, however, serve as a resource for utilities that must meet the RES requirements.

4.4.2.5 Environmental Cost Planning

Minn. Stat. § 216B.243, subd. 3(12) requires the Commission to evaluate the extent to which an applicant has considered the risk of environmental costs and regulation. As the Commission and the Department of Commerce, Division of Energy Resources (Department) have determined, this statute does not apply to renewable generation facilities such as the Project.[36]

[35] An "innovative energy project" is defined as a coal-burning facility employing innovative technology and located on the Iron Range. Minn. Stat. § 216B.1694, subd. 1.

[36] *Elm Creek*, Docket No. IP6631/CN-07-789, Commission Order Granting Certificate of Need (Jan. 15, 2008), at 12.

4.4.2.6 Transmission Planning Compliance

Minn. Stat. § 216B.243, subd. 3(10) requires the Commission to consider whether a utility seeking a CN is in compliance with certain transmission planning requirements to meet the RES. As an IPP, this statute does not apply to Plum Creek.

4.4.3 The Project is Consistent with Federal Energy Policy

The Project is consistent with federal policy interests, including in affordable and secure domestic energy production, as well as conservation of environmental resources.[37] According to the U.S. Department of Energy (DOE), affordable and long-term fixed price agreements for wind energy are expected to diminish sector-wide the price volatility currently associated with carbon-based energy sources, such as natural gas and coal.[38] This is anticipated to save consumers $280 billion dollars by 2050 nationwide.[39] In that same time period, DOE predicts that wind energy will provide over 600,000 jobs nationwide and increase local tax revenues by more than $3 billion annually.[40] In addition to the economic benefits, wind energy reduces both air pollution emissions and preserves water resources. DOE predicts that by 2050, wind energy could avoid the emission of 12.3 gigatonnes of greenhouse gases and save 260 billion gallons of water.[41] Thus, wind energy is consistent with stated federal energy policy goals.

4.4.4 The Project Complies with Federal, State, and Local Environmental Regulation.

The Project will meet or exceed the requirements of all applicable federal, state, and local environmental laws and regulations. Tables 8 and 9 in Section 12.4 provides a list of approvals the Project may need to obtain from governmental entities to demonstrate full compliance. Plum

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[37] Congressional Research Service, Energy Policy: 114th Congress Issues (2016), at Summary (available at https://fas.org/sgp/crs/misc/R42756.pdf) ("Energy policy in the United States has focused on three major goals: assuring a secure supply of energy, keeping energy costs low, and protecting the environment").

[38] U.S. Department of Energy, *Wind Vision: A New Era for Wind Power in the United States* (2015), at 139 (available at https://www.energy.gov/sites/prod/files/WindVision_Report_final.pdf).

[39] U.S. Department of Energy, *Wind Vision: A New Era for Wind Power in the United States* (2015), at 139 (available at https://www.energy.gov/sites/prod/files/WindVision_Report_final.pdf).

[40] U.S. Department of Energy, *Wind Vision: A New Era for Wind Power in the United States* (2015), at 139 (available at https://www.energy.gov/sites/prod/files/WindVision_Report_final.pdf). *See also* Trieu Mai, *et al*, *The Value of Wind Technology Innovation: Implications for the U.S. Power System, Wind Industry, Electricity Consumers and Environment*, Nat'l Renewable Energy Laboratory (Sept. 2017) at 30-35 (predicting addition of more than 500,000 by the late 2040s) (available at https://www.nrel.gov/docs/fy17osti/70032.pdf); Lu Nelsen, *U.S. Wind energy generates more than $1 billion in tax revenue payments*, the Laurel Outlook (Jun. 6, 2019) (available at https://www.laureloutlook.com/content/us-wind-energy-generates-more-1-billion-tax-revenue-payments).

[41] U.S. Department of Energy, *Wind Vision: A New Era for Wind Power in the United States* (2015), at 139 (available at https://www.energy.gov/sites/prod/files/WindVision_Report_final.pdf). *See also* Trieu Mai, *et al*, *The Value of Wind Technology Innovation: Implications for the U.S. Power System, Wind Industry, Electricity Consumers and Environment*, Nat'l Renewable Energy Laboratory (Sept. 2017) at 30-35 (predicting avoidance of greenhouse gas emissions and water savings of 16-19% by 2050) (available at https://www.nrel.gov/docs/fy17osti/70032.pdf).

Creek is committed to obtaining all necessary environmental and other approvals required under federal, state, and local law.

5.0 DESCRIPTION OF PROJECT AND ALTERNATIVES (MINN. R. 7849.0250)

5.1 PROPOSED PROJECT

The Project will consist of an array of wind turbines, transformers, a project substation and interconnection facilities, access roads, permanent meteorological towers, one or more sonic range detecting units or light range detecting unit, underground electrical collection lines, aircraft detection lighting system equipment (if approved by the FAA), a 345 kV transmission line (approximately 31 miles long), a switching station, and an O&M building. The turbines will be interconnected by communication and electric power collection cables within the Wind Farm. *See* Figures 3a, 3b, and 3c.

The Project will have up to 414 MW of nameplate wind energy capacity. Plum Creek is currently proposing three wind turbine models with rated nameplate capacity ranging from 2.8 MW to 5.6 MW, corresponding to between 74 and 110 wind turbines. Two of the turbine models would utilize the same turbine layout (Vestas 5.6-V150 and 5.6-V162 turbines) and the GE 2.8-127turbine model would utilize a second turbine layout. Plum Creek notes that the layouts for the two Vestas turbine models are exactly the same (including turbine positions as well as associated facilities such as access roads, collection lines, and crane paths). The GE 2.8-127 layout includes some of the same turbine positions as the Vestas layout but differs due to turbine spacing requirements and this layout having 36 more turbines than the Vestas layout.

Within each of the layouts, Plum Creek selected the proposed turbine locations to minimize the potential land use and environmental impacts from the Project. Plum Creek proposes to construct one of the Project layouts presented in its Site Permit Application but also recognizes that changes to the location of some Project facilities may occur as a result of the Commission's and other permitting processes, further landowner input, and micrositing activities.

Each turbine will be accessible via all-weather gravel roads that are approximately 20-feet wide, depending on the turbine size selected, and will extend from public roads to the turbines. Plum Creek estimates that approximately 20-31 miles of gravel access roads will be constructed, depending on the turbine model selected and the final design. Land will be graded on-site for the turbine pads. Drainage systems, access roads, storage areas, and O&M facilities will be installed as necessary to fully accommodate all aspects of the construction, operation, and maintenance of the Project.

The turbine selected will have Supervisory Control and Data Acquisition communication technology, which permits automatic, independent operation, and remote supervision that allows simultaneous control of the wind turbines. In addition, Plum Creek will maintain a computer program and database to track each wind turbine's operational history.

Each tower will be secured by a concrete foundation that can vary in design depending on the soil conditions. A control panel inside each turbine tower will house communication and electronic circuitry. Each turbine will be equipped with a wind speed and direction sensor that communicates to the turbine's control system to signal when sufficient winds are present for

operation. The turbines feature variable-speed control and independent blade pitch to assure aerodynamic efficiency.

At the base of or within the tower section of each turbine, a step-up transformer will be installed to raise the voltage of the electricity generated by the turbine to the power collection line voltage of 34.5 kV. In the Vestas V150 and V162 turbines, the step-up transformer is located within the nacelle. The GE 2.8-127 uses an external pad-mounted transformer, which will require small concrete slab foundations to be constructed within the gravel area at the turbine base to support the transformers. The transformer is a rectangular steel box measuring approximately 2.3 meters (m) by 2.6 m (7.5 feet by 8.5 feet). Support for the transformer is provided by a concrete pad or foundation approximately 8.0 inches thick, which is placed over 0.6 m (2 feet) of concrete fill. The concrete fill will measure 2.3 m by 4.1 m (7.5 feet by 13.5 feet) and will be placed under the transformer pad and between the transformer and the tower pedestal. The exact dimensions of the transformers, concrete pad, and concrete fill will be dependent upon transformer manufacturer specifications and site-specific engineering requirements.

Power will run through an underground and/or aboveground collection system to one of the two collector substations, which will raise the voltage to 345 kV. The electrical collection system will consist of a network of underground electrical cabling operating at 34.5 kV. Approximately 132 miles of underground lines will be installed for the GE 2.8-127 layout, and 123 miles for the Vestas 5.6-V150 and 5.6-V162 layout by trenching, plowing, and/or, where needed, directionally boring the cables underground. Generally, the electrical collection lines will be buried in trenches. Additionally, collector system cabling may go aboveground when conflicts with existing underground utilities, other infrastructure, or sensitive environmental conditions such as native prairie remnants cannot be resolved and aboveground cabling will resolve the conflict. Where electrical collectors meet public road right-of-way, the power collection lines will either rise to become aboveground lines (if requested by the road authority or if shallow bedrock, sensitive environmental conditions, or conflicts with underground utility or other infrastructure are encountered) or will continue as underground lines. The collection lines will occasionally require an aboveground junction box when the lines from separate spools need to be spliced together.

All of the collection circuits will connect to Plum Creek's two collector substations, which will have a fiber optic connection to the O&M facility and a communication system to the grid operator. The power delivered to the Project substation will be converted to 345 kV. There will then be a 345 kV transmission line segment connecting Collector Substation 1 to Collector Substation 2, and an additional segment connecting Collector Substation 2 to the switching station which will interconnect into the existing Brookings to Hampton 345 kV transmission line. This Transmission Line and switching station will be addressed in a separate route permit application (*see* Docket No. IP6997/TL-18-701). The switching station will connect the proposed Transmission Line to the Brookings to Hampton County 345 kV line, one of the lines designated by MISO as an MVP.

5.1.1 Wind Farm (Minn. R. 7849.0250(A))

5.1.1.1 Nominal Generating Capacity and Effect of Economies of Scale

Each turbine will have a net nominal rating of between 2.8 and 5.6 MW. Larger wind projects, such as the Project, can realize economies of scale by spreading out the relatively fixed transaction, operation, and maintenance costs over the entire Project, resulting in decreased costs per kWh of electricity produced.

5.1.1.2 Annual Capacity Factor

A net capacity factor of approximately 40 to 48 percent, with projected average annual output of between approximately 1,450,000 and 1,740,000 MWh, is anticipated for the Project.

5.1.1.3 Fuel

The wind turbines will be powered by the wind.[42]

5.1.1.4 Anticipated Heat Rate

Heat rates are not applicable to a wind project.

5.1.1.5 Facility Location

The Wind Farm will be located in Cottonwood, Murray and Redwood Counties, and its footprint spans approximately 73,000 acres in portions of Germantown, Highwater, Ann, and Westbrook Townships in Cottonwood County; Holly, Murray, Dovray, and Des Moines River Townships in Murray County; and North Hero and Lamberton Townships in Redwood County. Plum Creek currently has site control over approximately 53,225 acres. With respect to turbine pads, access roads, and collector substations, only approximately 115 acres will be converted for the 2.8 MW turbines, and the 5.6 MW turbines will require the least amount of conversion (85 acres). Between approximately 50-75 acres will be converted for access roads, and up to an additional 21 acres will be used for construction of the Project substations and O&M building. The Transmission Line will be approximately 31 miles in length and cross portions of Cottonwood and Redwood Counties. The Transmission Line will be located within a 150-foot right-of-way, and the estimated permanent impacts from each transmission structure foundation will be up to nine feet in diameter at the surface. In addition, Plum Creek estimates that the proposed switching station will result in approximately 15 acres of impact.

The Project Area is rural with an agricultural-based economy. The Project site was selected based on its excellent wind resources, its access to existing transmission infrastructure and the landowners' interest in participating in the Project.

[42] Minn. R. 7849.0250(A)(3) also requests information projecting the availability of the Project's fuel source and alternative fuels. The Commission has determined that these data requirements are inapplicable to a wind facility. *See, e.g., In the Matter of the Application of High Prairie Wind Farm II, LLC for a Certificate of Need for a Large Energy Facility*, Docket No. PT-6556/CN-06-1428, Order (Dec. 11, 2006).

5.1.2 Transmission Generation-Tie Associated Facility (Minn. R. 7849.0260(A))

5.1.2.1 Design Voltage

The generation-tie line will be a 345 kV transmission line.

5.1.2.2 Number, Size, and Types of Conductors

The conductors for the 345 kV transmission line will consist of 2-bundled "Cardinal" (954 kcmil) or 2-bundled "Bittern" (1,272 kcmil) Aluminum Conductor Steel Reinforced cables, or cables with comparable capacity. The 345 kV conductors will have a capacity equal or greater to 1,992 amperes (AMPs).

5.1.2.3 Expected Losses

The Commission granted Plum Creek an exemption from Minn. R. 7849.0260(A)(3), which requires the applicant to provide information on ". . . the expected losses under projected maximum loading and under projected average loading in the length of the transmission line and at the terminals or substations." Unlike a traditional utility transmission line, the large high voltage transmission line (LHVTL) associated with the Project is a generation-tie line that has the sole purpose of delivering the output of the wind facility to the transmission grid. As such, the generation-tie line is a radial line that will not impact losses on the transmission system as would a more typical utility-LHVTL that is part of the integrated transmission system. However, the 345 kV voltage will minimize losses of energy while transmitting from the collector substations to the switching station.

5.1.2.4 Approximate Length

The length of the Transmission Line will be approximately 31 miles, so as to connect the Project to the 345 kV Brookings to Hampton line.

5.1.2.5 Approximate Location of Terminals or Substations

The end-to-end Project termini are the Collector Substation 1 within the Wind Farm and the switching station approximately 26 miles north, with a connection to Collector Substation 2, also within the Wind Farm. *See* Figure 4. Their locations were selected based on landowner willingness to host the facilities, access within the Wind Farm, facility constructability, environmental suitability, and to optimize the electrical layout associated with the Wind Farm. The switching station location was selected based on its proximity to the existing Brookings to Hampton 345 kV transmission line, willingness of a landowner to host the facility, constructability, and environmental suitability.

5.1.2.6 List of all Counties Reasonably Likely to be Affected

Cottonwood, Murray, and Redwood Counties, Minnesota are the counties reasonably likely to be affected by construction and operation of the proposed Transmission Line.

5.2 AVAILABILITY OF ALTERNATIVES (MINN. R. 7849.0250(B))

The objective of this alternatives analysis is to determine whether there are other energy sources that can satisfy the need identified for the Project. As noted above, Plum Creek intends to develop a generation source that will aid utilities and non-utility customers in satisfying the renewable energy need, including that created by the Minnesota RES and other federal and state renewable and clean energy standards. Therefore, non-renewable energy sources have been excluded from this alternatives analysis.[43] The criteria used in this analysis include: (1) is the energy source cost-effective; (2) is the energy source commercially-proven and reliable for the electrical generation output needed; and (3) is the energy source appropriate for the site selected.

Developing and operating generating sources that are cost-effective and use proven technology is particularly important to an IPP, like Plum Creek. Plum Creek does not have access to ratepayer funds that could provide a resource for retirement of capital investments. In addition, as a seller of electricity to utilities, Plum Creek must keep its prices – and, thus, its costs – low enough to remain competitive. For these reasons, Plum Creek must exercise diligence in deciding where and when to pursue opportunities for capital investment in new power-generating facilities.

Commercial feasibility and reliability with respect to the generation output needed are important considerations in selling the power generated, and wind is a proven and reliable resource. However, with respect to the alternatives discussed below, without a guaranty of long-term reliability and cost-effectiveness, it is difficult or impossible to convince customers that an unproven technology should be selected for purchase.

5.2.1 Alternatives Considered

5.2.1.1 Purchased Power

Plum Creek is an IPP and does not purchase power. Instead, Plum Creek will sell power to utilities or other potential customers. As such, this data requirement is not applicable, and the Commission granted Plum Creek an exemption.

5.2.1.2 Upgrades to Existing Resources

Plum Creek has no existing facility in Minnesota for which it might seek improved operating efficiency. As such, this data requirement is not applicable, and the Commission granted Plum Creek an exemption.

5.2.1.3 New Transmission

Plum Creek has no plans to become involved in owning or operating transmission lines beyond what could be needed for interconnection of the Project. The development, construction,

[43] Minnesota Rules 7849.0250(B)(4) requires an applicant to discuss the availability of new generating facilities of a different size or using a different energy source as an alternative to the proposed facility. The Commission granted Plum Creek a partial exemption from this data requirement and accordingly, Plum Creek will discuss only renewable alternatives.

and operation of transmission and distribution lines designed to deliver power to end use customers will be left to utilities with defined service area obligations to retail customers. As such, this data requirement is not applicable, and the Commission granted Plum Creek an exemption.

5.2.1.4 Solar Power

Minnesota has a significant and important solar resource that can and is being used for capacity services within the state's generating portfolio. Solar is a good capacity resource, whereas wind is a good energy resource. As a result, these two technologies complement each other and are not true substitutes. There is a need for both wind and solar energy in Minnesota's renewable portfolio. However, to the extent Plum Creek competes directly with utility-scale solar generators for PPAs with utility and non-utility customers, wind energy provides cost advantages over solar energy.[44]

5.2.1.5 Hydropower

Hydropower is also not an alternative to the Project. In 2015, hydropower in Minnesota produced 849,054 MWh, which represents "a modest 10 percent increase over the last 10 years."[45] According to the 2016 Quad Report, this slow overall growth is primarily caused by "[c]osts of maintaining and operating dams compared to other sources of energy. . . , as well as increased concern about the potential negative effect dams can have on Minnesota's river ecosystems."[46] In additional, the hydropower sites in Minnesota have largely been developed. There are not sufficient hydropower resources to replace the power offered by Plum Creek.

5.2.1.6 Biomass

Minnesota communities do have accessible and low-value biomass feedstocks. However, the cost of these feedstocks vary widely, and the supply of biomass feedstock is limited.[47] Indeed, in 2018, the Commission gave Xcel Energy permission to buy out and close two biomass facilities because terminating the facilities was more economical to ratepayers than continuing with the PPA.[48] Further, the environmental impacts of a biomass facility may be greater than the

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[44] Lazard's Levelized Cost of Energy Analysis—Version 12.0 (Nov. 2018). *See also* IRENA, *Renewable Power Generation Cost in 2018* (2019) (predicting that onshore wind will continue to provide a cost advantage of $0.03/kWh, as compared to solar, through 2020) (available at https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/May/IRENA_Renewable-Power-Generations-Costs-in-2018.pdf?la=en&hash=99683CDDBC40A729A5F51C20DA7B6C297F794C5D).

[45] Minnesota Department of Commerce, *Energy Policy and Conservation Quadrennial Report 2016* (hereinafter, 2016 Quad Report), at 28.

[46] 2012 Quad Report, at 28.

[47] 2012 Quad Report, at 20.

[48] Order Approving Petitions, Approving Cost Recovery Proposals, and Granting Variances, *In the Matter of Xcel Energy's Petition for Approval to Terminate the Power Purchase Agreement (PPA) with Benson Power, LLC, Acquire the Benson/Fibrominn Plant, and Close the Facility*, Docket No. E-002/M-17-530 and *In the Matter of Xcel Energy's Petition for Approval to Terminate the PPA with Laurentian Energy Authority I, LLC*, Docket No. E-002/M-17-551 (Jan. 23, 2018), eDockets Doc. ID 20181-139242-02.

Project, due to both the facility itself and the machinery and equipment needed to gather and transport the biomass fuel. For these reasons, a biomass plant is not an alternative to the Project.

5.2.1.7 Emerging Technologies

New renewable emerging power generation technologies have been developed, and Plum Creek believes that the current approaches are not sufficiently mature to either provide the output needed or to be cost-effective and reliable.

5.2.1.7.1 Pumped Storage

The proposed site in Cottonwood, Murray, and Redwood Counties is not suited to a pumped storage application because of the need to store large amounts of water in an elevated reservoir. In addition, there is currently no net generation from pumped storage in Minnesota.[49] Accordingly, this technology is not an alternative to the Project.

5.2.1.7.2 Compressed Air

Highly specialized geological sites are needed to make use of compressed air technology. Such sites are scarce in Minnesota, and those that do exist are not located in the vicinity of the site. This technology is not yet commercially proven and, as with all storage technologies, it creates no net new energy generation. Accordingly, it is not an alternative to the Project.

5.2.1.7.3 Superconducting Magnets

This technology, which makes use of coils that can store electric energy, is not yet commercially-proven. Accordingly, it is not an alternative to the Project.

5.2.1.7.4 Hydrogen and Fuel Cells

Hydrogen and its use in fuel cells has received a lot of attention for its potential to impact energy production and use. Fuel cells can be used to make electricity and heat to operate vehicles and buildings. Fuel cells use a chemical reaction rather than a combustion reaction, are more efficient than generation from combustion sources, and have nearly no pollution. Hydrogen, on the other hand, is an energy carrier, not an energy source. As such, its potential to "store" electricity is being explored.

While much research is being done regarding hydrogen and fuel cells, the technology is not yet available on a commercial scale. It is possible, however, that as research and commercial applications advance, this technology may be used with and enhance other renewable technologies, such as the Project.

[49] EIA, *Net Generation from Hydroelectric (Pumped Storage) Power by State by Sector* (available at http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_1_12_a).

5.2.1.7.5 Battery Storage

As prices for the technology fall, lithium-ion batteries have begun to receive attention for their potential to store energy at low demand times for use during times of peak demand. However, grid-scale lithium-ion battery projects have been minimal across the United States to date, and the majority have been deployed for power quality benefits supporting the electric grid, a different purpose than electric generation. In no case do batteries generate their own energy, and therefore batteries are not an alternative to wind as they do not help utilities and non-utility customers in satisfying the need for renewable energy

5.2.1.8 Non-CN Facilities (Minn. R. 7849.0120(A)(4))

Under Minn. Stat. §§ 216B.2421 and 216B.243, subd. 2, and Minn. R. Ch. 7849, a CN is required for the Project because it is a "large energy facility," *i.e.*, larger than 50 MW. As an IPP, Plum Creek must compete with other available technologies to secure a PPA with a utility or non-utility customer. Plum Creek will be compared to other non-CN facilities at the time it submits bids to utilities and other potential customers, and the potential customer will select a resource based on a variety of factors, including price. Plum Creek has the advantage of additional economies of scale not available to smaller, non-CN facilities.

5.2.1.9 No Facility Alternative (Minn. R. 7849.0340)

The Commission granted Plum Creek an exemption from Minn. R. 7849.0340, which requires an applicant to submit data for the alternative of "no facility," including a discussion of the impact of this alternative on the applicant's generation and transmission facilities, system, and operations. Minn. R. 7849.0340 also requires an analysis of "equipment and measures that may be used to reduce the environmental impact of the alternative of no facility." Minn. R. 7849.0340(C).

Plum Creek does not have a "system," nor does it have other generation and transmission facilities in Minnesota. As such, the requirements of Minn. R. 7849.0340 are not applicable to the Project and are not necessary to determine need for the facility. Instead, Plum Creek will provide data regarding the impact of the "no facility" alternative on the wholesale market.

Given that the Project is designed to increase the amount of energy available for purchase on the wholesale market that will satisfy clean energy standards, not building the facility is not an alternative. Not building the facility would result in no increase in renewable energy and, in turn, no opportunity for utilities and non-utility customers to purchase the Project's output to satisfy the RES and other clean energy standards. Such an outcome is contrary to Plum Creek's objective for the Project and will not satisfy the state and regional need for renewable energy.

5.2.1.10 Facility Information for Alternatives Involving Construction of an LHVTL (Minn. R. 7849.0330)

The Commission granted Plum Creek an exemption from Minn. R. 7849.0330, which requires the applicant to provide certain data for each alternative that would involve construction of an LHVTL. Transmission facilities are not true alternatives to the proposed Plum Creek generation-tie line, since the purpose of the generation-tie line is to deliver the output from the

facility to increase the supply of renewable energy to the purchaser to meet its renewable, clean energy, or sustainability obligations. Access to transmission facilities beyond the point of interconnection will be arranged by the utility or utilities purchasing the Project's energy output and will depend on the buyer and the ultimate destination for the energy output. Thus, except for the 345 kV transmission line necessary for interconnection to the existing Brookings to Hampton 345 kV transmission line, it is anticipated that the electricity generated will be transmitted via facilities owned or operated by others. For these reasons, Minn. R. 7849.0330 is not applicable, and the Commission granted Plum Creek an exemption from this data request.

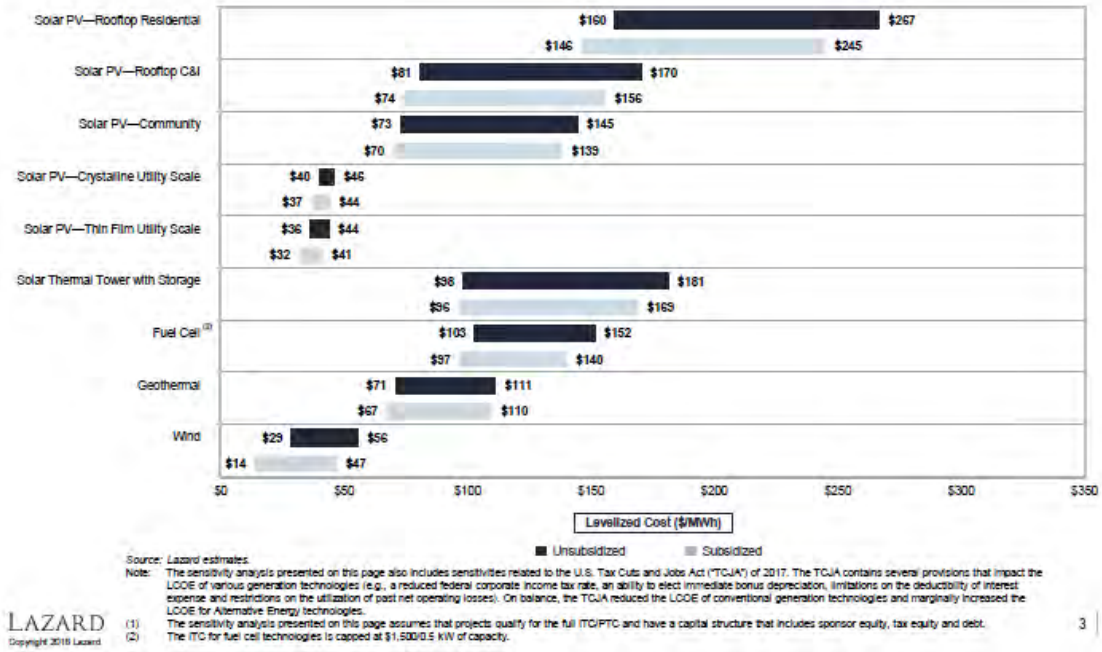
5.2.1.11 Combinations

No combination of the aforementioned alternatives would be appropriate because, as compared to the Project, they would not enable Plum Creek to more efficiently or cost-effectively produce renewable electric output to be purchased by utilities to provide needed energy and satisfy renewable and other clean energy goals.

5.2.2 Economic Comparison

Table 3 below, taken from the 2018 Lazard Levelized Cost of Energy (LCOE) Analysis demonstrates that wind energy has a lower LCOE than other types of renewable resources.

Table 3: Levelized Cost of Energy Comparison[50]



Wind continues to be among the most practical of all renewable generation technologies.

[50] The figures in this table are taken from https://www.lazard.com/media/450784/lazards-levelized-cost-of-energy-version-120-vfinal.pdf (accessed October 16, 2019).

5.2.3 Alternatives Summary

The Project is the best alternative for meeting the renewable energy needs in Minnesota and the region in the near term. All other potential alternatives reviewed by Plum Creek, including the use of alternative renewable resources or emerging technologies, non-CN facilities, or the no-build alternative, fall short in one or more categories. Moreover, as an IPP, Plum Creek does not have the right to sell its electricity to anyone. Instead, Plum Creek will compete with alternative sources of energy to obtain a purchase agreement. In this manner, the Project will have at least one other comparison to alternatives prior to its construction and operation.

5.3 DISCUSSION OF PROPOSED FACILITY AND ALTERNATIVES

5.3.1 Wind Facility (Minn. R. 7849.0250(C))

The Commission granted Plum Creek a partial exemption from Minn. R. 7849.0250(C)(1)–(9), which requires a discussion of various details regarding both the proposed facility and each of the alternatives discussed in response to Minn. R. 7849.0250(B). Because the Commission granted Plum Creek a partial exemption from the data requirements in Minn. R. 7849.0250(B), thereby limiting its discussion to only renewable alternatives, the Commission also limited the information required under this data requirement to only those renewable alternatives discussed in response to Minn. R. 7849.0250(B)(4) that could provide electric power at the asserted level of need. As discussed above, no such alternatives exist. Therefore, only information regarding the Project is applicable.

5.3.1.1 Capacity Cost

Wind energy projects are accredited by MISO at a fairly low rate (currently about 15 percent of nameplate) and are most often used as energy resources. Thus, costs for wind energy facilities are typically not expressed in terms of capacity costs. The Project will deliver energy and accredited capacity to utilities on an as-generated basis and will receive payment for both in the form of a single $/kWh payment. Plum Creek's estimated cost for the Project per kW is provided in Appendix A, which has been designated nonpublic. The largest component in the total cost of the Project will be the wind turbines; however, infrastructure costs for access road construction and electrical collection systems also are factors.

5.3.1.2 Service Life

A service life of 30 years has been assumed to estimate annualized capital costs. With proper maintenance, service, and replacement of parts, the expected life of the Wind Farm is 30 years. Plum Creek is confident that its maintenance program will result in excellent longevity for the Project.

5.3.1.3 Estimated Average Annual Availability

Plum Creek estimates that the Project will be available at least 97 percent of the year, which is consistent with industry standards.

5.3.1.4 Fuel Costs

The Project will be fueled by wind, which is free. The easements for the wind rights on the land where the turbines will be located will require annual lease payments. Nominal purchases of electricity will be necessary to run the Project, with Plum Creek ultimately selling the Project's net output.

5.3.1.5 Variable Operating and Maintenance Costs

Variable maintenance costs have been provided in Appendix A, which has been designated as nonpublic. An advantage of wind energy facilities is that they typically are not required to go completely offline for maintenance. Individual turbines can be serviced while the rest of the facility continues to deliver energy.

5.3.1.6 Total Cost

Plum Creek's estimated total capital cost per kWh for the Project is provided in Appendix A, which has been designated nonpublic. This estimate assumes typical wind farm design, construction, and operational data for a 30-year estimated service life. The price for which Plum Creek will sell the energy will be determined as a result of negotiations with the purchasers.

5.3.1.7 Estimate of Facility's Effect on Rates

Minnesota Rules Chapter 7849.0250(C)(7) requires an applicant to estimate its proposed project's "effect on rates systemwide and in Minnesota, assuming a test year beginning with the proposed in-service date." The Commission granted Plum Creek an exemption from this requirement because it does not have a "system" as defined by the Rules, and it is not a utility with retail rates for the power it plans to generate. As such, the data are neither available to Plum Creek nor necessary to determine the need for the Project. Instead, Plum Creek proposes to submit data on the Project's impact on state or regional wholesale prices.

The Project's energy production will be modest in comparison to the annual energy consumption of Minnesota and the region and will likely not have a measurable effect on rates. However, the Project could ultimately play a role in stabilizing or even lowering rates by offering an alternative to conventional generation sources.[51] For instance, utilities would have the option of purchasing output from the Project to partially replace energy from generation sources with more volatile pricing, such as natural gas plants. In addition, the Project will not face the same cost-increasing hurdles to construction (*e.g.*, potential carbon regulation and higher permitting costs due to increased regulatory scrutiny) faced by conventional fossil-fuel generation sources.

[51] *E.g.*, Christian Roselund, *Renewables reduced wholesale power costs by $5.7 billion in Texas*, pv magazine (Nov. 6, 2018) (reporting that wind, and to a lesser degree solar, "are bringing down wholesale power prices and making them more stable"); Good Energy, *Wind and solar reducing consumer bills* (Oct. 2015) (analyzing impact of renewable energy usage on electric rates in the United Kingdom); Union of Concerned Scientists, *Clean Power Green Jobs*, (2009) (analyzing impacts of meeting "25 by '25" nationally on consumer electric rates).

5.3.1.8 Efficiency

Because no fuel is burned in the production of energy at the Project, this information is not applicable.

5.3.1.9 Alternatives to LHVTL

Plum Creek was granted an exemption from Minn. R. 7849.0260(B)(1), which requires a discussion of new generation alternatives to the LHVTL. The Plum Creek generation-tie line is proposed to connect the Project to the transmission grid, and thus, there is no new generation alternative that can be a true substitute for the proposed generation-tie line. Unlike a traditional utility that is adding an LHVTL to the transmission system for purposes of addressing system reliability or congestion, for which a new generation resource may be an alternative, the Plum Creek generation-tie line is proposed solely to interconnect the Project to the transmission grid.

5.3.1.10 Upgrading of Existing Transmission Lines or Existing Generating Facilities

There are no existing high voltage transmission lines in proximity to the Project that have sufficient capacity or could be upgraded to deliver the wind energy from the Project to the Brookings to Hampton 345kV transmission line. Upgrading existing generation facilities is also not a reasonable alternative because, as noted in Section 5.3.1.9, the need for the Transmission Line is to deliver energy from a new wind farm.

5.3.1.11 Transmission Lines with Different Voltages, Numbers, Sizes, and Types of Conductors

The Transmission Line must provide sufficient capacity to serve an up to 414 MW wind farm. Plum Creek evaluated higher and lower voltage lines and determined that amperage of at least 1,992 AMPs would be required. This amperage can only be provided by voltage of 230 kV and higher. Therefore, Plum Creek determined that lower voltage 69 kV and 115 kV facilities would not meet the need. Plum Creek also evaluated, but did not select a 230 kV voltage because there are no other 230 kV facilities in the area, the voltage would not provide capacity for future growth, and because the 230 kV line would require transformation to 345 kV for the interconnection to the Brookings to Hampton 345 kV transmission line.

Plum Creek concluded that the most appropriate voltage was 345 kV consisting of two bundled Cardinal (954 kcmil) or 2-bundled “Bittern” (1,272 kcmil) Aluminum Conductor Steel Reinforced cables, or cables with comparable capacity which would provide a capacity of 1,992 AMPs. This capacity will meet the current Project needs and provide capacity for future generation. The 345 kV voltage was also preferred because:

- It fits with the 345 kV regional backbone system reinforced by the CapX2020 lines. The Minnesota CapX2020 utilities recently announced that they are studying further additions to Minnesota’s high-voltage-transmission system

because of growing demand for renewables.[52] MISO expects its installed wind generation capacity to expand by 10 gigawatts between 2019 and 2023,[53] and CapX2020, which consisted of three new 345 kV lines and one new 230 kV line is likely insufficient to meet that demand as the CapX2020 system is already at capacity.[54]

- The higher operating voltage and resulting increased thermal capacity of a 345 kV generation-tie line offer an improved efficiency relative to a lower voltage line. For example, the 345 kV line incurs less than one quarter the power losses of a 161 kV line to carry the same amount of power, assuming the same conductor is used.

- A 345 kV generation-tie line efficiently uses available right-of-way, requiring less land to deliver equivalent amounts of power compared to lower voltage options. For example, a single circuit or double 345 kV line can be constructed in a 150-foot right-of-way and carry three to six times more energy than a single circuit or double circuit 161 kV line. To provide equivalent capacity, three double circuit 161 kV lines would be required for a combined right-of-way exceeding 200 feet.

- The higher the voltage of a line, the more reliable the line is during low voltage ride through (LVRT) events and transmission faults. Higher voltage lines generally utilize high speed protections that clear faults faster than lower voltage lines, which supports LVRT passage.

5.3.1.12 Transmission Lines with Different Terminals or Substations

No other alternative terminal or substation studied offers the same benefits as the proposed substations and switching station. Two newly constructed collector substations will serve as the point of initiation and are the necessary origination point for the generation-tie line. A switching station on the Brookings to Hampton 345 kV transmission line is the end point and provides a path for the wind energy to be delivered to transmission designated by MISO as an MVP. The point of interconnection is the closest and most efficient terminal for the closest high-voltage line capable of transmitting the energy from the Wind Farm.

5.3.1.13 Double Circuiting of Existing Transmission Lines

There is no existing transmission line that is located to deliver the energy from the Plum Creek Wind Farm to the Brookings to Hampton 345 kV transmission line, and, thus, the double circuiting of an existing transmission line is not feasible. The Project also considered double circuiting the proposed 345 kV Transmission Line and determined that a single circuit line provided sufficient capacity for the Wind Farm and additional capacity for future use.

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[52] Mike Hughlett, *Minnesota utilities will study if the $2B CapX2020 grid improvements were enough*, Star Tribune (August 19, 2019).

[53] Amanda Durish Cook, *MISO looks to get better read on wind,* RTO Insider (April 29, 2019).

[54] *See* Mike Hughlett, *Technology, cost could hamper efforts for 100 percent carbon-free grid in Minnesota by 2050,* Star Tribune (April 20, 2019).

5.3.1.14 The Use of DC Transmission Line

A direct current (DC) transmission line is generally employed to deliver generation over a considerable distance, in some instances several hundred miles, to a load center. The DC technology is not technically viable for a wind project delivering over short distances, such as for the proposed 31-mile generation-tie line to the Brookings to Hampton 345 kV transmission line.

5.3.1.15 Use of Underground Transmission Lines

Undergrounding the 345 kV transmission line is not cost-effective, nor feasible, due to the land use impacts, cost, and distance that would be involved. Undergrounding also would be inconsistent with industry standard practice, as it is more typical in areas not suitable for overhead transmission, such as in large cities, and at a much lower voltage, such as 69 kV. In addition, there are currently no underground 345 kV facilities in Minnesota.

5.3.1.16 Any Reasonable Combination of Factors

There is no reasonable combination of the factors in Minn. R. 7849.0260(B) that could result in an alternative approach to the development, construction, and operation of the Transmission Line.

5.3.1.17 Total Cost

The estimated total cost of the Transmission Line ranges from approximately $29 million to $30 million depending on the route selected in the Route Permit proceeding.

5.3.1.18 Service Life

The service life of the generation-tie line as part of the Project is 30 years.

5.3.1.19 Estimated Annual Availability

The Transmission Line has an estimated annual availability of at least 99 percent.

5.3.1.20 Annual O&M

Annual O&M costs from transmission lines in Minnesota and other states vary. The annual inspections are the principal O&M costs for transmission facilities. Annual O&M costs are expected to be approximately $500/mile/year.

5.3.1.21 Estimate of System-Wide Rates

Plum Creek was granted an exemption from Minn. R. 7849.0260(C)(5), which requires an applicant to estimate its proposed project's "effect on rates systemwide and in Minnesota, assuming a test year beginning with the proposed in-service date." Plum Creek is not a Minnesota public utility whose rates are regulated by the Commission. Rather, as an IPP providing its electrical output to a single purchaser, Plum Creek cannot derive a systemwide rate effect, nor do so for the entirety of the State of Minnesota.

5.3.1.22 Efficiency of the Transmission Line

Plum Creek was granted an exemption from Minn. R. 7849.0260(C)6, which requires that an applicant provide a discussion of the Project's ". . . efficiency, expressed for a transmission facility as the estimated losses under projected maximum loading and under projected average loading in the length of the transmission line and at the terminals or substations, or expressed for a generating facility as the estimated heat rate. . . ." Unlike a traditional utility transmission line, the LHVTL associated with Plum Creek is a generation-tie line that has the sole purpose of delivering the output of the wind facility to the transmission grid. As such, the generation-tie line is a radial line that will not impact losses on the transmission system as would a utility-LHVTL that is part of the integrated transmission system.

5.3.1.23 Major Assumptions

There are no specific assumptions other than those already identified that impacted the provision of information in response to Minn. R. 7849.0260(C)(1-6).

5.4 MAP OF SYSTEM (MINN. R. 7849.0250(D), 7849.0260(D))

The Commission granted Plum Creek an exemption from Minn. R. 7849.0250(D) and 7849.0260(D), which both require an applicant to include a map showing the applicant's system. As an IPP, Plum Creek does not have a "system." The information requested is not available to Plum Creek or relevant to the determination of need for the Project. Instead, maps showing proposed site of the Project and its location relative to the power grid are included as Figures 5.

6.0 PEAK DEMAND AND ANNUAL CONSUMPTION FORECAST (MINN. R. 7849.0270)

The Commission granted Plum Creek an exemption from Minn. R. 7849.0270, subps. 1-6, which require the applicant to provide "data concerning peak demand and annual electrical consumption within the applicant's service area and system." Plum Creek does not have a "service area" or "system" and, as such, the requested data is inapplicable. Moreover, Plum Creek will sell power generated by the Project at wholesale to one or more buyers affiliated with different systems and serving different areas. Given that Plum Creek does not yet know who the buyer or buyers will be, Plum Creek cannot reasonably forecast peak demand for those buyers' service areas and systems. As an alternative to the requested data, Plum Creek provides the following data regarding the regional demand, consumption, and capacity data from credible sources to demonstrate the need for the independently produced renewable energy that will be generated by the Project.

A review of utilities' IRPs, requests for proposals, and similar documents demonstrates that utilities will seek additional renewable generation resources in the next several years.[55] Xcel Energy has announced plans to reduce carbon emissions 80 percent Company-wide by 2030, and to provide 100 percent carbon-free electricity across its service territory by 2050.[56] To reach this goal, Xcel Energy plans to eliminate all coal generation on its system by 2030, and to add 4,000 MW of renewable energy, in addition to approximately 1,200 MW of cumulative wind by 2034 to replace wind that is set to retire. Minnesota Power has also announced that it expects to be at 50 percent renewable energy by 2021.[57] Great River Energy also announced a goal of reacting 50 percent renewable energy by 2030.[58]

More broadly, retirements of coal-based generating units are expected across the MISO region, and renewable generation resources are expected to fill the resulting capacity needs.[59] Additional demand is being driven by corporate and industrial consumers, who are increasingly entering into longer PPAs for renewable energy.[60]

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[55] Xcel Energy, Upper Midwest Resource Plan 2020-2034, at 5, 2020-2034 Upper Midwest Integrated Resource Plan Docket No. E002/RP-19-368. *See also* Minnesota Power, 2015 Integrated Resource Plan (available at http://www.mnpower.com/Content/documents/Environment/2015-ResourcePlan.pdf) (approved by the Minnesota Public Utilities Commission on June 10, 2015); Otter Tail Power Company, Application for Resource Plan Approval 2017-2031 (available at https://www.otpco.com/media/838904/resource-plan.pdf).

[56] Xcel Energy, Upper Midwest Resource Plan 2020-2034, at 5.

[57] https://mnpower.com/EnergyForward (accessed October 18, 2019).

[58] https://greatriverenergy.com/great-river-energy-sets-50-renewable-energy-goal-for-2030/ (accessed October 18, 2019).

[59] U.S. Energy Information Administration, *Annual Energy Outlook 2017*, at 22 (available at https://www.eia.gov/outlooks/aeo/pdf/0383(2017).pdf); NRDC Issue Paper, *Clean Energy and Efficiency Can Replace Coal for a Reliable, Modern Electricity Grid* (Mar. 2017) (available at https://www.nrdc.org/sites/default/files/clean-energy-replace-coal-modern-electricity-grid-ip.pdf).

[60] American Wind Energy Association, *Consumer demand drives record year for wind energy purchases* (Jan. 30, 2019) (available at https://www.awea.org/resources/news/2019/consumer-demand-drives-record-year-for-wind-energy); *see also* Business Renewables Center, *Corporate Renewable Deals 2014-2018* (available at https://businessrenewables.org/corporate-transactions/#wpcf7-f942-p471-o1).

7.0 SYSTEM CAPACITY (MINN. R. 7849.0280)

Minn. R. 7849.0280 requires a CN applicant to provide information on the ability of its existing system to meet the forecasted demand. As an IPP, Plum Creek does not have a "system" as defined by the Rules. Accordingly, the Commission granted Plum Creek an exemption from this requirement and permitted Plum Creek to instead provide regional demand, consumption, and capacity data from credible sources to demonstrate the need for the independently-produced renewable energy that will be provided by the Project. This information is provided in Section 3.0.

8.0 CONSERVATION PROGRAMS (MINN. R. 7849.0290)

The Commission granted Plum Creek an exemption from Minn. R. 7849.0290, which requires an applicant to describe its energy and conservation plans, including load management, and the effect of conservation in reducing the applicant's need for new generation and transmission facilities.

9.0 CONSEQUENCES OF DELAY (MINN. R. 7849.0300)

The Commission granted Plum Creek an exemption from Minn. R. 7849.0300, which requires the applicant to discuss the "anticipated consequences to its system, neighboring systems, and the power pool should the proposed facility be delayed one, two, and three years, or postponed indefinitely." Plum Creek is not a utility and has no "system" as defined by the Rules. Thus, this data requirement is inapplicable to Plum Creek and is unnecessary to determine the need for the Project. Instead, Plum Creek provides the following data on the consequences of delay to its potential customers and the region.

The data presented regarding utilities' and industrial customers' requirements and desire for additional renewable energy resources provides evidence that the energy to be generated by the Project is needed. Delaying an up to 414 MW wind project has the potential to jeopardize utility and non-utility customers' efforts to obtain necessary renewable energy in a cost-effective and reliable manner.

10.0 ENVIRONMENTAL INFORMATION FOR PROPOSED PROJECT AND ALTERNATIVES (MINN. R. 7849.0310)

Plum Creek is submitting Site and Route Permit Applications, in addition to this Application for a CN (*see* Docket Nos. IP6997/WS-18-700 and TL-18-701). Included below is a summary of some of the impacts to key resources found within the Project Area, including visual resources, land use, and wildlife. Additional environmental information is provided in Section 11, below, and in the Site and Route Permit Applications.

10.1 WIND FACILITY

10.1.1 Visual Impacts and Mitigation

The introduction of wind turbines, collector substations and transmission lines has the potential to alter the existing visual resource within 10 miles of the Project Area where they are most perceptible. During construction, visual impacts associated with the Project facilities would include the removal of existing vegetation and the exposure of bare soils, as well as earthwork and grading scars associated with heavy equipment tracks, trenching, and machinery and tool storage. Other visual effects could result from the removal or alteration of vegetation that may currently provide a visual barrier, or landform changes that introduce contrasts in visual scale, spatial characteristics, form, line, color, or texture. Due to the general lack of development in the immediate Project Area, visual scale is uniform, with little contrast in line, form, color, or texture, and no dominant features. Construction in flat terrains would disrupt and dominate foreground and middle ground views with the introduction of equipment, materials, the trench, and spoil piles.

During operation, visual impacts associated with the development of wind energy facilities in the Project Area include the presence of wind turbine structures, movement of the rotor blades, shadow flicker, turbine marker lights, and other lighting on control buildings and other ancillary structures, roads, vehicles, and workers conducting maintenance activities. These impacts would be similar to the impacts of other operating wind farms in the area, including the Jeffers Wind and Marshall Wind projects, which are both located within 20 miles of the Project.

The Federal Aviation Administration (FAA) requires obstruction lighting or marking of structures over 200 feet aboveground to provide safe air navigation. Plum Creek will apply to the FAA for approval of a lighting plan that is compliant with FAA requirements. It is anticipated that all turbines will be lit. FAA requires synchronized flashing of red lights for wind turbines within a Project. However, to minimize visual impacts, Plum Creek will seek FAA approval for use of an Aircraft Detection Lighting System (ADLS), which involves the installation of radar units around the perimeter of the Project. When the radar does not detect an aircraft, it sends a signal to the wind turbine lighting that keeps the light off. When the radar detects aircraft, it stops sending that signal, and the wind turbine lighting activates.

The following are proposed mitigative measures to further mitigate visual impacts:

- Wind turbines will exhibit visual uniformity in the shape, color, and size of rotor blades, nacelles, and towers.

- Collection cables or lines on the site will be buried in a manner that minimizes additional surface disturbance (*e.g.*, collocating them with access roads, where feasible).
- For ancillary buildings and other structures, low-profile structures will be chosen whenever possible to reduce their visibility.
- Turbine foundations and roads have been designed to minimize and balance cuts and fills.
- Facilities, structures, and roads will be located in stable fertile soils to reduce visual contrasts from erosion and to better support rapid and complete regrowth of vegetation.
- Lighting for facilities will not exceed the minimum required for safety and security, and full-cutoff designs that minimize upward light pollution will be selected. Plum Creek will install lights that are off until aircraft approach.
- Commercial messages and symbols on wind turbines will be avoided.

10.1.2 Shadow Flicker Impacts and Mitigation

Shadow flicker caused by wind turbines is defined as alternating changes in light intensity at a given stationary location (or receptor), such as the window of a home. In order for shadow flicker to occur, three conditions must be met: (1) the sun must be shining with no clouds to obscure it; (2) the rotor blades must be spinning and must be located between the receptor and the sun; and (3) the receptor must be sufficiently close to the turbine to be able to distinguish a shadow created by it. Shadow flicker intensity and frequency at a given receptor are determined by a number of interacting factors:

- **Sun angle and sun path:** As the sun moves across the sky on a given day, shadows are longest during periods nearest sunrise and sunset, and shortest near midday. They are longer in winter than in summer. On the longest day of the year (the summer solstice), the sun's path tracks much farther to the north and much higher in the sky than on the shortest day of the year (the winter solstice). As a result, the duration of shadow flicker at a given receptor will change significantly from one season to the next.

- **Turbine and receptor locations:** The frequency of shadow flicker at a given receptor tends to decrease with greater distance between the turbine and receptor. The frequency of occurrence is also affected by the sightline direction between turbine and receptor. A turbine placed due east of a given receptor will cause shadow flicker at the receptor at some point during the year, while a turbine placed due north of the same receptor at the same distance will not, due to the path of the sun at Plum Creek's latitude.

- **Cloud cover and degree of visibility:** As noted above, shadow flicker will not occur when the sun is obscured by clouds. A clear day has more opportunity for shadow flicker than a cloudy day. Likewise, smoke, fog, haze, or other phenomena limiting visibility would reduce the intensity of the shadow flicker.

- **Wind direction:** The size of the area affected by shadow flicker caused by a single wind turbine is based on the direction that the turbine is facing in relation to the sun and location of the receptor. The turbine is designed to rotate to face into the wind, and as a result, turbine direction is determined by wind direction. Shadow flicker will affect a larger area if the wind is blowing from a direction such that the turbine rotor is near perpendicular to the sun-receptor view line. Similarly, shadow flicker will affect a smaller area if the wind is blowing from a direction such that the turbine rotor is near parallel to the sun-receptor view line.

- **Wind speed:** Shadow flicker can only occur if the turbine is in operation. Turbines are designed to operate within a specific range of wind speeds. If the wind speed is too low or too high, the turbine will not operate, eliminating shadow flicker.

- **Obstacles:** Obstacles, such as trees or buildings, can have a screening effect and reduce or eliminate the occurrence of shadow flicker if they lie between the wind turbine and the receptor.

- **Contrast:** Because shadow flicker is defined as a change in light intensity, the effects of shadow flicker can be reduced by increasing the amount of light within a home or room experiencing shadowing flicker.

- **Local topography**: Changes in elevation between the turbine location and the receptor can either reduce or increase frequency of occurrence of shadow flicker, compared to flat terrain.

Shadow flicker frequency calculations for the Project were modeled for 461 residences (receptors) with WindPRO based on the primary turbines in each layout. These receptors are those within the Project Area and one-mile buffer that could receive shadow flicker. As demonstrated in Table 4, all non-participating residences are expected to experience 30 hours or less per year of shadow flicker. Figures 7a – 7c (Shadow Flicker) provide a visual representation of shadow flicker across the Project for each of the three turbine models.

Table 4
Summary of Shadow Flicker Assessment

Turbine Model	Shadow Flicker (hr./year)	Participating		Non-Participating		Total	
		No. Receptors	% of Receptors	No. Receptors	% of Receptors	No. Receptors	% of Receptors
GE-127	0	60	42.0%	236	74.2%	296	64.3%
	0.1 to 20	64	44.7%	79	24.8%	143	31.0%
	20.1 to 30	11	7.7%	3	1.0%	14	3.0%
	30.1 to 40	4	2.8%	0	0.0%	4	0.9%
	40.1 to 50	2	1.4%	0	0.0%	2	0.4%
	50.1 to 60	1	0.7%	0	0.0%	1	0.2%
	60.1 or more	1	0.7%	0	0.0%	1	0.2%
V150	0	76	53.1%	277	87.1%	353	76.6%
	0.1 to 20	28	19.6%	40	12.6%	68	14.8%
	20.1 to 30	13	9.1%	1	0.3%	14	3.0%
	30.1 to 40	9	6.3%	0	0.0%	9	2.0%
	40.1 to 50	8	5.6%	0	0.0%	8	1.6%
	50.1 to 60	3	2.1%	0	0.0%	3	0.7%
	60.1 or more	6	4.2%	0	0.0%	6	1.3%
V162	0	79	55.2%	283	89.0%	362	78.5%
	0.1 to 20	32	22.4%	35	11.0%	67	14.5%
	20.1 to 30	13	9.1%	0	0.0%	13	2.8%
	30.1 to 40	8	5.6%	0	0.0%	8	1.7%
	40.1 to 50	4	2.8%	0	0.0%	4	0.9%
	50.1 to 60	4	2.8%	0	0.0%	4	0.9%
	60.1 or more	3	2.1%	0	0.0%	3	0.7%

WindPRO calculates the number of hours per year as well as the maximum minutes per day during which a given receptor could realistically expect to be exposed to shadow flicker from nearby wind turbines. The maximum shadow flicker (hours per year) for each layout is summarized in Table 5.

Table 5
Maximum Shadow Flicker (hours/year)

Turbine Model	Maximum Shadow Flicker (hours/year)	
	Participating	Non-Participating
GE-127	62.1	28.1
V150	100.4	18.1
V162	114.6	22.0

The shadow flicker modeling is conservative and does not take in consideration several factors including:

- availability of the turbines (*i.e.*, whether they are operating or not based on meteorological conditions and/or maintenance);
- turbines not operating below cut-in and above cut-out wind speeds;
- obstacles (like trees or buildings) obstructing shadow flicker from a receptor; and
- dust or aerosols in the air which reduce the impact of shadow flicker.

For example, the participating residence modeled to receive the maximum amount of shadow flicker in both the V150 and V162 layouts is surrounded by trees that are not accounted for by the model. Similarly, the participating residence modeled to receive the maximum amount of shadow flicker in the GE-127 layout is also surrounded by trees that are not accounted for by the model. These trees provide an obstruction to shadows from nearby proposed turbines. There are no non-participating residences which the model calculates will receive more than 30 hours of shadow flicker per year for each of the three turbine models.

At a distance of 1,000 feet or greater (the Project minimum setback for residences), receptors will typically experience shadow flicker only when the sun is low in the sky, and when certain meteorological and operational factors are present. If a receptor does experience shadow flicker, it most likely will be only during a few days per year from a given turbine, and for a total of only a fraction (typically less than one percent) of annual daylight hours.

Shadow flicker from the proposed turbines is not harmful to the health of photosensitive individuals, including those with epilepsy. The Epilepsy Foundation has determined that generally, the frequency of flashing lights most likely to trigger seizures is between five and 30 flashes per second (Epilepsy Foundation, 2013).The frequency of shadow flicker due to wind turbines is a function of the rotor speed and number of blades, and it is generally no greater than approximately 1.5 hertz (Hz) (*i.e.*, 1.5 flashes per second). Because the frequency of wind turbine shadow flicker is so much lower than the frequency range that can trigger seizures, there is no potential for causing seizures.

Plum Creek has sited turbines in both layouts to minimize impacts to residences. Based on the results of the Project's shadow flicker modeling, no specific mitigation is currently proposed. To the extent that a residence experiences inordinately more flicker than anticipated by modeling during Project operation, mitigation would be addressed at that time. However, because of the conservative methods used for the modeling, it is highly unlikely that more flicker than modeled will occur. In order to assess site-specific mitigation measures, flicker occurrences should be documented daily for several consecutive months including location, date, time of day, and duration. Mitigation measures will be considered and implemented based on individual circumstances of residences experiencing shadow flicker, and as a reasonable function of the amount of flicker experienced. Such mitigation measures may include Plum Creek taking the following actions:

- Providing education to landowners about how to minimize the effect of shadow flicker.
- Providing indoor screening, such as curtains or blinds in windows, where appropriate and reasonable.
- Providing exterior screening, such as a vegetation buffer or awnings over windows, where appropriate and reasonable.
- Implementing Turbine Control Software programmed to temporarily shut down a specific turbine for a few minutes if conditions are present to create flicker.

10.1.3 Impacts to Land Use

The Project Area includes a total of approximately 73,000 acres, and Plum Creek currently has site control over approximately 53,225 of these acres. Of acres within the Project Area, less than one half of one percent will be permanently converted from agricultural fields to sites for wind turbines, access roads, and transformer pads. With respect to turbine pads and access roads, only approximately 15-20 acres will be converted for 74 to 110 turbines, respectively. Between approximately 50-75 acres will be converted for access roads, and up to an additional 21 acres will be used for construction of the Project substation and O&M building. The existing land use will continue on the remainder of the land. No relocation of people or businesses will be necessary for the Project. Thus, land use impacts will be minimal.

10.1.4 Impacts to Wildlife

Development of the Project, including the construction and operation, is expected to produce a minimal impact to wildlife. Based on studies of existing wind power projects in the United States and Europe, the impact to wildlife would primarily occur to avian and bat populations. Although Plum Creek pre-construction surveys are ongoing, it can be expected that, similar to other wind developments, there is a high likelihood that individual bird and bat fatalities will occur at the Project. However, it is unlikely that Plum Creek will affect species at the population level.

Three recent studies are available with geographic proximity and comparable landscapes to Plum Creek that provide both pre- and post-construction data from which to draw correlative inferences about potential impacts on birds and bats: Odell Wind Farm (Odell) in Cottonwood, Jackson, Martin and Watonwan Counties, Minnesota; Red Pine Wind Energy Facility (Red Pine)

in Lincoln County, Minnesota; and Lakefield Wind Project (Lakefield) in Jackson County, Minnesota. All three projects have similar land cover types. Plum Creek has evaluated the pre- and post-construction data from these sites to inform its own minimization and mitigation measures.

Overall, adjusted fatality rates for all bird species vary between three to six birds/MW/year for the majority of post-construction fatality studies nationwide. Fatality estimates are relatively constant across the country except for in the Great Plains, where there appears to be lower avian fatality rates, and the Pacific region, where there may be slightly higher fatality rates. Most avian fatalities due to wind turbines are small passerines, about 60 percent of avian fatalities in publicly available reports in the United States. Fatality rates of migratory passerines increase in the spring and fall during migration (American Wind Wildlife Institute [AWWI], 2017). Based on the post-construction fatality studies outlined above, national averages for post-construction fatalities, and the AWWI's conclusions about geographic trends, Plum Creek anticipates that unavoidable avian fatalities due to collision will be at or below the national average and may result in limited localized impacts to some groups of birds, such as small passerines.

Potential unavoidable impacts from the Project on bats are expected to be similar to the post-construction fatality rates at the above wind facilities, based on the similar land uses within the Project Area, geographic proximity of the projects, and similarities in species composition. Tree-roosting bats that migrate, including the hoary bat, silver-haired bat, and eastern red bat, which were detected during the Project's pre-construction studies, may have the highest risk of collision based on previous bat fatality studies (AWWI, 2017). Overall, risk of mortality to bats in the Project Area is likely to be greatest on nights during fall migration, when bat migration rates are the highest. During the fall migration, weather conditions that are most conducive to higher mortality rates occur with warm temperatures (greater than 50 degrees Fahrenheit) and low wind speeds (less than 6.5 m/s or 14 mph) (Baerwald and Barclay, 2009; Arnett et al., 2011; Good et al., 2011; Cryan and Brown, 2007). In addition, risk may be higher on the first night following the passage of a low-pressure system when the prevailing wind shifts from a southerly to a northerly direction (Cryan and Brown, 2007; Good et al., 2011). Additional impacts may include a small reduction in the available habitat that some wildlife uses for forage or cover; however, operation of the Project will not significantly change the existing land use.

Plum Creek will implement the following measures to the extent practicable to help avoid potential impacts to wildlife in the Project Area during selection of the turbine locations and subsequent Project development and operation:

- Prioritize turbine siting in cultivated cropland.
- Avoid siting turbines in mapped native prairie, native plant communities, and Sites of Biological Significance (SOBS) (all ranks).
- Maintain, at a minimum, the 3 by 5 times the rotor diameter setback from adjacent Wildlife Management Areas and Waterfowl Production Areas to reduce risk to waterfowl/waterbirds and grassland-associated birds when siting turbines in the Project Area.
- Avoid siting turbines within a 1,000-foot habitat connectivity buffer of forested areas associated with Highwater and Dutch Charley Creeks.

- Avoid or minimize disturbance of individual wetlands or drainage systems during Project construction. Wetland delineations will be conducted prior to construction to identify the limits of wetland boundaries in the vicinity of Project activities.
- Conduct one year of post-construction Project monitoring for birds and bats to assess operational impacts to birds and bats.
- Protect existing trees and shrubs by avoiding tree removal for turbines, access roads, and underground collector lines. These will be identified based on aerial photos and during field surveys.
- Maintain sound water and soil conservation practices during construction and operation of the Project to protect topsoil and adjacent resources and to minimize soil erosion. To minimize erosion during and after construction, best management practices (BMPs) for erosion and sediment control will be used. These practices include silt fencing, temporary seeding, permanent seeding, mulching, filter strips, erosion blankets, grassed waterways, and sod stabilization.
- Construct wind turbines using tubular monopole towers.
- Light turbines according to FAA requirements, which may include ADLS radar.
- Revegetate non-cropland and pasture areas disturbed during construction or operation with an appropriate native seeding mix.
- Inspect and control noxious weeds in areas disturbed by the construction and operation of the Project.
- Prepare and implement an Avian and Bat Protection Plan (ABPP) during construction and operation of the Project. A draft ABPP is attached to the Site Permit Application as Appendix G. This ABPP consists of Geronimo's corporate standards for minimizing impacts to avian and bat species during construction and operation of wind energy projects. The ABPP has been developed in a manner that is consistent with the guidelines and recommendations of the U.S. Fish and Wildlife Service (USFWS) WEG (USFWS, 2012). It includes Plum Creek's commitments to wind farm siting and transmission route suitability assessments, construction practices and design standards, operational practices, permit compliance, and construction and operation worker training. It also includes additional avoidance and minimization measures that may be implemented in consultation with the USFWS and Minnesota Department of Natural Resources (MNDNR) if avian and bat mortalities exceed an acceptable level.
- The HVTL Project will be constructed and operated according to Avian Power Line Interaction Committee (APLIC) recommended standards to reduce the potential for avian collisions and electrocutions (APLIC, 2006; APLIC, 2012).

Plum Creek is committed to minimizing wildlife impacts within the Project Area. Plum Creek has designed both layouts to minimize avian impacts by siting all turbines in cultivated cropland and avoiding high use wildlife habitat (woodlands adjacent to farmsteads), using tubular towers to minimize perching, placing electrical collection lines underground as practicable, and minimizing infrastructure. Plum Creek continues to consult with the Commission, USFWS, and MNDNR regarding appropriate mitigation measures for wildlife impacts.

10.2 TRANSMISSION GEN TIE ASSOCIATED FACILITY

10.2.1 Transmission Line Project Study Area

The Transmission Line Project Study Area was developed to include an area large enough to accommodate a reasonable number of segment options to connect the proposed Project to the existing Brookings to Hampton 345 kV transmission line approximately 16 miles to the north. The Transmission Line Project Study Area is approximately 22 miles long (north-south) and up to six miles wide (east-west) and includes the three facilities for which the proposed Transmission Line would connect: Collector Substation 2, Collector Substation 1, and the switching station. The purpose of identifying a Transmission Line Project Study Area for the Transmission Line was to establish boundaries and limits for landowner outreach for voluntary easements, the information-gathering process (*e.g.*, identifying environmental and land use resources, routing constraints, and routing opportunities), and the subsequent development of segment options for the Transmission Line. The Transmission Line Project Study Area became the Transmission Line Notice Area for the CN process.

10.2.2 Description of Environmental Setting

The MNDNR and the U.S. Forest Service have developed an Ecological Classification System (ECS) for ecological mapping and landscape classification in Minnesota that is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features (MNDNR, undated). Through the ECS, the State of Minnesota is split into Ecological Provinces, Sections, and Subsections. All of the Application segments are located entirely within the Prairie Parkland Province and the North Central Glaciated Plains section (251B). All four segments cross the Coteau Moraines ecological subsection in the southern portion of the Transmission Line Project Study Area, and the Blue and Red segments cross into the Minnesota River Prairie ecological subsection as these segments move north.

The Coteau Moraines ecological subsection is characterized as a transition from shallow deposits of windblown silt (loess) over glacial till to deeper deposits of loess. A steep escarpment marks the northeast edge of the subsection. The depth to bedrock in this subsection is 600 to 800 feet through most of this area. Soils are loamy and well-drained with thick dark surface horizons. Annual precipitation in the Coteau Moraines subsection ranges from 24 inches in the west to 27 inches in the east and averages 145 to 150 days in length. Prior to Euro-American settlement, vegetation in this subsection was almost entirely tallgrass prairie. Wet prairies were restricted to narrow stream margins and forests were similarly restricted to ravines along a few streams, such as the Redwood River. Currently, land used in this subsection is agricultural activity and remnants of tallgrass prairie are rare (MNDNR, 2019a).

The Minnesota River Prairie ecological subsection is characterized by large till plains that are bisected by the broad valley of the Minnesota River (MNDNR, 2019b). The Minnesota River was formed by Glacial River Warren which drained Glacial Lake Agassiz. Topography outside of the river valley in this subsection consists of level to gently rolling ground moraine. Soils in this subsection are predominantly well- to moderately well-drained loams formed in gray calcareous till of the Des Moines lobe with some localized inclusions of clayey, sandy, and gravelly soils. Annual precipitation in this subsection ranges from 25 inches in the west to 30

inches in the east and the growing season is approximately 147 to 152 days in length. Prior to Euro-American settlement, vegetation in this subsection was predominantly tallgrass prairie interspersed by many islands of wet prairie and areas of deciduous forest along the margins of the Minnesota River, floodplains, and other small streams. Current land use in the subsection is dominated by agricultural activity and remnants of tallgrass prairie are rarely found (MNDNR, 2019b).

Most of the area crossed by the segments is between 1,060 and 1,280 feet above mean sea level, with elevation gradually decreasing from south to north.

10.2.3 Land Use and Human Settlement

Depending on the final route selected, the Transmission Line crosses parts of Cottonwood and Redwood Counties that are predominantly zoned agricultural. Where route alignments cross parcels zoned as residential, commercial or industrial, the proposed alignments are on the opposite side of the road of the parcel boundary and, therefore, will not impact areas zoned as commercial, industrial, or residential, regardless of which route is ordered.

Displacement is defined as compelling a person or persons to leave their home. Plum Creek developed the Transmission Line to be co-located with existing infrastructure (*i.e.*, roads) and property boundaries and to avoid proximity to residential and non-residential structures. In addition, where residences are located within 500 feet of the Transmission Line, Plum Creek made every effort to site the Transmission Line on the opposite side of existing roads or along property lines to minimize disruptions to residences during construction and operation of the Transmission Line. No residences are within the 150-foot right-of-way of the proposed alignments for the Transmission Line. Additionally, Plum Creek has worked with landowners on the placement of potential facilities on their properties, incorporating a number of factors such as landowner preference, constructability, and environmental and human settlement impacts. Therefore, no displacement is anticipated as a result of the Transmission Line.

10.2.4 Public Health and Safety

Public emergency services within the Transmission Line Project Study Area are provided by local law enforcement and emergency response agencies located in nearby communities. The sheriff's offices of Cottonwood, Murray, and Redwood Counties provide law enforcement to communities in the Transmission Line Project Study Area. Fire safety services are provided by city and community fire departments, including Windom, Redwood Falls, Marshall, Lamberton, and Wabasso. Ambulance response in the Transmission Line Study Area is provided by local ambulance services in Windom, Marshall, and Wabasso.

There are eight towers that are a part of the Allied Radio Matrix for Emergency Response (ARMER) in Cottonwood, Murray, and Redwood Counties (Minnesota Department of Public Safety (MDPS), 2018). These ARMER towers are part of Minnesota's Statewide Communication Interoperability Plan, which aims to improve communication for emergency responders. There are no ARMER towers within one mile of any of the Application segments; the nearest ARMER tower to Application segments is located in Vesta, which is 3.2 miles north

of the northern end of the Transmission Line (MDPS, 2018). No impacts on ARMER towers are anticipated.

The influx of workers to construct the Transmission Line would not be expected to influence emergency or public health services. Local law enforcement resources may be utilized for traffic control and law enforcement during construction activities. In the event that emergency services are needed for local residents during construction, construction will stop, and any impeding equipment will be relocated so that emergency vehicles may access the emergency site. Once construction is complete, the Transmission Line will not impede emergency services. As such, construction and operation of the Transmission Line will have minimal impacts on the security and safety of the local populace.

The Transmission Line will be designed to local, state, and National Electrical Safety Code safety standards. The proposed Transmission Line will be equipped with protective devices to prevent damage from Transmission Line or pole falls or other potential accidents. Proper signage around the Transmission Line will warn the public of the safety risks associated with the energized equipment. The construction of the Transmission Line is not expected to have a negative impact on public health or safety. Construction crews will comply with Occupational Safety and Health Administration measures to ensure their own safety.

Plum Creek will work with landowners as necessary to appropriately ground fences, gates, buildings, or other structures that may be subject to induced current from the line and educate landowners on these concerns and protective measures. Should landowners identify safety concerns, Plum Creek will investigate and take appropriate corrective action.

The Transmission Line will be equipped with protective devices (circuit breakers and relays located in substations where transmission lines terminate) to safeguard the public in the event of an accident, or if a structure or conductor falls to the ground. The protective equipment will de-energize the Transmission Line should such an event occur. In addition, substation facilities will be properly fenced and accessible only by authorized personnel.

10.2.5 Land-Based Economies

Within the Transmission Line Study Area, Plum Creek analyzed the potential impacts to agriculture, tourism, forestry and mining land-based economies.

The Application segments were developed with attention to minimizing farmland impacts; however, permanent impacts to farmland will occur where structures are placed in cultivated fields. Structures in cultivated fields act as barriers and can hinder efficient operation of large machinery. As proposed, the Transmission Line predominately follows roads and property lines. Plum Creek proposes to minimize farmland impacts by placing structures along field edges, as closely as feasible (approximately 10 feet) from the edge of road rights-of-way or parcel lines.

Furthermore, Plum Creek will work with landowners to identify appropriate locations for the Transmission Line structures. The final spacing and location of structures will be designed to accommodate the movement of farm equipment within cultivated fields while still maintaining safety and design standards. The estimated permanent impacts from each transmission structure

foundation will be up to nine feet in diameter at the surface. In addition, Plum Creek estimates that the proposed switching station will result in approximately 15 acres of construction impact on cultivated crops.

Post-construction restoration efforts will include restoration of any temporary access modifications and deep plowing to remove compaction. Both crop and livestock activities will be able to continue around Transmission Line facilities after construction. While no impacts to cultivated land are anticipated during operation of the Transmission Line, if impacts to crops do occur during operation or maintenance of the Transmission Line, Plum Creek will compensate the landowner or farm operator for crop damages.

Plum Creek will work with the Minnesota Department of Agriculture to develop an Agriculture Impact Mitigation Plan for the Transmission Line. This plan will outline best practices to minimize and mitigate for agriculture impacts, including measures to protect farmland. The Transmission Line may result in the removal or trimming of trees within and/or adjacent to the Transmission Line right-of-way to ensure it is clear of obstructions. Vegetation management is necessary for the safe operation of the Transmission Line as tree branches can cause stress on transmission lines and increase the risk of outages, especially in areas with a strong wind resource, which is typical of this area of the state.

To the extent possible, Plum Creek will try to minimize the need for trimming and removal of trees during construction and operation of the Transmission Line. Where trimming of trees is necessary, it will be performed by an arborist familiar with best practices for tree trimming so as to minimize stress on the tree.

Construction of the Transmission Line is not anticipated to affect available tourism and recreational opportunities. None of the Application segments would impact the Laura Ingalls Wilder Museum and Gift Store or any of the associated historic sites. Construction and operation of the Transmission Line is not expected to impact public access to any of the festivals associated with the museum. Any impacts to tourism would mostly be related to Transmission Line construction, which will be temporary and isolated to specific areas.

No mining resources will be impacted by the proposed Transmission Line; therefore, no mitigation measures are proposed.

10.2.6 Archeological and Historical Resources

Information regarding the location of previously documented cultural resource sites was taken into consideration during initial segment design. Plum Creek made efforts to design the segments to avoid any physical impacts to all previously documented cultural resources either by segment alteration. Following final route selection, Plum Creek will initiate consultation with the Minnesota State Historic Preservation Office (SHPO) to determine if additional mitigation efforts would be required.

It is understood that the area surrounding the Transmission Line also has potential to contain additional, previously undocumented cultural resources. Archaeological resources would most likely be located on or near elevated landforms near permanent water sources. Additionally, construction of transmission structures may impact viewshed integrity of existing historic

architectural resources. For this Transmission Line, Plum Creek will conduct a Phase Ia Literature Search to assess the potential for unrecorded cultural resources within a larger buffer along the proposed segments. The study will meet the standards established in the *SHPO Manual for Archaeological Projects in Minnesota.* This investigation will be conducted by a professional archaeologist meeting the Secretary of the Interior's Standards for Archaeology as published in Title 36 Code of Federal Regulations Part 6. The completed Phase Ia Literature Search will be shared with SHPO for review and comment.

If cultural resources are identified as a result of the Phase Ia review, avoidance is the primary mitigation measure to reduce impacts to archaeological and historic architectural resources during construction of the Transmission Line. Avoidance of resources may include minor adjustments to the Transmission Line design and designation of environmentally sensitive areas to be left undisturbed or spanned by the Transmission Line. If archaeological resources are discovered during construction, ground disturbing activity will be halted in that location, the SHPO will be notified, and appropriate measures will be implemented to assess and protect the resource. Additionally, if unanticipated human remains are discovered during construction, they will be reported to the State Archaeologist per Minn. Stat. § 307.08, and construction will cease in that area until adequate mitigation measures have been developed between Plum Creek and the State Archaeologist.

10.2.7 Effects on Natural Environment

10.2.7.1 Air Quality

Construction of the Transmission Line will result in intermittent and temporary emissions of criteria pollutants. These emissions generally include dust generated from soil disturbing activities, such as earthmoving and wind erosion associated with right-of-way clearing and construction, combustion emissions from construction machinery engines, and indirect emissions attributable to construction workers commuting to and from work sites during construction. These emissions will be dependent upon weather conditions, the amount of equipment at any specific location, and the period of operation required for construction at that location. Air pollutants from the construction equipment will be limited to the immediate vicinity of the construction area and will be temporary. Therefore, it is not anticipated that construction activities will independently cause or significantly contribute to an emission level that results in a violation of National Ambient Air Quality Standards.

The amount of dust generated would be a function of construction activity, soil type, soil moisture content, wind speed, precipitation, vehicle traffic, vehicle types, and road surface characteristics. Emissions would be greater during dry periods and in areas where fine-textured soils are subject to surface activity. If construction activities generate problematic dust levels, Plum Creek may employ construction-related practices to control fugitive dust such as application of water or other commercially-available dust control agents on unpaved areas subject to frequent vehicle traffic, reducing the speed of vehicular traffic on unpaved roads, and covering open-bodied haul trucks.

During operation of the Transmission Line, air emissions would be minimal. A small, insignificant amount of ozone is created due to corona from the operation of transmission lines

(Electric Power Research Institute, 1982; Whitmore and Durfee, 1973; U.S. Department of Energy, Bonneville Power Administration, 1989). A corona signifies a loss of electricity and Plum Creek has engineered the Transmission Line so as to limit the corona. The production rate of ozone due to corona discharges decreases with humidity and less significantly with temperature. Rain causes an increase in ozone production, but also accelerates the decay of ozone. Ozone production by high voltage transmission lines is not detectable during fair weather above ambient conditions. Ozone production under wet-weather conditions is detectable with special efforts but is still considered insignificant.

Design of the Transmission Line also influences ozone production rate. The production rate decreases significantly as the conductor diameter increases and is greatly reduced for bundled conductors over single conductors. The production rate of ozone increases with applied voltage. The emission of ozone from the operation of a transmission line of the voltages proposed for the Transmission Line is not anticipated to have a significant impact on the environment.

10.2.7.2 Primary Water Resources

The Transmission Line may require transmission line structures to be placed within the Federal Emergency Management Agency designated 100-year floodplain areas. The placement of transmission line structures in floodplains is not anticipated to alter the flood storage capacity of the floodplain based on the minimal size of individual transmission line structures. Plum Creek will work with Redwood County to permit any structures in floodplains.

The Transmission Line will have minor, mostly short-term effects on surface water resources. Plum Creek will design the Transmission Line to minimize or avoid impacts to surface water resources to the extent feasible. The Transmission Line will be designed to span surface water resources and floodplains where practicable and to minimize the number of structures in surface water resources where these resources cannot be spanned.

Plum Creek met with the MNDNR in October 2018 to discuss potential segment options. Specific to waterbody crossings, the MNDNR suggested reconsideration of the proposed crossing of the Cottonwood River along County State Aid Highway (CSAH) 5. However, MNDNR indicated the low area adjacent to the Cottonwood River along CSAH 5 provides wildlife habitat and frequently floods due to rain and spring melting. MNDNR suggested avoiding this area, and Plum Creek implemented this Application alignment suggestion. However, Plum Creek has not been able to secure voluntary easements along the alignment suggested by MNDNR.

Plum Creek will work with the MNDNR to ensure all proper licenses and approvals are obtained for Public Waters Inventory (PWI) crossings by the Transmission Line. Through the license approval process, Plum Creek and the MNDNR will determine the appropriate mitigation measures for PWI crossings.

Plum Creek will obtain a National Pollutant Discharge Elimination System (NPDES) permit from the Minnesota Pollution Control Agency (MPCA) for construction of the Transmission Line. Plum Creek will also develop a Stormwater Pollution Prevention Plan

(SWPPP) that complies with MPCA rules and guidelines. All waterways crossed will be maintained for proper drainage through the use of temporary culverts or other temporary crossing devices, according to BMP and permit requirements. If tree removal is required along waterways, trees will be cut so that the root system is not disturbed to retain bank stability. Sediment barriers, if deemed necessary, will be used along waterways and slopes during construction to protect from soil erosion and sedimentation. Additionally, if new access roads for vehicles and equipment are required, access roads will be selected to avoid disturbance to stream banks. No permanent impacts to surface water resources are anticipated.

10.2.7.3 Water Quality

Construction of the proposed Transmission Line could potentially impact water quality. Rivers, streams, and ditches crossed by the Application segments are narrow enough to be spanned with normal spacing of the structures so that all structures can be placed outside of these features. Short-term, minor, Transmission Line-related water quality impacts may occur during the construction of the proposed Transmission Line even though mitigation measures will be implemented to prevent sedimentation. These impacts would be associated with the soils from areas disturbed during construction being washed by stormwater into adjacent waters during rainstorm events. Increased turbidity and localized sedimentation of the stream bottom may occur from the runoff. If any of these events occur, however, these impacts would be temporary and would not significantly alter water quality conditions due to the minimal soil disturbance that is expected to occur in any one location during construction of the Transmission Line. The construction and maintenance of the Transmission Line is not expected to disturb any subsurface waters.

Mitigation measures will be implemented to prevent or minimize surface water impacts. The MPCA, through the NPDES under the Clean Water Act, regulates construction activities that may impact stormwater runoff. An NPDES permit is required for construction activity disturbing: 1) one acre or more of soil; 2) less than one acre of soil, but part of a larger common plan of development or sale that is greater than one acre; or 3) less than one acre of soil, but that the MPCA determines poses a risk to water resources.

As discussed above, Plum Creek will apply for an NPDES permit from the MPCA and will develop a SWPPP that will identify BMPs to be implemented during construction to minimize erosion and sedimentation impacts to surface waters. Erosion and sedimentation abatement measures, for example, would be employed to decrease impacts to the hydrology of the Transmission Line Study Area. No fueling or maintenance of vehicles or application of herbicides would occur within 100 feet of streams, ditches, and waterways to protect against introduction of these materials into surface or groundwater systems. Materials such as fuels, lubricants, paints, and solvents required for construction would be stored away from surface water resources according to appropriate regulatory standards. Any spills or leaks would be cleaned up immediately and leaking equipment removed from the area for proper maintenance.

10.2.7.4 Groundwater

Wells in the area range from 23 feet to 290 feet deep. Structure foundations will generally range from 18 feet to 48 feet in depth. All foundation materials will be non-hazardous. Plum

Creek does not anticipate any impacts to groundwater resources during construction or operation of the Transmission Line as groundwater resources along the Application segments are at depths greater than proposed foundation depths. If shallow depths to groundwater resources are identified during geotechnical investigations, specialty structures requiring wider, but shallower, excavation for foundations may be used. Plum Creek will continue to work with the landowners to identify springs and any additional wells near the Transmission Line.

10.2.7.5 Wetlands

Wetlands located in the 150-foot wide right-of-way would be spanned and placement of structures within wetlands would be avoided to the extent practicable. Where it is not possible to span a wetland, Plum Creek identified several mitigation strategies to minimize impacts to wetlands including:

- Scheduling construction during frozen conditions where practicable;
- Use of construction mats when construction during frozen conditions is not feasible;
- Use of all-terrain construction equipment that is designed to minimize soil impact in damp areas;
- Use of the shortest route to the pole location in the wetland; and
- Assembling structures in upland areas, when feasible, before they are brought to the site for installation.

Wetlands impacted by construction will be restored as required by the United States Army Corps of Engineers (USACE). Vegetation maintenance requirements under transmission lines prohibit establishment of trees. Existing trees must be removed throughout the right-of-way that are determined by Plum Creek to pose a hazard to transmission line operation, including those in forested wetlands. Any mitigation required will be determined through consultation with USACE. Plum Creek will obtain all appropriate permits and approvals from the USACE, MNDNR, local government units, and watershed districts (if necessary) for any actions determined to occur in wetlands.

10.2.7.6 Flora

Impacts on flora for the segments will primarily be associated with cultivated crop areas. Other impacts to flora may be related to wind breaks, woodlots, fence rows, and other landscape features.

The majority of impacts would be temporary in nature and would be related to construction activities. Disturbance would be minimized by limiting vehicle traffic to the extent practicable to roads and pathways along the right-of-way, and within previously disturbed areas, restricting equipment to narrow paths within the right-of-way and spanning any sensitive areas, where practicable (*i.e.*, wetlands and SOBS).

10.2.7.7 Fauna

Plum Creek conducted a constraints analysis during the routing process to assess potential impacts to sensitive resources, including wildlife habitat. Where possible, Plum Creek designed the Transmission Line to avoid these resources. Given that the majority of the land use along Transmission Line is cultivated crop land, Plum Creek anticipates that the potential impacts on wildlife and wildlife habitat during construction and maintenance of the Transmission Line will be minimal. In addition, most impacts on wildlife habitat would be temporary with the exception of any necessary tree clearing and habitat conversion related to permanent Transmission Line features such as concrete foundations. Potential impacts on wildlife during construction would be primarily related to temporary disturbance and displacement; wildlife may be acclimated to human activity due to the agricultural activity within the Transmission Line Study Area.

During operations, birds, including eagles, may be injured or killed due to either collisions with the Transmission Line and associated Transmission Line components or electrocution. Avian collision risk may be greater during certain behaviors such as flushing, courtship displays, and aerial displays; these behaviors may distract birds such that they are less aware of nearby structures. Collision risk may also be greater if a powerline is located between roosting, feeding, or nesting areas. Individuals or species with poor vision, that are young or less agile, or that are unfamiliar with the area may also be at greater risk of collision with transmission lines. Electrocutions typically result when an individual bird's wingspan is equal to or greater than the distance between two energized and/or grounded components of a transmission line (APLIC, 2006).

Plum Creek will coordinate with USFWS and MNDNR as needed to identify avian movement pathways and migration flyways that may be crossed by the Application segments and to discuss areas along the Transmission Line that may need to be marked with avian flight diverters to minimize impacts to birds. In addition, the Transmission Line will be constructed and operated according to APLIC recommended standards to reduce the potential for avian collisions and electrocutions (APLIC, 2006; APLIC, 2012).

Potential impacts on eagles using these nests would be the same as those described above for other birds—specifically, potential injury or death due to collision and electrocution. Plum Creek will avoid and minimize these potential impacts through coordination with the USFWS and MNDNR, and adherence to APLIC recommended standards regarding avian collisions and electrocutions, as described above (APLIC, 2006; APLIC, 2012).

10.2.8 Rare and Unique Natural Resources

10.2.8.1 Federally Listed Species

The proposed Transmission Line may impact individual northern long-eared bats if clearing or construction occurs when the species is roosting, foraging, or raising pups in its summer habitat. The species may be injured or killed if occupied trees are cleared during the species' active window (*i.e.,* April 1 – October 31). In addition, northern long-eared bats may be disturbed during clearing or construction activities due to human presence or noise.

The USFWS published a final 4(d) rule for the northern long-eared bat on January 14, 2016. In the final 4(d) rule, the agency limited prohibitions for the species to those that would protect the bat in White Nose Syndrome (WNS)-affected geographic areas during the most vulnerable stages in the species' life history—specifically, during hibernation, spring staging, fall swarming, and pup rearing. (USFWS, 2016a). The Transmission Line is located within the USFWS-designated WNS Zone (USFWS, 2018b). Per the species' final 4(d) rule, within the WNS Zone, incidental take due to tree removal is prohibited as follows:

- If it occurs within 0.25 mile of a documented hibernaculum, or
- If it involves a documented maternity roost tree or other trees within 150 feet of the documented maternity roost tree during June or July.
- In addition, all take within known hibernacula is prohibited (USFWS, 2016a).

Records of documented hibernacula and roost trees are maintained in the MNDNR's National Heritage Information System (NHIS). Based on a review of northern long-eared bat records, Plum Creek determined that there are no documented northern long-eared bat maternity roost trees within 150 feet or hibernacula within 0.25 mile of the Application segments.

The Transmission Line does not cross prairie habitat for either prairie bush-clover or Dakota skipper. Therefore, impacts to these two species are not anticipated.

Plum Creek submitted a letter to the USFWS Minnesota-Wisconsin Field Office on October 1, 2018 introducing the Transmission Line and met with the USFWS Minnesota-Wisconsin Field Office staff in November 2018 to discuss the Transmission Line and federally-protected species that may occur in the Transmission Line Study Area. The USFWS did not provide a letter response, but topics covered in the November 2018 meeting included eagle nests and potential habitat for threatened and endangered species. The USFWS indicated the Project is primarily routed along roads and parcel lines and cultivated crops which do not provide habitat for federally listed species in Cottonwood, Murray, and Redwood Counties.

10.2.8.2 State-Listed Species

Based on the Plum Creek's NHIS review, no occurrences of state-listed threatened or endangered species are recorded within one mile of the Transmission Line. Overall, impacts on state species of special concern are expected to be insignificant given the limited number of occurrences within a mile of the Application segments, the dates of these records, the limited number of natural resource sites, and the predominant land uses (agriculture and developed).

Plum Creek sent a Transmission Line introduction letter to MNDNR in early October 2018 and held a follow-up meeting with MNDNR staff on October 22, 2018 to discuss impacts to sensitive resources, including state-listed species and state species of special concern. MNDNR has not provided a comment letter for the Project, but based on the October 2018 meeting, Plum Creek modified one of the routes near the Cottonwood River crossing based on comments from MNDNR. Plum Creek will continue to coordinate with the MNDNR to avoid and minimize adverse impacts on these species.

11.0 FACILITY INFORMATION FOR PROPOSED PROJECT AND ALTERNATIVES INVOLVING CONSTRUCTION OF AN LEGF (MINN. R. 7849.0320)

11.1 LAND REQUIREMENTS (MINN. R. 7849.0320(A))XX

The Project is located on land that is zoned for agricultural use. The Project will remove a total of between approximately 80 to 110 acres from agricultural use. Typical wind farms require approximately one-half to one acre per turbine for the turbine pad, transformer, access road, and associated infrastructure. The land requirements for the Project are consistent with the requirements for wind projects of a similar size. No relocation of people or businesses will be necessary for the Project.

11.1.1 Land Requirements for Water Storage

The Project will not require any land for water storage.

11.1.2 Land Requirements for Cooling System

The Project will not require any land for a cooling system.

11.1.3 Land Requirements for Solid Waste Storage

The Project will require minimal space in the maintenance facility for the storage of used oil and other lubricants, as well as for spare parts and tools.

11.2 TRAFFIC (MINN. R. 7849.0320(B))

During the construction phase, temporary impacts are anticipated on some public roads within the Project Area. Roads will be affected by the transportation of equipment to and from the Project Area and Project facilities. Some roads may also be expanded along specific routes as necessary to facilitate the movement of equipment. Construction traffic will use the existing county, state, and federal roadway system to access the Project Area and deliver construction materials and personnel. Construction activities will increase the amount of traffic using local roadways, but such use is not anticipated to result in adverse traffic impacts. O&M activities will not noticeably increase traffic in the Project Area.

The Project may also temporarily affect traffic numbers in the area due to construction traffic. During the construction phase, several types of light, medium, and heavy-duty construction vehicles will travel to and from the Project Area, as well as private vehicles used by construction personnel. Plum Creek estimates that there will be 475 large truck trips per day and up to 950 small-vehicle (pickups and automobiles) trips per day in the area during peak construction periods. The functional capacity of a two-lane paved rural highway is in excess of 5,000 vehicles per day. Currently, the heaviest traffic is on Minnesota Highway 30 located immediately south of Dovray at 1,100 average annual daily traffic.

After construction is complete, traffic impacts during the operations phase of the Project will be minimal. A small maintenance crew driving through the area in pickup trucks on a regular basis will monitor and maintain the wind turbines as needed. There would be a slight increase in traffic for occasional turbine and substation repair, but traffic function will not be impacted as a result.

Plum Creek will develop a transportation plan and road restoration agreement in cooperation with Cottonwood, Murray, and Redwood Counties and/or the applicable township road authorities. Impacted roadways will be restored per the road restoration agreement(s). Plum Creek will ensure that the general contractor communicates with the respective road authority(ies) throughout the construction process, particularly as it pertains to the movement of equipment on roads and those items identified within the road and transportation agreements.

Impacted roadways will be restored and improved per a formalized road agreement between Plum Creek and the relevant local governments. Plum Creek is currently coordinating with all applicable counties and townships on the development and execution of a single, cooperative Development, Road Use, and Drainage Agreement. Plum Creek will ensure that the general contractor communicates with the relevant road authorities throughout the construction process, particularly regarding the movement of equipment on roads and the terms of the Development, Road Use and Drainage Agreement.

11.3 Information Pertaining to Fossil-Fueled Activities (Minn. R. 7849.0320(C)-(D))

11.3.1 Fuel

The Project is not a fossil-fueled facility. The Project will be fueled by wind.

11.3.2 Emissions

The Project is not a fossil-fueled facility and will not release any emissions from the power generation process.

11.4 Water Usage for Alternate Cooling Systems (Minn. R. 7849.0320(E))

Wind power plants do not utilize cooling systems. Water requirements are, therefore, minimal, and limited to potable water needs for Project personnel. The water requirements of the O&M building will be met through the local rural water service or the installation of a well in accordance with applicable regulations.

11.5 Wastewater Discharges (Minn. R. 7849.0320(F))

No wastewater discharges will occur as a result of the construction or operation of the Project except for domestic-type sewage discharges of Project personnel. Temporary sanitary facilities will be provided during construction, and the O&M building may require a septic system, which will be installed in accordance with applicable regulations.

11.6 RADIOACTIVE RELEASES (MINN. R. 7849.0320(G))

The Project will not produce any radioactive releases.

11.7 SOLID WASTE (MINN. R. 7849.0320(H))

The only solid waste generated during the operation of the Project will be domestic wastes and used lubricants and other maintenance materials. These wastes and their disposition are summarized in Table 6.

Table 6: Summary of Wastes and Disposition

Waste Stream	Description	Estimated Annual Generation (tons)	Disposal Method
Used oil & oily debris	Hydraulic fluid, lubrication oil, grease, oil filters, oily rags	4.2	Used oil vendor picks up from site
Aerosol containers	Brake cleaners, solvents/ degreasers, and paint	0.03	Waste vendor picks up from site
Universal waste	Fluorescent light tubes, batteries	0.06	Waste vendor picks up from site
Compressed gas cylinders	Compressed gas cylinders	0.05	Exchanged with manufacturer
Solid waste (shop, warehouse, office, domestic and empty containers)	This waste includes solid waste that has not been contaminated by hazardous materials as well as empty containers. This waste is not hazardous waste.	12	The waste will be disposed in the solid waste dumpster or recycled if possible

11.8 NOISE (MINN. R. 7849.0320(I))

When in motion, the wind turbines emit audible sound. The level of this sound varies with the speed of the turbine and the distance of the listener from the turbine. Sound is generated from the wind turbine at points near the hub or nacelle and from the blade tips and trailing edges as they rotate. The most stringent noise standards, as regulated by the MPCA under Minn. R. Ch. 7030, is a 50 dB(A) L_{50} limit for nighttime noise levels.

Plum Creek proposes siting turbines the minimum 1,000 feet from residences plus the distance required to comply with the MPCA limit of a 50 dB(A) nighttime L_{50} noise level, if necessary (L_{50} is the median noise level or the level exceeded 50 percent of the time) (MPCA,

2015). The closest turbine to a non-participant residence in the GE-127 layout is 2,219 feet and in the Vestas layout is 2,700 feet. The closest turbine to a participating residence in the GE-127 layout is 1,224 feet and in the Vestas layout is 1,047 feet.

Plum Creek incorporated the Project-specific background sound monitoring data with turbine sound modeling using the Computer Aided Design for Noise Abatement (Cadna-A) software program to determine the sound levels at receptors within one mile of the Project Area. The monitoring methodologies and results are detailed in Appendix B of the Site Permit Application. The Cadna-A acoustical analysis software is designed for evaluating environmental noise from stationary and mobile sources and was used to calculate the L_{50} for all three turbine models. Assuming that wind speeds are at the maximum sound power level wind speed for each turbine model and are constant for an entire one-hour period, the L_{50} calculated by Cadna-A was compared to the MPCA L_{50} standard.

The analysis accounted for all noise generating elements associated with the proposed wind turbine models and layouts for the Project. All proposed primary wind turbines (noise sources) were modeled in Cadna-A and Project-related noise levels were calculated at 461 noise-sensitive receptors within the Project Area and a buffer of approximately one mile. Table 7 presents analysis results. The baseline noise isopleths of turbine-only sound (a line or curve of equal values) are depicted in Figures 6a-6c (Sound/Noise).

Table 7
Summary of Noise Assessment

Turbine Model	Noise Source	Statistic	Residence Classification		
			dB(A) Levels at All Residences	dB(A) Levels at Participating	dB(A) Levels at Non-Participating
GE-127	Turbine-Only Noise	Avg L_{50} Modeled	35	40	33
		Max L_{50} Modeled	46	46	44
		Min L_{50} Modeled	19	23	19
	Total Sound (Background + Turbine)[1]	Avg L_{50} Modeled	43	44	43
		Max L_{50} Modeled	47	47	46
		Min L_{50} Modeled	42	42	42
V150	Turbine-Only Noise	Avg L_{50} Modeled	31	36	29
		Max L_{50} Modeled	46	46	41
		Min L_{50} Modeled	13	20	13

Table 7
Summary of Noise Assessment

Turbine Model	Noise Source	Statistic	Residence Classification		
			dB(A) Levels at All Residences	dB(A) Levels at Participating	dB(A) Levels at Non-Participating
	Total Sound (Background + Turbine)[1]	Avg L_{50} Modeled	42	43	42
		Max L_{50} Modeled	48	48	44
		Min L_{50} Modeled	42	42	42
V162	Turbine-Only Noise	Avg L_{50} Modeled	30	35	28
		Max L_{50} Modeled	45	45	40
		Min L_{50} Modeled	12	19	12
	Total Sound (Background + Turbine)[1]	Avg L_{50} Modeled	42	43	42
		Max L_{50} Modeled	47	47	44
		Min L_{50} Modeled	42	42	42

[1] The average Project nighttime sound was monitored at 42 dB(A) (L_{50})

Maximum calculated sound levels at all residential receptors for all turbine models are below the nighttime L_{50} noise limit of 50 dB(A). The maximum calculated sound level, based on assumptions incorporated into the Cadna-A model and the turbine layouts, results in a 46 dB(A) L_{50} at the nearest noise-sensitive receptor (maximum Project-related L_{50} range from 40 to 46 dB(A)). Average Project-related sound levels at residences for all turbine models range from 30 to 35 dB(A), on an hourly L_{50} basis. As depicted in the multi-turbine constraint maps and in Table 7, all turbine models and layouts comply with MPCA noise guidelines at residential receptors

Plum Creek has sited turbines to minimize noise impacts to residents. In addition, each proposed turbine model has sound mitigation built into the turbine in the form of serrated trailing edges (STE) on the Vestas turbines or low-noise trailing edges (LNTE) on the GE turbines. In addition, some of the turbines in each layout use noise reduced operations.

Plum Creek has incorporated the 2019 LWECS Application Guidance and sited turbines so that turbine-only noise is < 45 dB(A) at non-participating residences and < 47 dB(A) at participating residences. The layouts have been modeled to help ensure cumulative impacts from all wind turbines, and maximum calculated noise levels for all turbine models are below the MPCA's nighttime L_{50} noise limit of 50 dB(A) at residential receptors. To the extent that the sound characteristics of the selected turbine vary, Plum Creek will ensure compliance with

MPCA noise standards by re-running the noise modeling and making any necessary adjustments the Project design meet those requirements.

11.9 WORK FORCE FOR CONSTRUCTION AND OPERATION (MINN. R. 7849.0320(J))

Onsite, physical construction of the Project is anticipated to be completed by October 2022. During this time, approximately 250 construction jobs will likely be created. Between 11 and 15 permanent positions will likely be created to operate the Project.

The civil contractor will be the lead entity for the construction management of the Project. The primary civil, erection, and electrical contractors will use, where possible, the services of local contractors to assist in the construction of the Project.

Plum Creek will self-perform the turbine preventive and small corrective maintenances or utilize the operations team. Large corrective repairs will be performed by third-party contractors. The Balance of Plant (BOP) maintenance and inspections will be self-performed. The operations phase of the Project will require up to 15 full-time staff to perform the turbine and BOP inspections and maintenance.

11.10 NUMBER AND SIZE OF TRANSMISSION FACILITIES (MINN. R. 7849.0320(K))

Construction of the Project will include up to 110 wind turbines, each potentially with a pad-mounted transformer at its base and with underground and/or aboveground electrical collection and fiber optic communication systems. These wires will connect the Project's wind turbines to the collector substations and provide communications between the wind turbines, substations, O&M facility and electrical grid. Where underground, the wires will be placed in the same trench wherever possible and will include a marking system and occasional aboveground junction boxes. All of the collection circuits will connect to Plum Creek's two collector substations, which will have a fiber optic connection to the O&M facility and a communication system to the grid operator. The power delivered to the Project substation will be converted to 345 kV. There will then be a 345 kV transmission line segment connecting Collector Substation 1 to Collector Substation 2, and an additional segment connecting Collector Substation 2 to the switching station which will interconnect into the existing Brookings to Hampton 345 kV transmission line. This Transmission Line and switching station will be addressed in a separate route application. All grid to Project communications will be specified by the interconnecting utility(ies) under a Generator Interconnection Agreement.

12.0 OTHER FILINGS AND PERMITS

12.1 EXEMPTION REQUEST

On November 9, 2018, Plum Creek requested an exemption from several of the informational requirements in Minn. R. Ch. 7849. On January 17, 2019, the Commission granted Plum Creek's Exemption Request.[61]

12.2 ENVIRONMENTAL REPORT

Pursuant to Minn. R. 7849.1000 - .2100, the Department is required to prepare an Environmental Report for any large energy facility for which a CN must be obtained.

12.3 SITE & ROUTE PERMIT

Plum Creek will also submit to the Commission a Site Permit Application for a Large Wind Energy Conversion System, as required by Minn. Stat. § 216F.04 and a Route Permit Application for a High-Voltage Transmission Line, as required by Minn. Stat. § 216E.03. Plum Creek's Site Permit Application is available in Docket No. IP6997 /WS-18-700 and the Route Permit Application is available in Docket No. IP6997 /TL-18-701.

12.4 OTHER PROJECT PERMITS

Project permits and approvals that may be necessary to complete the Project are listed in Tables 8 and 9. Plum Creek will obtain these approvals, as necessary, prior to Project construction.

Table 8
Potential Wind Farm Permits and Approvals

Administering Agency	Permit, Approval, or Consultation	Status and Applicability to the Project
Federal		
U.S. Army Corps of Engineers	Wetland Delineation Approvals Jurisdictional Determination Federal Clean Water Act Section 404	Wetland delineations will be completed prior to construction; Plum Creek anticipates impacts will be within the Nationwide Permit 51 threshold.
U.S. Fish and Wildlife Service (USFWS)	Review for Threatened and Endangered Species	Based on coordination with USFWS, a Take Permit is not anticipated for the Project.
Environmental Protection Agency (Region 5) in	Spill Prevention Control and Countermeasure Plan	Plum Creek will develop a Spill Prevention Control and Countermeasure Plan for use

[61] Order, *In the Matter of the Application of Plum Creek Wind Farm, LLC for a Certificate of Need for an up to 414 MW Large Wind Energy Conversion System and 345 kV Transmission Line in Cottonwood, Murray, and Redwood Counties, Minnesota*, Docket No. IP-6997/CN-18-699 (Jan. 17, 2019), eDockets Doc. ID 20191-149302-01.

Table 8
Potential Wind Farm Permits and Approvals

Administering Agency	Permit, Approval, or Consultation	Status and Applicability to the Project
coordination with the Minnesota Pollution Control Agency (MPCA)		during construction and operation of the Project to minimize risk of site contamination.
Federal Aviation Administration (FAA)	Form 7460-1 Notice of Proposed Construction or Alteration (Determination of No Hazard)	Plum Creek will re-submit Form 7460-1 for the turbine locations in Q4 2019 to initiate FAA review of the layout and ADLS.
	Notice of Actual Construction or Alteration (Form 7460-2)	After construction is complete, Plum Creek will submit Form 7460-2 for the turbine locations.
State of Minnesota		
Board of Water and Soil Resources (BWSR)	Wetland Conservation Act approvals	Plum Creek has coordinated with the USACE and conducted a desktop review of wetlands and potential impacts with the MNDNR update to NWI data. Based on this desktop data, the Project will fall under the Nationwide Permit 51 threshold for impacts. Prior to construction, Plum Creek will conduct wetland delineations to confirm wetland boundaries and impacts based on final design.
Minnesota Public Utilities Commission	Certificate of Need	Submitted November 12, 2019.
	Site Permit for Large Wind Energy Conversion System	Submitted concurrent with this Certificate of Need Application.
	Route Permit for electric transmission line	Submitted concurrent with this Certificate of Need Application.
Minnesota State Historic Preservation Office (SHPO)	Minnesota Statute 138; Cultural and Historic Resources Review and Review of State and National Register of Historic Sites and Archeological Survey	Plum Creek has coordinated with SHPO, conducted a literature review of the Project Area, and Project Facilities avoided previously identified archaeological sites. Plum Creek will conduct surveys for previously unidentified cultural resources in high-potential areas in spring/summer 2020. Plum Creek will coordinate with SHPO on the protocol and any potential mitigation.
MPCA	Section 401 Water Quality	Concurrent with Section 404,

Table 8
Potential Wind Farm Permits and Approvals

Administering Agency	Permit, Approval, or Consultation	Status and Applicability to the Project
	Certification	Clean Water Act – Plum Creek will meet the Minnesota conditions
	National Pollutant Discharge Elimination System Permit – MPCA General Stormwater Permit for Construction Activity	After the Site Permit is Ordered by the Commission, Plum Creek will submit NPDES Permit. The permit is required to be submitted within 30 days of the start of construction. The NPDES permit will cover the Transmission Line and Wind Farm.
	Very Small Quantity Generator License – Hazardous Waste Collection Program	To be obtained prior to construction.
	Aboveground Storage Tank Notification Form	To be obtained prior to construction.
Minnesota Department of Natural Resources	License to Cross Public Waters	Plum Creek will submit its License to Cross Public Waters based on a final Project design.
	Native Prairie Protection Plan	After the Site Permit is Ordered by the Commission, Plum Creek will submit its Native Prairie Protection Plan.
	General Permit for Water Appropriations (Dewatering)	To be obtained prior to construction.
	Public Waters Work Permit	To be obtained prior to construction.
Minnesota Department of Transportation (MNDOT)	Utility Permits on Trunk Highway Right-of-way (Long Form No. 2525)	To be obtained prior to construction.
	Oversize/Overweight Permit for State Highways	To be obtained prior to construction.
	Access Driveway Permits for MNDOT Roads	To be obtained prior to construction.
	Tall Structure Permit	To be obtained prior to construction.
Local		
Cottonwood, Murray, and Redwood Counties	Right-of-way permits, crossing permits, driveway permits for access roads, oversize/overweight permits for County Roads	Plum Creek will enter into a Development, Road Use, and Drainage Agreement prior to construction.
Townships	Right-of-way permits, crossing permits, driveway permits for access	Plum Creek will enter into a Development, Road Use, and

Table 8 Potential Wind Farm Permits and Approvals		
Administering Agency	**Permit, Approval, or Consultation**	**Status and Applicability to the Project**
	roads, oversize/overweight permits for township roads	Drainage Agreement prior to construction.

Table 9 Potential Transmission Line Permits and Approvals		
Administering Agency	**Permit, Approval, or Consultation**	**Status and Applicability to the Project**
Federal		
Federal Aviation Administration	Form 7460-1, Notice of Proposed Construction in compliance with 14 CFR § 77.9	After the Route Permit is Ordered by the Commission, Plum Creek will submit Form 7460-1 for the structure locations.
U.S. Army Corps of Engineers (USACE), St. Paul District	Section 404, CWA – Dredge and Fill	Plum Creek has coordinated with the USACE and conducted a desktop review of wetlands and potential impacts with the MNDNR update to NWI data. Based on this desktop data, the HVTL Project will fall under the Regional General Permit threshold for impacts. Once a route is ordered, Plum Creek will conduct wetland delineations to confirm wetland boundaries and impacts based on final design.
U.S. Fish and Wildlife Service (USFWS)	ESA of 1973, Section 9 Incidental or Non-Purposeful Take Permit, if deemed necessary	Based on coordination with USFWS, a Take Permit is not anticipated for the HVTL Project.
State of Minnesota		
Minnesota Public Utilities Commission	Certificate of Need and Route Permit	Submitted concurrent with this Application.
Minnesota Pollution Control Agency (MPCA)	Section 401 CWA Water Quality Certification	Concurrent with Section 404, CWA – Plum Creek will meet the Minnesota conditions.
MPCA	National Pollutant Discharge Elimination System Stormwater Permit (NPDES)	After the Route Permit is Ordered by the Commission, Plum Creek will submit NPDES Permit. The permit is required to be submitted within 30 days of the start of construction. The NPDES permit will cover the HVTL Project and Wind Farm.

Table 9
Potential Transmission Line Permits and Approvals

Administering Agency	Permit, Approval, or Consultation	Status and Applicability to the Project
Board of Water and Soil Resources (BWSR)	Wetland Conservation Act approvals	Plum Creek has coordinated with the USACE and conducted a desktop review of wetlands and potential impacts with the MNDNR update to National Wetlands Inventory data. Based on this desktop data, the HVTL Project will fall under the Regional General Permit threshold for impacts. Once a route is ordered, Plum Creek will conduct wetland delineations to confirm wetland boundaries and impacts based on final design.
Minnesota Department of Natural Resources (MNDNR)	License to Cross Public Waters	After the Route Permit is issued by the Commission, Plum Creek will submit its License to Cross Public Waters.
MNDNR	State Protected Species Consultations	NHIS request submitted 10/30/2019. Plum Creek will continue coordinating with MNDNR.
Minnesota State Historic Preservation Office (SHPO)	Minnesota Statutes, Chapter 138 (Minnesota Field Archaeology Act and Minnesota Historic Sites Act)	Plum Creek has coordinated with SHPO, conducted a literature review of the route segments, and avoided and previously identified archaeological sites within the right-of-way. Once a route is designated by the Commission, Plum Creek will conduct surveys for previously unidentified cultural resources in high-potential areas. Plum Creek will coordinate with SHPO on the protocol and any potential mitigation.
Minnesota Department of Transportation (MNDOT)	Utility Permit on Trunk Highway Right-of-Way (Long Form No. 2525)	Plum Creek is coordinating the MNDOT on crossings of US-14 and MN-68.
MNDOT	Driveway Access	To be obtained prior to construction.
MNDOT	Oversize/overweight permits	To be obtained prior to construction.
Minnesota Department of Agriculture (MDA	Agricultural Impact Mitigation Plan	Plum Creek will prepare an Agricultural Impact Mitigation Plan, and have it reviewed and approved by MDA.

Table 9
Potential Transmission Line Permits and Approvals

Administering Agency	Permit, Approval, or Consultation	Status and Applicability to the Project
Local		
County, Township, City, BWSR	Minnesota Wetland Conservation Act approvals	
Redwood County	Floodplain Development Permit	Plum Creek will obtain a Floodplain Permit for structures placed with the floodplains depending on the route designated by the Commission.
County, Township, City	Right-of-way/utility permits	Plum Creek is coordinating with Cottonwood and Redwood Counties.
County, Township, City	Overwidth/overweight loads permits	To be obtained prior to construction.
County, Township, City	Road crossing permits	To be obtained prior to construction.
County, Township, City	Driveway/access permits	To be obtained prior to construction.

PUBLIC DOCUMENT – NONPUBLIC DATA HAS BEEN EXCISED

Appendix A

Project Costs

Plum Creek Wind Farm, LLC
Docket No. IP6997 / CN-18-699
November 2019

APPENDIX A: PROJECT COSTS

Section 5.3.1.1 Capacity Costs

Plum Creek has estimated the cost for the project to be **[NONPUBLIC DATA HAS BEEN EXCISED]** per kWh over the 30-year project life.

Section 5.3.1.5 Variable Operating and Maintenance Costs

Variable maintenance costs will likely be approximately **[NONPUBLIC DATA HAS BEEN EXCISED]** per MWh.

Section 5.3.1.6 Total Cost

Plum Creek has estimated total capital costs to be approximately **[NONPUBLIC DATA HAS BEEN EXCISED]** per kW.