

Appendix I

Updated Bird and Bat Conservation Strategy

**Nobles Wind Energy Facility
Bird and Bat Conservation Strategy**

Northern States Power Company

414 Nicollet Mall
Minneapolis, MN 55401

Updated February 2021

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Contributors to this Document:

Merjent, Inc. (Merjent)
Western EcoSystems Technology, Inc. (WEST)
Northern States Power Company, an Xcel Energy Company

1.0 INTRODUCTION

Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (Xcel Energy) owns and operates the Nobles Wind Energy Facility in Nobles County, Minnesota, which was issued a large wind energy conversion system (LWECS) Site Permit from the Minnesota Public Utilities Commission (Commission) in 2009 (Docket No. IP6646/WS-09-584) (original Project). The original Project became operational in 2010 with a generating capacity of 201 megawatts (MW).

The original Project consists of 134 GE 1.5 sle turbines with a rotor size of 77 meters (252.6 feet) in diameter. Xcel Energy is requesting an amendment to the Site Permit to repower 133 of the 134 GE turbines and replace one GE 1.5 sle turbine with a Vestas V136 turbine (Repower Project), which will increase energy production from the facility, improve overall reliability, and extend the service life of the turbines. Xcel Energy proposes to repower 111 turbines with 97-meter rotors, 22 turbines with 91-meter rotors, and replace one GE turbine with a Vestas V136. The original Project will continue to operate until the Repower Project construction activities occur.

1.1 Purpose

This Bird and Bat Conservation Strategy (BBCS) has been developed for the Repower Project to ensure compliance with the regulatory framework outlined in Section 1.3 of this document. Although the Site Permit for the original Project did not require development of a BBCS, a BBCS was developed by Xcel Energy for the original Project in 2016 in response to issuance of USFWS wind energy guidance documents (see Section 1.3). This BBCS document for the Repower Project includes a summary of measures taken to protect birds and bats under the original Project BBCS and provides a framework for future actions to be taken for the life of the Repower Project.

This BBCS document specifically provides: (1) guidance on mitigating the risks to birds and bats during construction and operation of the Repower Project; and (2) incorporates a framework for complying with federal and state laws and meeting the requirements described in Section 7.5 of the Minnesota Public Utilities Commission (Commission) Large Wind Energy Conversion System (LWECS) Site Permit for the Project. The processes and procedures set forth are designed to ensure:

- Avian and bat fatalities and secondary effects on wildlife are minimized at the Repower Project.
- Project-related actions comply with federal and state wildlife regulations.
- Fulfillment of wildlife-related conditions in the LWECS site permit.
- Ongoing surveys, monitoring, and management efforts are undertaken to avoid and minimize adverse wildlife impacts throughout all phases of the Project.
- Bird and bat injuries and fatalities are effectively documented to provide a basis for ongoing development of avian and bat protection procedures.

- Adequate implementation training is provided to the Construction Contractor and Operations and Maintenance staff.
- Coordination between Xcel Energy, wildlife agencies, Minnesota Department of Commerce (MDOC) Energy Environmental Review & Analysis (EERA) staff and the Commission is effective and continuous.

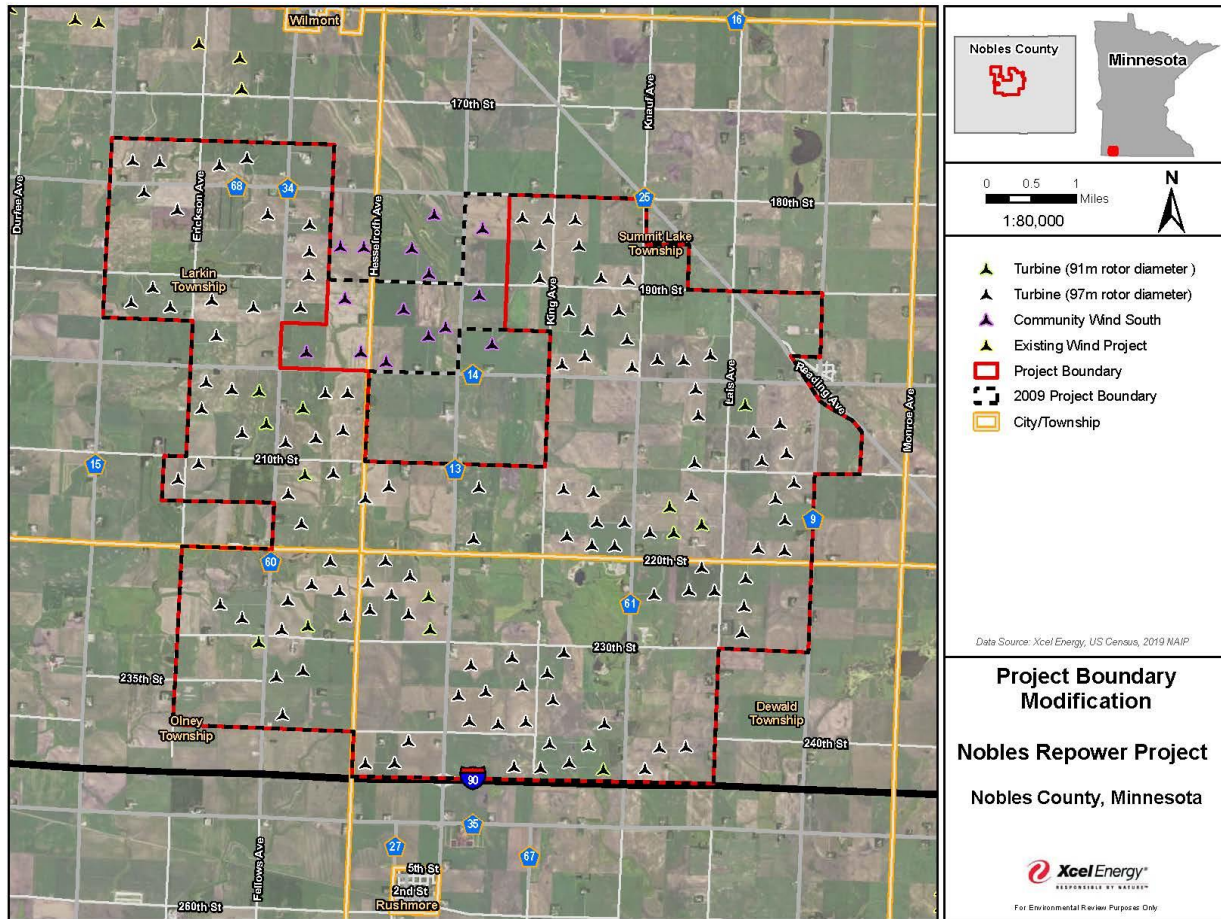
1.2 Project Description

1.2.1 Original Project

The original Project consists of 134 GE 1.5-MW turbines, with the capacity of producing 201 MW of power. Each turbine has a 213-foot (80-meter) hub height and a 253-foot (77-meter) rotor diameter, resulting in a rotor swept area of 126 to 340 feet (38.5 to 103.5 meters) above ground level. The original Project boundary is comprised of approximately 25,525 acres of private land in central Nobles County, Minnesota just north of Interstate 90 between the towns of Adrian and Worthington.

1.2.2 Repower Project

Xcel Energy is requesting modification of the original Project boundary permitted in 2009. The Repower Project infrastructure is physically located on approximately 23,912 acres of privately owned and mostly leased land in Nobles County, generally north of Interstate 90 and west of Highway 25. All 23,912 of these acres are located within the previously evaluated, and permitted, original Project boundary. Approximately 1,615 acres of the 2009 permitted boundary contains a portion of the Community Wind South Wind Farm and its infrastructure, not Nobles Wind Farm infrastructure, and has therefore been eliminated from the Repower Project boundary for permit amendment purposes (see Figure – Project Boundary Modification below).



The purpose of the repowering project is to improve turbine technology, maximize energy yield, and extend service life of the turbines. New blades provide an increase in the rotor swept area, which, when coupled with the upgraded generators, results in a corresponding increase in the nominal production capacity of the Project from 201 MW to roughly 216.4 MW, a 7.7 percent increase.

Xcel Energy is proposing to repower 133 of the 134 existing GE 1.5 sle turbines with GE 1.6 sle turbines; 111 of these turbines will have 97-meter rotors and 22 will have 91-meter rotors. All GE repowered turbines will have a 1.6 MW generating capacity and will maintain the current hub height of 80 meters (262 feet). The repower involves installing rotors with longer blades and replacing components of existing nacelles. The Project nameplate capacity, existing turbine towers, and foundations will remain the same, with the potential for new concrete collars fitted around the existing base. Additionally, Xcel Energy will replace one GE 1.5 sle turbine with a Vestas V136 turbine. This turbine will have a 3.6 MW generating capacity and 82-meter hub height and be located within approximately one hundred feet of the existing GE 1.5 sle turbine that will be decommissioned.

Previously permitted turbine access roads for the Wind Farm will remain in the same locations and temporarily be widened to up to 150 feet. A large construction crane will be used to remove

the old rotors and nacelles, and to re-install the longer rotors and upgraded nacelles, generally requiring a temporary 400-foot radius workspace around each turbine and an approximately 100-foot-wide crane path between turbines.

Repowering will consist of the following general construction steps: completing improvements to existing gravel roads to accommodate truck deliveries, preparing laydown and staging areas, installing temporary crane crossings over streams, offloading new turbine components near operating turbines, removing and replacing existing blades and nacelles with a construction crane, removal of existing met towers, performing engineering inspections on new components, returning turbines to operation, and restoring temporarily disturbed areas to pre-construction conditions.

1.3 Regulatory Framework

1.3.1 Federal Endangered Species Act

Certain species at risk of extinction, including many birds and bats, are protected under the federal Endangered Species Act (ESA) of 1973, as amended. The ESA of 1973 defines and lists species as “endangered” and “threatened” and provides regulatory protection for the listed species. The federal ESA provides a program for conservation and recovery of threatened and endangered species. Section 9 of the federal ESA prohibits the “take” of species listed by USFWS as threatened or endangered. Take is defined as follows: “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in such conduct.” Section 10(a) of the federal ESA includes provisions for the authorization of take that is incidental to, but not the purpose of, otherwise lawful activities. Section 10(a)(1)(B) permits (Incidental Take Permits) may be issued if take is incidental and does not jeopardize the survival and recovery of the species.

Currently the only federally listed bird or bat species with known potential to be affected by the Project is the northern long eared myotis. This species was listed as federally threatened by the USFWS on April 2, 2015 and a final 4(d) rule was published on January 14, 2016 (USFWS 2016b). In brief summary, this final 4(d) rule establishes an exemption from the take prohibition for development and operation of large wind energy facilities unless the project would directly impact a known hibernation or maternity site. In the event that NLEB becomes protected as endangered during the operational life of the project, Xcel Energy will assess whether application for an Incidental Take Permit under Section 10 of the ESA is warranted; Xcel will efile this assessment

1.3.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) makes it unlawful to pursue, capture, kill, or possess any migratory bird or part, nest, or egg of any such bird listed in wildlife protection treaties between the United States, Great Britain, Mexico, Japan, and Russia (and other countries of the former Soviet Union; MBTA 1918). Most birds (except for introduced species and non-migratory game birds) within the U.S. and the Project area are protected under the MBTA. The birds, occupied nests and the contents of the nest (eggs or chicks) within the Project area are afforded protection

pursuant to the MBTA. Due to the potential for resident and migratory birds within the Project area, compliance with the MBTA has been considered in the development of this BBCS.

1.3.3 Bald and Golden Eagle Protection Act

The purpose of the BGEPA (BGEPA; 16 USC 668–668c, as amended), administered by the USFWS, is to protect bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*), including their nests, eggs, and parts (BGEPA 1940). The BGEPA states that “no person shall take, possess, sell, purchase, barter, offer for sale, purchase or barter, transport, export, or import any bald or golden eagle alive or dead, or any part, nest or egg without a valid permit to do so.”

The BGEPA defines the take of an eagle to include “...to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, or molest or disturb.” The term “disturb” is defined in regulations found at 50 C.F.R. § 22.3 to include to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available: (1) injury to an eagle, (2) a decrease in its productivity by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.

The BGEPA authorizes the Secretary of the Interior to permit the take of bald or golden eagles for several defined purposes, including when “necessary to permit the taking of such eagles for the protection of wildlife or of agricultural or other interests in any particular locality.” Based on this authority, the USFWS published a final rule (Eagle Permit Rule) on September 11, 2009 (see 50 C.F.R. Parts 13 and 22) establishing two new permit types: 1) individual permits that can be authorized in limited instances of disturbance and in certain situations where other forms of take may occur, such as human or eagle health and safety; and 2) programmatic permits that may authorize incidental take that occurs over a longer period of time or across a larger area (USFWS 2009). On December 16, 2016, the USFWS published a final rule (Eagle Permits; Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests) which included changes to permit issuance criteria and duration, definitions, compensatory mitigation standards, criteria for eagle nest removal permits, permit application requirements, and fees; with the intent to add clarity to the eagle permit regulations, improve their implementation, and increase compliance, while maintaining strong protection for eagles.

The Eagle Permit Rule authorizes take of bald eagles and golden eagles where take: (1) is compatible with the preservation of the bald and golden eagle; (2) is associated with and not the purpose of an otherwise lawful activity; and (3) cannot practicably be avoided (50 C.F.R. § 22.26). Specific to wind energy operations, the USFWS issued its Eagle Conservation Plan Guidance (ECPG) to provide specific recommendations on assessing eagle risk and taking steps to avoid, minimize, and mitigate potential impacts to eagles consistent with the BGEPA (USFWS 2013).

1.3.4 Minnesota Threatened and Endangered Species Laws

The 2020 Minnesota Statutes, specifically the Protection of Threatened and Endangered Species (Minn. Stat. 84.0895), includes the language “Notwithstanding any other law, a person may not take, import, transport, or sell any portion of an endangered species of wild animal or plant, or sell or possess with intent to sell an article made with any part of the skin, hide, or parts of an endangered species of wild animal or plant, except as provided in subdivisions 2 and 7.” The Statute directs the Commissioner of the MNDNR to develop lists of endangered species, threatened species, and species of concern.

1.3.5 USFWS Wind Energy Guidelines and Eagle Conservation Plan Guidance

Prior to 2012, the USFWS had been recommending, and many wind energy companies had been developing, Avian and Bat Protection Plans (ABPP) for wind projects. In Minnesota, it is now a standard requirement of the LWECS Site Permit to develop an ABPP for the operation of the Project; however, at the time the Nobles Wind Energy Facility went through the LWECS permit process (2008/2009), no ABPP was required. With publication of the final 2012 Land-Based Wind Energy Guidelines (WEG), the USFWS began recommending development of a BBCS instead of an ABPP (USFWS 2012). While the components may be generally the same, the BBCS is a mechanism by which wind energy companies document the studies, analyses, agency input, and decisions in navigating through the WEG to help avoid and minimize impacts to environmental resources.

The WEG outlines a tiered approach to assessing suitability and risks to wildlife at a potential wind resource area. The “tiered” approach ensures that sufficient data are collected to enable project proponents to make informed decisions about continued development of a proposed project (USFWS 2012). The original Project was developed and permitted prior to the WEG; however, the efforts completed in siting, studying, analyzing, reviewing, and coordinating with state and federal officials generally align with the WEG tiered approach. This BBCS briefly describes the efforts completed during pre-construction of the original Project (generally corresponding to Tiers 1 – 3 of the WEG). The bulk of the BBCS focuses on what the Project has done in Tier 4 as well as adaptive management measures that will occur throughout operation of the Repower Project.

As described in Section 1.3.3, the USFWS issued its ECPG in April 2013 to assist developers with addressing eagle concerns associated with wind energy projects. As with the WEG, the USFWS’s eagle guidance came out after the original Project was developed, permitted, and constructed. Although the eagle guidance came out after the original Project was operational, the original BBCS addressed the recommendations included in the USFWS’s eagle guidance. In particular, Xcel Energy is proposing eagle-specific studies as part of post-construction studies (see Section 5.1). Eagles are also specifically included in Xcel Energy’s adaptive management program (see Section 7). Xcel Energy’s commitments to assess risk, avoid and minimize impacts, monitor for potential effects, and respond to potential concerns related to eagles as part of the original construction and operation, as well as the Repower Project are clearly described throughout this updated BBCS.

2.0 SITE CHARACTERIZATION: TIER 1 & 2

2.1 Original Project

As stated above, siting of the original Project occurred prior to issuance of the WEG, so formal Tier 1 and Tier 2 site characterization studies were not undertaken; however, desktop evaluation of the original Project boundary was conducted as part of the LWECS site permitting process. A biological inventory was conducted in coordination with the MNDNR. The biological inventory concluded that the Project area contained “a negligible amount of native plant communities and a minimal amount of significant wildlife habitat.” Three resources with potential biological significance were identified:

- 1) The Bluebird Prairie Wildlife Management Area: This Wildlife Management Area is located near the center of the Project on approximately 74 acres of land.
- 2) East Branch of Kanaranzi Creek and its tributaries.
- 3) Planted native prairie area in Section 4 of Dewald Township.

The biological inventory noted that there was not very much wooded habitat (i.e., potential bat habitat) in the Project area, and recommended that turbines be sited away from wooded areas wherever possible. The biological inventory also included a review of potential avian and bat mortality for the Project, which included a review of related literature and description of habitat with the Project and compares the Project to Minnesota and Iowa wind projects with available mortality study data. The review summarized that the fatality surveys conducted at the other Minnesota and Iowa wind facilities suggest that bird and bat fatalities associated with operation of these facilities are not likely significant from a population standpoint. Furthermore, the review concluded that because the Nobles wind energy facility had fewer significant wildlife areas within or adjacent to it compared to the wind facilities where fatality survey data was available, bird and bat fatalities at the Nobles wind energy facility would likely be similar to or lower than those at the studied sites, and therefore not significant.

2.2 Repower Project

In a letter dated November 2, 2020, Xcel Energy requested comments on the Project from the MNDNR and USFWS. The MNDNR responded with early coordination comments on the Project in a letter dated December 2, 2020. The MNDNR recommended that a Natural Heritage Information System (NHIS) Review be completed for the Project and provided comments regarding rare species and habitat protection. Xcel Energy submitted a Natural Heritage Review Request to the MNDNR for the Project on February 22, 2021. To date, a response has not been received.

In an e-mail dated December 2, 2020, the USFWS directed Xcel Energy to its Information for Planning and Consultation (IPaC) system for a list of federally listed species and designated critical habitat that may be impacted by the Project; and noted that this list is considered a technical assistance tool for use in determining if further consultation is required with the USFWS.

A desktop reevaluation of the Repower Project boundary for bird and bat habitat took place as part of the request for a LWECS site permit amendment.

Based on review of aerial photographs and land use/land cover database information, the majority of the land area in the Project Area is cultivated crops. Corn and soybeans are the dominant agricultural crops by acreage in Nobles County (USDA, 2012). The land cover types in the Project Area are shown in Table 1 (Yang et al., 2018).

Land Cover	Acres	Percent of Project Area
Cultivated Crops	20,673.1	86.5
Herbaceous	1,602.0	6.7
Hay/Pasture	317.7	1.3
Developed	916.7	3.8
Emergent Herbaceous Wetlands	268.7	1.1
Open Water	28.5	0.1
Deciduous/Mixed Forest	79.4	0.3
Barren Land	26.7	0.1
Total	23,912.7	100.0%
Source: 2016 National Land Cover Database (Yang et al., 2018)		

Forested areas are primarily windbreaks around residences and riparian areas along the East Branch Kanaranzi Creek. Wetlands are generally associated with streams. Hay/Pasture and grassland/herbaceous lands are generally associated with waterbodies and the one WMA located within the Project Area: Bluebird Prairie WMA. Xcel Energy has designed the temporary construction workspaces to avoid the Bluebird Prairie WMA. The grassland and wetland areas at the site may contain potential remnant native prairie areas.

Development of the Repower 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. It can be expected that, similar to the existing wind farm and at other wind developments, there is a high likelihood that individual bird and bat fatalities will occur at the Project. Repowering the Project with longer rotors will increase in rotor-swept-area, and therefore, may increase collision risk to birds and bats. Similarly, construction activities will introduce risk to primarily birds from construction equipment and vehicles traveling around the Project Area. However, it is unlikely that the Nobles Repower Project will affect species at the population level.

Recent post-construction data are available from the following wind facilities in southern Minnesota with comparable landscapes to Nobles from which to draw correlative inferences about potential impacts on birds and bats from Project operations:

- Odell Wind Farm (Odell) in Cottonwood, Jackson, Martin and Watonwan Counties, Minnesota;
- Red Pine Wind Energy Facility (Red Pine) in Lincoln County, Minnesota;
- Lakefield Wind Project (Lakefield) in Jackson County, Minnesota;
- Elm Creek I Wind Project (Elm Creek I) in Jackson County, Minnesota;
- Elm Creek II Wind Project (Elm Creek II), in Jackson and Martin Counties, Minnesota;
- Prairie Rose Wind Energy Facility (Prairie Rose) in Rock County, Minnesota;
- Big Blue Wind Farm (Big Blue) in Faribault County, Minnesota;
- Grand Meadow Wind Farm (Grand Meadow) in Mower County, Minnesota; and
- Oak Glen Wind Farm (Oak Glen) in Steele County, Minnesota.

Data from post-construction avian and bat studies at these facilities suggest the types and levels of impacts that may be occurring at the Project and may be realized at the Repower Project (Table 2):

Facility	Survey Timeframe (month/year)	Bird (#/MW)	Bat (#/MW)	Comments
Odell ¹	12/2016-12/2017	4.69	6.74	<ul style="list-style-type: none"> • Most avian fatalities were in September and October • Bat fatalities were primarily July through September • Seasonality suggests most fatalities were fall migrants • Most common bat species was hoary bat
Red Pine ²	3/2018-11/2018 (cleared plot)	4.47	11.35	<ul style="list-style-type: none"> • Most common bird species were ruby-crowned kinglet, marsh wren, red-eyed vireo, and sedge wren • Bat species were hoary, big brown, eastern red, and silver-haired
	3/2018 – 11/2018 (road & pad)	2.68	18.74	
Lakefield ³	4/2012-11/2012	2.75	19.97	<ul style="list-style-type: none"> • Fifteen species of birds documented • Documented bat species were hoary, big brown, eastern red, and little brown • No fatalities were federal- or state-listed
	6/2014-10/2014	1.07	20.19	<ul style="list-style-type: none"> • Most of the bat fatalities (65 percent) were solitary tree roosting bats (eastern red bat, hoary bat)

Table 2				
Recent Bird and Bat Post-Construction Fatality Estimates at Wind Facilities in Southern Minnesota				
Facility	Survey Timeframe (month/year)	Bird (#/MW)	Bat (#/MW)	Comments
				<ul style="list-style-type: none"> Bat fatalities were during fall migration (last week of July through mid-September)
Elm Creek I	2009-2010	2.32	1.49	<ul style="list-style-type: none"> This report is not publicly available
Elm Creek II	2011-2012	8.73	2.81	<ul style="list-style-type: none"> This report is not publicly available
Prairie Rose ⁴	4/2014-6/2014	0.44	0.41	<ul style="list-style-type: none"> Estimates provided are per study period (i.e., 8 weeks during spring migration and 10 weeks during fall migration) An operational shut-down from August 18 through August 28, 2014 may have affected fatality rates
	8/2014-10/2014			
Big Blue, Grand Meadow, & Oak Glen ⁵	7/2013-10/2013	--	3.1-6.3	<ul style="list-style-type: none"> Systematic avian surveys were not conducted Fatality rates are the range for the three facilities Bat fatalities peaked twice: in late July/early August and in late August/early September. Bat fatalities were primarily tree-roosting bats
1	Chodachek and Gustafson, 2018			
2	Trana et al., 2019			
3	Westwood Professional Services, 2015			
4	Chodachek et. al, 2015			
5	Chodachek et al., 2014			

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 (AWWI, 2020). The majority of avian species have a low risk of impacts at the population level (Allison et al., 2019). Based on the post-construction fatality studies outlined above, national averages for post-construction fatalities, and AWWI’s conclusions about

geographic trends, Xcel Energy anticipates that 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. Migratory tree-roosting bats (e.g., 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, 2020). Unlike birds, wind facilities may present a risk to populations of migratory tree-roosting bats; in addition, although impacts from wind facilities on cave-roosting bats are typically low, even a small impact can be a risk to populations already impacted by white-nose syndrome (Allison et al., 2019). Overall, risk of mortality to bats in the Project Area is likely to be greatest on nights during fall migration, when the number of bats moving through the area 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 miles per hour) (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.

3.0 FIELD STUDIES: TIER 3

3.1.1 Original Project

Because the original Project was sited and developed prior to issuance of the WEG, no formal Tier 3 pre-construction field studies were conducted. However, ground surveys of wetlands, the Bluebird Prairie WMA, and surrounding areas were conducted as part of the biological inventory of the original Project in 2009 (see Section 2.1.1).

3.1.2 Repower Project

Tier 3 avian and bat studies are intended to document baseline preconstruction avian/bat use of a project area prior to construction. Because the original Project is operational, Tier 3 studies of avian and bat use of the Repower Project boundary are unlikely to provide useful information and are therefore not planned. However, Xcel Energy will conduct field studies for wetlands and native prairie, as necessary, prior to construction of the Repower Project so impacts to wetlands and other sensitive habitats can be avoided during construction.

4.0 AVOIDANCE AND MINIMIZATION MEASURES

4.1 Original Project

The siting and development process for the original Project occurred prior to development of the USFWS WEG (USFWS 2012). However, information gathered during pre-construction studies and the Large Wind Energy Conversion System (LWECS) permitting process was used during the turbine and infrastructure siting process to minimize potential impacts to birds and bats and their habitats. Prior to designing the facility layout, setback and constraint information was incorporated from expert sources, literature reviews, and siting requirements resulting from the LWECS Site Permit process with the Public Utility Commission (PUC). This information was used to establish setbacks and inform site design.

4.1.1 Project Siting Measures Used to Reduce Impacts

- The original Project was sited in a heavily cultivated landscape to avoid impacts to wildlife and habitats.
- Standard setbacks for non-participating landowners, residences, environmental areas (such as state-managed lands), noise, airports, etc. were implemented.
- The overall Project lacks suitable northern long-eared bat (*Myotis septentrionalis*, NLEB) foraging habitats (wooded patches of 15 acres or greater) and no turbines were located within wooded patches of any size or within 1,000 feet of wooded habitat connected to suitable foraging habitat, minimizing potential impacts to the NLEB.
- Existing roads and field accesses were used or improved for access roads when practicable.
- Turbines were sited to avoid impacts to wetlands, and access roads and other infrastructure were sited to avoid and minimize wetland impacts to the greatest extent possible.
- With the exception of one turbine sited within a small area with a biodiversity significance of “Below,” all turbines have been sited outside native plant communities and sites of biodiversity significance. Sites rated by the Minnesota Biological Survey as “Below” lack occurrences of rare species and natural features or do not meet the DNR’s standards for other ratings. No turbines were sited in the one area of native prairie plantings identified in the Tier 1 studies as having potential wildlife habitat (Section 2.1)
- The layout for the Nobles Wind Energy Facility was sited so that all turbines and access roads avoided possible impacts to Kanaranzi Creek (designated critical habitat for the Topeka Shiner) and its tributaries.
- Turbines are at least 800 feet from the Nobles County Landfill (located on 220th St. and Knauf Ave.). Bald eagles have been anecdotally observed at this landfill (eBird 2016), where they might feed on carrion, rodents, or other prey, particularly during winter or early spring.

4.1.2 Project Design Used to Reduce Impacts

- Wind turbines were designed with tubular towers and no external ladders or platforms on the towers or nacelles were used to minimize bird perching and nesting opportunities.
- The number of turbines with visibility lighting was minimized, within Federal Aviation Administration (FAA) requirements.
- FAA-approved lighting uses the shortest allowable flash duration, the minimum allowed flashes per minute, and all lights flash at the same time so that nocturnal migrating birds are not disoriented by lights.
- Lighting at the operations and maintenance (O&M) facility, Project substation, and other installations has been minimized and designed so that light is directed downward (toward the access or work area) and is hooded to prevent light from shining into the sky and attracting or disorienting nocturnal migrants. Motion or heat-activated lighting is used where practicable.
- The meteorological (met) tower has been designed to minimize collision risk for birds by installing the minimum number of met towers needed and constructing met towers without permanent guy wires.
- Electrical collection systems within the Project have been buried underground.

4.1.3 Construction and Operational Procedures to Minimize Impacts

- During original construction, the site was cleared only the minimum extent necessary to assure suitable access for construction.
- Underground electrical cables that crossed the Kanaranzi Creek and its tributaries were installed using low-impact installation methods to further avoid any construction impacts (WSB 2010).
- A Soil Erosion and Sediment Control Plan was developed and adhered to during construction.
- Tree removal was minimized to the extent possible during construction.
- All waste and scrap was removed from the site at the completion of each stage of construction; litter and trash was removed on a daily basis.
- Temporary impacts at the site were restored after completion of construction to pre-construction conditions.
- Construction and operation staff have been trained on best management practices to reduce risks to wildlife and the protocol for identifying and communicating bird and bat fatalities and injuries.
- A preconstruction meeting was held with the Department of Commerce to ensure all permit conditions were being met, a field representative was designated and responsible for permit compliance throughout construction and reclamation activities, and all employees and contractors were informed of all permit conditions, including those that avoided and minimized impacts to wildlife and wildlife habitats.

4.2 Repower Project

The Repower Project will involve repowering 133 of the 134 currently operating turbines as they were sited and constructed as part of the original Project. Xcel Energy will replace one GE 1.5 sle turbine with a Vestas V136 turbine that is sited in cultivated cropland and will utilize an existing access road. In addition, associated facilities exist in the locations previously permitted and constructed to support the operation of the wind turbines and facilitate the delivery of the electricity to consumers. The previously permitted locations of permanent associated facilities for the GE turbines such as access roads, collection lines, substation, and O&M facilities will remain the same.

A large construction crane will be used to remove the old rotors and nacelles, and to re-install the longer rotors and upgraded nacelles, generally requiring a temporary 400-foot radius workspace around each turbine and an approximately 100-foot wide crane path between turbines.

4.2.1 Project Siting Measures Used to Reduce Impacts

- Crane paths will be installed in a 100-foot (30.5-meter) corridor, all of which will be matted.
- Temporary workspaces (crane paths, temporary wider access roads, and staging/workspaces at turbines) that will be utilized will not require tree clearing and will avoid temporary construction impacts to Minnesota Department of Natural Resources (MNDNR) designated native plant communities, native prairie, and Minnesota Biological Survey Sites of Biodiversity Significance.
- The crane paths and construction workspaces will not occur within suitable Topeka shiner streams or designated critical habitat; and in accordance with the USFWS' Recommendations for Construction Projects Affecting Waters Inhabited by Topeka Shiners in Minnesota (Revised November 18, 2016; USFWS 2016a), Xcel Energy will implement the following measures to prevent sedimentation from entering Topeka shiner habitat:
 - Follow all applicable requirements and BMPs for stormwater and erosion control.
 - In non-cropland areas, Xcel Energy will mulch areas of disturbed soils and reseed promptly with native species.
 - Implement appropriate erosion and sediment prevention measures to the maximum extent practicable. Inspect devices frequently to ensure that they are effective and in good repair, especially after precipitation.

4.2.2 Project Design Used to Reduce Impacts

- Per MNDNR's recommendation, turbines will be equipped with software capable of adjusting cut-in speeds.
- Xcel Energy will coordinate with the FAA on potential implementation of an Aircraft Detection Lighting System. If approved by the FAA, this will mitigate the impact of nighttime lights by deploying a radar-based system for the Project, turning lights on only

when low-flying aircraft are detected nearby and then turning lights off after the aircraft is a safe distance from the Project.

- Turbines will be illuminated only as necessary to meet the minimum FAA requirements.
- FAA-approved lighting uses the shortest allowable flash duration, the minimum allowed flashes per minute, and all lights flash at the same time so that nocturnal migrating birds are not disoriented by lights.

4.2.3 Construction and Operational Procedures to Minimize Impacts

- A Soil Erosion and Sediment Control Plan was developed and will be adhered to during construction.
- All waste and scrap will be removed from the site at the completion of each stage of construction; litter and trash will be removed on a daily basis to prevent attraction of wildlife.
- Temporary impacts at the site will be restored after completion of construction to pre-construction conditions.
- As part of pre-construction and operation activities, Xcel Energy will conduct environmental training with employees and contractors, providing them information regarding this BBCS as well as well as policies regarding disturbance and harassment of wildlife. Employees and contractors will also be trained on the protocol for reporting bird and bat fatalities and injuries.
- Employees and contractors will be prohibited from bringing firearms or pets to the Project area.
- All carrion observed onsite during construction and operation activities, with the exception of bird and bat carcasses, will be disposed of in an appropriate manner to prevent the attraction of eagles and other raptors. Discoveries of bird and bat carcasses will be documented in accordance with this BBCS and federal and state permits.
- Per MNDNR's recommendation, turbines will be locked or feathered up to the manufacturer's standard cut-in speed from one-half hour before sunset to one-half hour after sunrise from April 1 to October 31 of each year of operation.
- A preconstruction meeting will be held with the DOC EERA to ensure all permit conditions will be met, a field representative will be designated and responsible for permit compliance throughout construction and reclamation activities, and all employees and contractors will be informed of all permit conditions, including those designed to avoid and minimize impacts to wildlife and wildlife habitats.

5.0 POST-CONSTRUCTION: TIER 4

The WEG recognize that projects can be in various stages of development and/or operations. This includes projects operating prior to finalization of the WEG. The WEG specify that "for projects initiated prior to publication, the developer should consider where they are in the planning

process relative to the appropriate tier and inform the Service of what actions they will take to apply the Guidelines” (USFWS 2012).

According to the WEG, “during post-construction tiers (including Tier 4), developers are assessing whether actions taken in earlier tiers to avoid and minimize impacts are successfully achieving the goals and, when necessary, taking additional steps to compensate for impacts” (USFWS 2012). The specific questions to be investigated in Tier 4 are:

1. What are the bird and bat fatality rates for the project?
2. What are the fatality rates of species of concern?
3. How do the estimated fatality rates compare to the predicted fatality rates?
4. Do bird and bat fatalities vary within the project site in relation to site characteristics?
5. How do the fatality rates compare to the fatality rates from existing projects in similar landscapes with similar species composition and use?
6. What is the composition of fatalities in relation to migrating and resident birds and bats at the site?
7. Do fatality data suggest the need for measures to reduce impacts?

5.1 Post-Construction Monitoring Results

5.1.1 Original Project

Post-construction fatality monitoring was not conducted as part of the original Project, but some Tier 4 questions were addressed by examining fatality rates at comparable projects in the same geographical area. Publicly available post-construction raptor fatality data from multiple projects in the tristate area (Minnesota, Iowa, and South Dakota) showed a range of fatality rates of 0 to 0.47 raptor fatalities/MW/study period and overall bird fatality rates ranging between 0.27 and 5.59 bird fatalities/MW/study period. For bats, publicly available fatality data from 27 projects in the tristate area shows a range of fatality rates of 0.16 to 20.19 bat fatalities/MW/study period; Appendix A). It is important to note that the study period often differed between surveys included in Appendix A, i.e., a study period for a project focusing on bats may be from July through October, or may cover the entire active period (April through early November).

The original Project was similar in potential species composition, geographical location, turbine type and size to many of the projects from Appendix A where post construction fatality data had been gathered. Additionally, as stated above, the habitat at the Nobles Project is highly agricultural, with limited high quality or unique wildlife habitat in the vicinity. Based on all this information, it can be reasonably inferred from available data that raptor and bat fatality rates at the Nobles Project are comparable to those projects listed in Appendix A, and likely would be in the mid to lower end of the ranges.

A docket search reveals that one snow goose incidental fatality has been reported at Nobles Wind Farm since 2010 (2011 fatality). Xcel Energy notes that wildlife fatality reporting has become more prescribed for more recent projects (quarterly incident reporting and immediate incident

reporting). In addition to PUC reporting, Xcel Energy trains its operational staff to look for and report avian and bat fatalities during their normal activities and has internal reporting and documentation procedures for avian and bat fatalities. In 2019 one unknown songbird was reported and in 2020, one unknown waterfowl and one unknown bat were reported.

Because the bald eagle population in southern Minnesota has been steadily growing in recent years, Xcel Energy conducted ground-based bald eagle nest surveys within two miles of turbines at the Nobles wind energy facility in 2017 and 2019. No bald eagle nests were identified during these survey efforts. Xcel Energy will continue to conduct incidental monitoring for bald eagle nests.

5.1.2 Repower Project

The MNDNR's early coordination response letter for the Repower Project, dated December 2, 2020, recommends that Xcel Energy conduct post-construction fatality monitoring. Follow-up coordination with MNDNR clarified that recent wind projects have required two years of post-construction fatality monitoring as a condition of a Site Permit; the MNDNR would support that for the Nobles Repower Project as well.

Xcel Energy proposes to conduct standardized post-construction fatality monitoring for two years following commissioning of the repowered turbines, in accordance with the WEG and MNDNR protocols (MNDNR, 2014). The Repower Project is considered low risk. An overview of the fatality monitoring protocol is below. A more detailed study plan for post-construction fatality monitoring will be developed in coordination with MNDNR and DOC-EERA staff prior to operation of the Repower Project.

An overview of the post-construction monitoring is described below. As the protocol is further developed with MNDNR, USFWS, and EERA prior to construction, the protocol will be moved to an appendix.

5.1.3 Search Methods

Based on the minimal number of incidental fatalities reported at the original Nobles Wind Farm Xcel proposes to conduct a hybrid of full-plot post-construction fatality monitoring at 10 turbines (one of which will be the V136 turbine) and road and pad fatality monitoring at 74 turbines. This protocol is consistent with a low risk site described in the MNDNR protocol (MNDNR 2014). Full search plots will be cleared of vegetation and will be searched by walking transects of a 120-meter square plot centered on the turbine. Road and pad searches will be conducted on the turbine pad and associated access road.

Searches for birds and bats will be conducted at the same survey turbines for the entire study period. Survey turbines will be chosen to provide relatively even coverage of the entire facility and to represent different Project area and turbine characteristics (e.g., edge versus mid-string turbines, lit versus unlit turbines, different surrounding land uses). During the spring, summer, and fall survey periods (March 15 – November 15), searches will be conducted once a week. The

frequency of searches may be updated if carcass persistence trials indicate that a significant number of carcasses are being removed from plots in fewer than seven days.

5.1.4 Recording Data

In accordance with the WEG, personnel trained in proper search techniques will look for bird and bat carcasses within the plots/transects identified in Section 3.1.1 above, and record and collect all carcasses located in the searchable areas. Data to be recorded include date, start time, end time, observer, which turbine area was searched (including GPS coordinates) and weather data for each search. When a dead bat or bird is found, the searcher will place a flag near the carcass and continue the search. After searching the entire plot, the searcher will return to each carcass and record information on a fatality data sheet, including date, species, sex and age (when possible), observer name, turbine number, distance from turbine, azimuth from turbine (including GPS coordinates), habitat surrounding carcass, condition of carcass (entire, partial, scavenged), and estimated time of death (e.g., <1 day, 2 days).

5.2 Incidental Monitoring

5.2.1 Training of On-Site Staff

All operations personnel are trained to identify potential wildlife conflicts and the proper response. This training includes sensitivity to birds and other wildlife. An incidental reporting process has been developed for operations personnel ensuring they can document bird or bat casualties that are discovered during routine maintenance work and at other times that personnel are within the Project area.

In addition to incidental fatality reporting, operations personnel are trained to identify bald eagles and to be sensitive to relative use rates of bald eagles and to look for eagle casualties while driving between turbines and conducting turbine maintenance. Staff are also trained to identify eagle nests and are directed to report any bald eagle nesting activity in the Project vicinity. This information will be used for the life of the LWECS Site Permit to continually maintain a relative sense of bald eagle use in the Project area so that modifications can be implemented as necessary.

5.2.2 Injured Wildlife Handling and Reporting Protocol

Any injured wildlife observed during operations of the Project will be left in place until the facility's primary environmental representative has been contacted. Xcel Energy will then decide the most appropriate course of action depending on the condition and species of injured animal discovered. All injured raptors, waterfowl, waterbirds, federally- or state-listed bird species, and federally- or state-listed bats will be promptly delivered to the appropriate rehabilitation center or other approved facility as specified in state and federal permits, if provided; or as directed as necessary by law enforcement personnel.

5.3 Reporting

Bird and bat fatalities discovered at the facility are reported according to LWECS Site Permit requirements for the life of the Project LWECS Site Permit. Xcel Energy anticipates that additional LWECS reporting requirements will be included in the amended site permit (including immediate, quarterly and annual avian and bat fatality reporting) and Xcel Energy will comply with these reporting requirements in accordance with the amended site permit.

Xcel Energy has received a Special Purpose Utilities Permit (SPUT) from the USFWS, which allows operational staff to collect, transport and temporarily possess migratory bird carcasses and injured migratory birds. Xcel Energy also holds a MNDNR Salvage Permit for its Minnesota wind facilities that allows collection of migratory birds and bats. Xcel Energy will report fatalities according to both SPUT and MNDNR salvage permit requirements.

6.0 RESEARCH: TIER 5

In addition to the Tiers 1-4 described above, the WEG contains a *Tier 5 Other Post-Construction Studies*. In general, the studies identified in Tier 5 are research-related and “will not be necessary for most wind energy projects”. Given that the Project’s studies to date indicate that the Project is not likely to cause significant adverse impacts, no Tier 5 studies are planned.

7.0 ADAPTIVE MANAGEMENT

Within the WEG, the USFWS defines adaptive management as “an iterative decision process that promotes flexible decision-making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Comprehensively applying the tiered approach embodies the adaptive management process” (USFWS 2012). The WEG further notes that adaptive management is unlikely to be needed at most wind facilities if they are sited in accordance with the tiered approach. Nevertheless, Xcel Energy recognizes the value of applying this approach to its Project activities that include some uncertainty. As such, Xcel Energy has incorporated an adaptive approach for the conservation of wildlife potentially impacted by the Project.

Findings during post-construction mortality monitoring or operational monitoring may trigger the need for adaptive management actions. Potential triggering events may include:

- Mortality of an eagle, northern long-eared bat, or species listed as endangered/threatened under the federal Endangered Species Act or Minnesota’s Endangered Species Statute;
- Significant levels of mortality of other species of birds or bats. Significance will be determined by qualified biologists and will be based on the latest information available, including the most recent data on species’ population sizes and trends. For example, even relatively high levels of mortality of the most common species may not be significant. Conversely, lower levels of mortalities of less common species may be of more concern, particularly if these species appear to be at risk (e.g. USFWS’s Birds of Conservation Concern. There are limited data on population sizes and trends for some bat species; as

such, significance levels will be evaluated on a per species basis and take into account federal and/or state listing (threatened, endangered, special concern).

If one of these triggering events occurs, Xcel will report the event as required by state and federal permits, and will initiate an investigation into potential causes of the event. In coordination with MNDNR, USFWS, and EERA, Xcel will: (1) evaluate monitoring data to determine whether the data are indicative of a pattern of fatalities at the Project that should be addressed through additional measures; (2) Identify practicable measures to address the impact and minimize fatalities; and (3) determine corrective actions, to the extent possible, to ensure longterm solutions are implemented for the life of the Project.

As described above in Section 5.2.1, operations staff are trained to identify and internally report the presence of suspected bald eagle nests in the vicinity of the Project. If a new bald eagle nest is discovered within 0.5 mile of a Project turbine, Xcel Energy will coordinate with the USFWS to determine the need for nest monitoring and/or operational changes in response to the nest.

Another potential event that could trigger the need for adaptive management action is the listing of a new species by USFWS or DNR. Should a new species be listed that has the potential to occur at the facility, Xcel will meet and confer with USFWS to determine if changes to the turbine operation plan are warranted based on results of monitoring at the Project.

8.0 KEY RESOURCES

This BBCS identifies key resources to address avian protection issues, including area USFWS and MNDNR biologists, engineers, planners, Xcel Energy Environmental Services staff, and operation personnel who have been trained on avian interaction problems. External organizations such as the National Wind Coordination Committee and APLIC can also serve as helpful resources by providing guidance, workshops, materials, and contacts. An understanding of bald eagles, other sensitive bird species, and bat behavior can influence how and when avian and bat protection should be utilized. Xcel Energy Environmental Services staff will coordinate with regulators and wildlife to reduce avian and bat injury or mortality and maintain Project reliability. The Site Manager will be responsible for enforcement of BMPs that focus on reducing impacts to birds and bats, as well as the implementation of this document. Operations and maintenance staff will be trained on this document and on avian protection planning.

Table 2 lists contacts that will serve as key resources for the Project.

Table 2. List of Key BBCS Resources			
Organization Type	Name	Address	Phone
Rehabilitation Center	The Raptor Center College of Veterinary Medicine, University of Minnesota	1920 Fitch Avenue St. Paul, Minnesota 55108	612-624-4745
Rehabilitation Center	Wildlife Science Center	5463 West Broadway Avenue	651-464-3993

Table 2. List of Key BBCS Resources

Table 2. List of Key BBCS Resources			
Organization Type	Name	Address	Phone
		Forest Lake, Minnesota 55025	
Government Agency	Minnesota Department of Natural Resources	500 Lafayette Road St. Paul, Minnesota 55155	651-296-5484
Government Agency	US Fish and Wildlife Service Twin Cities Field Office	4101 American Boulevard East Bloomington, Minnesota 55425	612-725-3548
Government Agency	Minnesota Department of Commerce Energy Environmental Review and Analysis	85 7th Place East, Suite 500 St. Paul, Minnesota 55101	800-657-3794
Owner/Operator	Northern States Power, a Minnesota corporation, d/b/a Xcel Energy	19469 McCall Avenue Reading, Minnesota 56165	612-215-5281

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Appendix A: Original Project Post-Construction Avian and Bat Fatality Estimates at Midwest Wind Energy Facilities in Minnesota, Iowa, and South Dakota.

Table 1. Wind energy facilities in Iowa, Minnesota, and South Dakota with comparable and publicly-available fatality data for raptor species.

Wind Energy Facility	State	fatality/MW/study period	Reference
Barton I and II	IA	0	Derby et al. 2011
Pioneer Prairie phase II (2011-2012)	IA	0	Chodachek et al. 2012
Top of Iowa 2003	IA	0	Jain 2005
Top of Iowa 2004	IA	0.17	Jain 2005
Winnebago	IA	0.27	Derby et al. 2010
Big Blue (2013)	MN	0	Fagen Engineering 2014
Big Blue (2014)	MN	0	Fagen Engineering 2015
Buffalo Ridge (Phase I; 1996)	MN	0	Johnson et al. 2000
Buffalo Ridge (Phase I; 1997)	MN	0	Johnson et al. 2000
Buffalo Ridge (Phase I; 1998)	MN	0	Johnson et al. 2000
Buffalo Ridge (Phase I; 1999)	MN	0.47	Johnson et al. 2000
Buffalo Ridge (Phase II; 1998)	MN	0	Johnson et al. 2000
Buffalo Ridge (Phase II; 1999)	MN	0	Johnson et al. 2000
Buffalo Ridge (Phase III; 1999)	MN	0	Johnson et al. 2000
Elm Creek	MN	0	Derby et al. 2010
Elm Creek II	MN	0	Derby et al. 2012
Moraine II (2009)	MN	0.37	Derby et al. 2010
Buffalo Ridge I (2010)	SD	0.2	Derby et al. 2010
Buffalo Ridge II (2011)	SD	0	Derby et al. 2012
Prairie Winds SD1 (Crow Lake) 2012-2013	SD	0.03	Derby et al. 2013
Prairie Winds SD1 (Crow Lake) 2013-2014	SD	0.17	Derby et al. 2014
PrairieWinds SD1 (Crow Lake) 2011-2012	SD	0	Derby et al. 2012
Wessington Springs (2009)	SD	0.06	Derby et al. 2010
Wessington Springs (2010)	SD	0.07	Derby et al. 2011

IA = Iowa, MN = Minnesota, SD = South Dakota,.

Table 2. Wind energy facilities in Iowa, Minnesota, and South Dakota with comparable and publicly-available fatality data for bat species.

Wind Energy Facility	State	fatality/MW/study period	Reference
Barton I and II	IA	1.85	Derby et al. 2011
Crystal Lake II	IA	7.42	Derby et al. 2010
Pioneer Prairie II (2013)	IA	3.83	Chodachek et al 2014
Pioneer Prairie phase II (2011-2012)	IA	10.06	Chodachek et al. 2012
Top of Iowa 2003	IA	7.16	Jain 2005
Top of Iowa 2004	IA	10.27	Jain 2005
Winnebago	IA	4.54	Derby et al. 2010
Big Blue (2013)	MN	2.04	Fagen Engineering 2014
Big Blue (2014)	MN	1.43	Fagen Engineering 2015
Buffalo Ridge (Phase I; 1997)	MN	0.74	Johnson et al. 2000
Buffalo Ridge (Phase II; 1998)	MN	2.16	Johnson et al. 2000
Buffalo Ridge (Phase II; 1999)	MN	2.59	Johnson et al. 2000
Buffalo Ridge (Phase II; 2001/Lake Benton I)	MN	4.35	Johnson et al. 2004
Buffalo Ridge (Phase II; 2002/Lake Benton I)	MN	1.64	Johnson et al. 2004
Buffalo Ridge (Phase III; 1999)	MN	2.72	Johnson et al. 2000
Buffalo Ridge (Phase III; 2001/Lake Benton II)	MN	3.71	Johnson et al. 2004
Buffalo Ridge (Phase III; 2002/Lake Benton II)	MN	1.81	Johnson et al. 2004
Elm Creek	MN	1.49	Derby et al. 2010
Elm Creek II	MN	2.81	Derby et al. 2012
Lakefield	MN	20.19	Westwood Professional Services 2015
Moraine II (2009)	MN	2.42	Derby et al. 2010
Buffalo Ridge I (2010)	SD	0.16	Derby et al. 2010
Buffalo Ridge II (2011)	SD	2.81	Derby et al. 2012
Prairie Winds SD1 (Crow Lake) 2012-2013	SD	1.05	Derby et al. 2013
Prairie Winds SD1 (Crow Lake) 2013-2014	SD	0.52	Derby et al. 2014
PrairieWinds SD1 (Crow Lake) 2011-2012	SD	1.23	Derby et al. 2012
Wessington Springs (2009)	SD	1.48	Derby et al. 2010
Wessington Springs (2010)	SD	0.41	Derby et al. 2011

IA = Iowa, MN = Minnesota, SD = South Dakota.

Table 3. Wind energy facilities in Iowa, Minnesota, and South Dakota with comparable and publicly-available fatality data for bird species.

Wind Energy Facility	State	fatality/MW/study period	Reference
Barton I and II	IA	5.5	Derby et al. 2011
Pioneer Prairie II (2013)	IA	3.83	Chodachek et al 2014
Pioneer Prairie phase II (2011-2012)	IA	0.27	Chodachek et al. 2012
Top of Iowa 2003	IA	0.42	Jain 2005
Top of Iowa 2004	IA	0.81	Jain 2005
Winnebago	IA	3.88	Derby et al. 2010
Buffalo Ridge (Phase I; 1997)	MN	2.51	Johnson et al. 2000
Buffalo Ridge (Phase II; 1998)	MN	2.47	Johnson et al. 2000
Buffalo Ridge (Phase II; 1999)	MN	3.57	Johnson et al. 2000
Elm Creek	MN	1.55	Derby et al. 2010
Elm Creek II	MN	3.64	Derby et al. 2012
Lakefield	MN	1.07	Westwood Professional Services 2015
Moraine II (2009)	MN	5.59	Derby et al. 2010
Buffalo Ridge I (2010)	SD	5.06	Derby et al. 2010
Buffalo Ridge II (2011)	SD	1.99	Derby et al. 2012
Prairie Winds SD1 (Crow Lake) 2012-2013	SD	1.41	Derby et al. 2013
Wessington Springs (2010)	SD	0.41	Derby et al. 2011

IA = Iowa, MN = Minnesota, SD = South Dakota.