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| In the Matter of the Application of MinnDakota Wind, LLC for a Site Permit for a 100 Megawatt Large Wind Energy Conversion System in Lincoln County, Minnesota | **FINDINGS OF FACT AND CONCLUSIONS**<br><br>**PUC DOCKET NO. PT-6530/WS-06-157** |

The above-entitled matter came before the Minnesota Public Utilities Commission (PUC), pursuant to an application by MinnDakota Wind, LLC, for a Large Wind Energy Conversion Site (LWECS) permit to construct, operate, maintain and manage an up to 100 Megawatt (MW) nameplate capacity wind farm and associated facilities in the townships of Drammen, Verdi, and Shaokatan, in Lincoln County, Minnesota. The LWECS site permit is to be issued to MinnDakota Wind, LLC.

All of the proposed wind turbines, foundations, transformers, feeder lines and 34.5 kV collection lines, and other associated infrastructure considered in these Findings of Fact and Conclusions, and the proposed LWECS permit approved by the Minnesota Commission will be located in Lincoln County, Minnesota.

MinnDakota Wind, LLC, plans on constructing up to an additional 99 MW of wind turbine capacity immediately across the state border in Brookings County, South Dakota. MinnDakota Wind, LLC has applied for and has been issued a permit from Brookings County for those facilities. MinnDakota Wind, LLC, anticipates operating the combined wind facilities in Minnesota and South Dakota as a single facility and will deliver electricity generated by the facility via 34.5 kV electrical lines to the proposed Xcel Energy Yankee Substation.

A new project substation, located in Section 32 of Drammen Township will be constructed to collect and deliver electricity generated from the MinnDaktoa Wind project to the proposed Xcel Yankee Substation in Section 5, of Verdi Township, Lincoln County.

## STATEMENT OF ISSUE

Should MinnDakota Wind, LLC, be granted a site permit under Minnesota Statutes section 116C.694 to construct an up to 100 MW Large Wind Energy Conversion System in Lincoln County, Minnesota?

Based upon the record and proceedings created in this proceeding, the Minnesota Public Utilities Commission makes the following:

# FINDINGS OF FACT

## Background and Procedure

1. On February 21, 2006, PPM Energy filed an application on behalf of MinnDakota Wind, LLC, for a Large Wind Energy Conversion Site (LWECS) permit to construct, operate, maintain and manage a 100 Megawatt (MW) nameplate capacity wind facility and associated facilities in the townships of Drammen, Verdi, and Shaokatan, in Lincoln County, Minnesota. (Exhibit 1)

2. On March 10, 2006, MinnDakota Wind, LLC, filed an amended application to request a change in the project boundary perimeter setback for the proposed project from 5 rotor diameters (RD) on the East-West crosswind axis to a distance of 2.5 RD on the East-West axis. (Exhibit 2)

3. Department of Commerce Energy Facility Permitting staff determined that the February 21, 2006, application complied with the application requirements of Minnesota Rules, part 4401.0450. In Comments and Recommendations to the PUC, dated March 16, 2006, DOC EFP staff recommended that the PUC accept the application as complete and appoint a public advisor. (Exhibit 3)

4. On March 20, 2006, the PUC issued an order accepting the application as complete and appointing a public advisor for the MinnDakota Wind, LLC project. (Exhibit 4)

5. MinnDakota Wind, LLC, distributed a permit application by U.S. Mail to each landowner and township clerk within the site boundary, county governmental and other required officials between March 29 and April 26, 2006. (Exhibit 5)

6. MinnDakota Wind, LLC, published a Notice of Application Acceptance of a LWECS Site Permit in the Lake Benton Valley Journal and Hendricks Pioneer newspapers on March 29, 2006. (Exhibits 6-7)

7. On April 12, 2006, the DOC EFP staff presented Comments and Recommendations to the PUC recommending the Commission make a preliminary determination to issue a draft site permit and recommending approval of a draft site permit for the MinnDakota Wind, LLC, project. (Exhibit 8)

8. On April 24, 2006, the PUC issued an order approving a draft site permit for the MinnDakota Wind, LLC, project and authorized initiation of the public comment and review process. (Exhibit 9)

9. On April 24, 2006, the DOC EFP staff served notice of the Public Information Meeting and Public Comment Period scheduled on May 9, 2006, in Hendricks, Minn., to the project mailing list to solicit comments on the site permit application, draft site permit, and to review the permitting process for LWECS. (Exhibit 10)

10. On April 24, 2006, EFP staff posted on the PUC Energy Facilities Permitting web page notice of the May 9, 2006, public information meeting in Hendricks, Minnesota, and the availability of the draft site permit.

11. EFP staff published notice of the Notice of Public Information Meeting and Public Comment Period, in the *Lake Benton Valley Journal* on April 26, 2006. The published notice provided: a) location and date of the public information meeting; b) description of the proposed project; c) deadline for public comments on the site permit application and draft site permit (May 25, 2006); d) description of the PUC site permit review process; and e) identification of the public advisor. The notice published meets the requirements of Minnesota Rules part 4401.0550 subp. 2. (Exhibit 11)

12. On May 8, 2006, the EFP staff published in the *EQB Monitor* Notice of Public Information Meeting and Public Comment Period, EQB Monitor, Volume 30, No. 10, May 8, 2006. The published notice contained all of the information required by Minnesota Rules part 4401.0550 subp. 1. (Exhibit 12)

13. The DOC EFP staff held a public information meeting on May 9, 2006, in Hendricks, Minnesota, to receive comments on the site permit application and draft site permit. Approximately 20 people attended the meeting. Representatives from MinnDakota Wind, LLC, attended. DOC EFP staff provided an overview of the permitting process and draft site permit and responded to questions about the permitting process. Representatives from MinnDakota Wind, LLC, reviewed the proposed project and responded to questions.

14. During the course of the public meeting, one member of the public asked questions about the permitting process and proximity of MinnDakota Wind, LLC, proposed wind turbines to existing wind turbines located in Section 31, Drammen Township.

15. No additional issues or concerns were raised about the permitting process, the proposed project, or conditions in the draft site permit at the public meeting.

16. The public comment period on the project closed on May 25, 2006.

**The Permittee**

17. MinnDakota Wind, LLC is an affiliate of PPM Energy.

18. MinnDakota Wind, LLC, will be responsible for development, project management, procurement, construction, commissioning, operation, and long-term ownership of the Project.

19. MinnDakota Wind, LLC will own the Project including all equipment up the project's interconnection to the proposed Xcel Energy Yankee Substation.

**Project Description**

20. The proposed project will use up to 66 1.5 MW wind turbines or wind turbines of a similar nameplate capacity for an installed nameplate capacity of up to 100 MW.

21. The MinnDakota Wind, LLC, Application provides a preliminary layout and site plan utilizing the GE 1.5 MW turbine. This model has a hub height of 80 meters (262 feet) and a rotor diameter of 70.5 meters (231 feet) to 80 meters (269 feet).

22. The MinnDakota Wind, LLC, Application indicates that if a 3.0 MW turbine is used, the expected hub height will be up to 105 meters (345 feet) and would have a rotor diameter of 90 meters (295 feet).

23. All turbines, towers and blades under consideration will be uniform in color and a neutral color.

24. The project will also include an underground-automated supervisory control and data acquisition system (SCADA) for communication purposes. One permanent meteorological tower will be used as part of the communication system. Other components of the project include a concrete and steel foundation for each tower, pad-mounted step-up transformers, all weather class 5 roads of gravel or similar material, and an underground and overhead electric energy feeder and collection system.

25. Each tower will be secured by a concrete foundation that will vary in size and design depending on site soil conditions. A control panel that houses communication and electronic circuitry is placed in each tower. A step-up, pad-mounted transformer will be located adjacent to each turbine to collect the power from the turbine and transfer it to a 34.5 kV collection system via underground or overhead cables.

26. Each turbine will be interconnected through an underground electrical collection and feeder system at 34.5 kV. The Applicant will place the 34.5 kV collection and feeder lines primarily on private rights-of-way and limit use of public rights-of-way. Feeder lines may be underground or overhead depending on local conditions. All of the proposed collection and feeder lines would connect to the proposed project substation in Section 32 of Drammen Township.

27. The project substation will connect to the Xcel Yankee Substation, where voltage from the MinnDakota Wind, LLC, 34.5 kV collection system will be stepped up to the transmission system level of 115 kV.

28. All turbines meteorological tower systems will be interconnected with fiber optic communication cables that will be installed underground. The communication cables will run back to a central host computer which will be located either at the project substation or at the operations and maintenance facility where a supervisory control and data acquisition (SCADA) system will be located. Signals from the current and potential transformers at each of the delivery points will also be fed to the central SCADA host

computer. The SCADA system will be able to give status indications of the individual wind turbines and the substation and allow for remote control of the wind turbines locally or from a remote computer. This computerized supervisory control and data acquisition network will provide detailed operating and performance information for each wind turbine. MinnDakota Wind, LLC, will maintain a computer program and database for tracking each wind turbine's maintenance history and energy production. The DOC EFP staff will have viewer access to the SCADA system.

**Wind Resource Considerations**

29. The MinnDakota Wind, LLC, project will be located in Lincoln County along the Buffalo Ridge approximately 1700 – 2000 feet above sea level. Land use in the project area is agricultural with intensive farming and some grazing activities and, as a result, there are few trees or structures in the proposed project site to inhibit the wind as it passes over the site. The wind resource in the project area is considered to be among the best in the nation and is well document by the Department of Commerce. The Wind Resource Analysis Program (WRAP) Report (2002), which presented wind analysis data from monitoring stations across the state of Minnesota, reported a mean annual wind speed of 15.2 to 16.4 miles per hour at an elevation of 70 meters (~230 feet) above ground level in the vicinity of the project area. More recent Wind Resource Maps produced by WindLogics for the Department of Commerce indicate that the resource in the vicinity of the project area at 80 meters (~263 feet) is between 18.1 and 19.9 miles per hour.

30. For this project wind turbines are sited so as to have good exposure to winds from all directions with emphasis on exposure to the prevailing southerly and northwesterly winds. The turbine spacing, according to site permit application, maximizes use of the available wind and minimizes wake and array losses within the topographical context of the site. Turbine placement has been designed to provide a minimum of 3 rotor diameter spacing in the east-west direction and 5 rotor diameter spacing in the north-south direction, with respect to the predominant energy production directions. Given the prevalence of southerly and northwest winds, the spacing is widest in the north-south direction. Greater or lesser spacing between the turbine strings may be used in areas where the terrain dictates the spacing. This is addressed in the permit at III.E.5. Individual, isolated turbine sites are avoided to minimize interconnection and access costs. Sufficient spacing between the turbines is utilized to minimize wake losses when the winds are blowing parallel to the turbine rows.

31. The project projected average annual output will be approximately 341,000 megawatt hours per year (MWh) assuming a 39 percent capacity factor. Final project output is subject to final layout, design, and equipment selected.

32. Most of the land within the project site is actively farmed. Cultivated lands comprise about 71 percent of the project area with corn, soybeans, and small grains as the dominant row crops. Pasture land is approximately 28 percent of the project area.

33. The project site as proposed includes approximately 31,000 acres in the townships of Verdi, Drammen and Shaokatan in Lincoln County. The land is predominately agricultural, with few scattered small woodlots and wetlands. The proposed wind turbine site layout found in Figure 1-3 of the amended site permit application shows where the proposed towers may be located. These locations are subject to change. It is estimated that the proposed facilities will result in the permanent, direct disturbance of 32 to 44 acres of land depending on turbine model, size and final site layout.

**Land Rights and Easement Agreements**

34. In order to build a large wind energy conversion system, a developer needs to secure wind rights, site leases and easement option agreements to ensure access to the site for construction and operation of a proposed project. These lease or easement agreements also prohibit landowners from any activities that might interfere with execution of the proposed project.

35. MinnDakota Wind, LLC, has obtained lease and easement option agreements and/or rights to such agreements with landowners for land within the project site boundary necessary for installation of the components of the wind farm. These rights and easements will be able to support the proposed project.

36. The project boundary set-back of 3 RD on the east-west (cross-wind) axis and set-back of 5 RD on the north-south (down-wind) axis have been established to protect the wind rights of adjacent landowners or owners not participating in the MinnDakota Wind, LLC, project.

37. The Applicant will be required to meet the 3 RD east-west and 5 RD north-south wind turbine set-backs from properties outside of the project boundary described in the application and from properties within the project boundary for which MinnDakota Wind, LLC, does not hold wind development easements or rights.

38. The Applicant will be required to meet a 5 RD set-back from all existing wind turbines regardless if such turbines are inside or outside of the proposed project area to protect the wind rights of owners of adjacent, existing wind turbines.

**Public Comments and Letters Received by May 25, 2006**

39. At the close of the comment period on May 25, 2006, the DOC had received six comment letters on the proposed MinnDakota Wind, LLC, project.

40. On May 11, 2006, the Department received comment letters from Mr. Wayne Hesse, Mr. Amos Schwarzrock, Mr. Jerry Schwarzrock, and Mr. Paul Schwarzrock, expressing concerns about the proximity of MinnDakota Wind, LLC, proposed wind turbine locations to their existing wind turbines located in Section 31, Drammen Township. The persons above indicated the concern that the proximity of two of MinnDakota Wind,

LLC, proposed turbines may affect the production of the existing wind turbines owned by the persons above. (Exhibits 13-16)

41. On May 24, 2005, the Department received a comment letter from Mr. Dennis Gimmestad of the Minnesota Historic Preservation Office. The letter indicates that the Office reviewed the permit application under its responsibility under the Minnesota Historic Sties Act and Minnesota Field Archaeology Act. The letter indicates that the Office will review MinnDakota Wind, LLC, cultural resources survey when has been completed. (Exhibit 17)

42. On May 25, the Department received a comment letter from Mr. Timothy Seck of PPM Energy on behalf of the MinnDakota Wind, LLC, project. Mr. Seck's letter made comments and suggestions on the language contained in the draft site permit. (Exhibit 18)

43. The public comment period closed on May 25, 2006.

**Site Criteria**

Minnesota Statutes sections 116C.691 – 116C.697 and Minnesota Rules Chapter 4401 apply to the siting of Wind Energy Conversion Systems. The rules require applicants to provide a substantial amount of information to allow the PUC to determine the potential environmental and human impacts of the proposed project and whether the project is compatible with environmental preservation, sustainable development, and the efficient use of resources. Minnesota Rules parts 4401.0450 through 4401.0600. The following analysis addresses the relevant criteria that are to be applied to a LWECS project.

**Human Settlement, Public Health and Safety**

44. The site is in an area of low population density, with little residential, commercial or industrial development on or near the site. As a result, the impact of the proposed LWECS on human settlement, public health and safety will be minimal. The site permit condition III. C. specifies conditions for setbacks from residences and roads. The proposed wind turbine layout meets or exceeds those requirements.

45. There will be no displacement of existing residences or structures in siting the wind turbines and associated facilities.

46. The project will comply with the Federal Aviation Administration requirements with respect to lighting. See site permit condition III.E.4.

47. MinnDakota Wind, LLC, will provide security during construction and operation of the project, including fencing, warning signs, and locks on equipment and facilities MinnDakota Wind, LLC, will also provide landowners and interested persons with safety information about the project and its facilities. See site permit condition III.B.15.

48. Each turbine will be clearly labeled to identify each unit and a map of the site with the labeling system to local public safety authorities as part of the fire protection plan.

**Noise**

49. Wind turbines generate noise. According to estimates provided by MinnDakota Wind, LLC, in its application, the sound pressure level is expected to be lower than the Minnesota Pollution Control Agency noise standard of 50 dBA measured at the closest residences. The MPCA noise standard is found in Minnesota Rules part 7030.0040. The Applicant will be required to meet the Minnesota Pollution Control Agency's (MPCA) noise standard.

50. For this project, the site permit application indicates that at a distance of 623 feet, the noise measured at a residence will meet the requirements of the Nightime L50 standard of 50 dB(A) for the 1.5 MW GE turbine, and 788 feet for a 3.0 MW turbine. These set-back distances are based on noise information and modeling provided to MinnDakota Wind, LLC, by relevant manufacturers. See site permit condition III.E.3.

**Visual Values**

51. Currently within and adjacent to the project boundary and on the Buffalo Ridge generally, wind turbines, towers and rotor blades are prominent features on the landscape. There are currently expansive views of the turbines to passing motorists on local, county and state highways.

52. The visual impact of the proposed MinnDakota Wind, LLC, wind turbines will be reduced by the use of a neutral paint color. The only lights will be those required by the Federal Aviation Administration. All site permits issued by the PUC require the use of tubular towers; therefore, the turbine towers will be uniform in appearance. Wind turbines are and will continue to be a dominant visual feature on the landscape on and near the Buffalo Ridge. The wind turbines in this project, while prominent on the landscape, will also blend in with the surrounding area. The project site will retain its rural character. The turbines and associated facilities necessary to harvest the wind for energy are consistent with existing land use, wind energy production, and agricultural practices.

53. The numerous wind farms on the Buffalo Ridge have altered the landscape from agricultural to wind plant/agricultural. This project will increase the visual impact to the area. The cumulative effect of the proposed project will increase both the industrial appearances of the wind plants in the area and the areas from which they will be seen. Because wind generation development is likely to continue in Lincoln County, this visual impact will continue to increase the size of the wind plant/farm footprint as the turbines harvest the wind resources of Lincoln County for energy. To date the presence of numerous wind turbines on Buffalo Ridge has been well accepted by the people who live and work in the area.

54. MinnDakota Wind, LLC, use of larger turbine rotor sizes and rotor diameters will result in greater turbine spacing to minimize wake loss. Therefore the MinnDakota Wind, LLC turbines will be spaced further from one another and existing turbines than in several older, existing projects on Buffalo Ridge which used smaller turbine rotors and rotor diameters. See site permit conditions III.C.

**Recreational Resources**

55. Recreational opportunities in Lincoln County include: hunting, fishing, snowmobiling, bird and wildlife watching, campgrounds and trails. Hunting, fishing and wildlife observation is permitted in designated Minnesota Department of Natural Resources Wildlife Management Areas (WMA's), Fish and Wildlife Service lands and other lands inside and outside of the project boundary, in public waters, and on private property in the area unless otherwise posted. There are no designated states or federal wildlife areas located within the project boundary; however several are present within one mile. The proposed project will not impact public access to public waters in the area.

56. The proposed turbines will be visible to persons using the lands inside and close to the project area. Turbines will not be located on public lands, WMA's, Scientific and Natural Areas or in any local parks. There are no designated WMAs, SNAs, or public parklands within the project boundary. Wind turbine operations are not expected to affect the natural areas in any material way and no adverse impact on wildlife areas is expected.

**Infrastructure**

57. The MinnDakota Wind, LLC project is expected to have a minimal effect on the existing infrastructure. The proposed project will use underground cables for the collector lines on private property within the wind farm. The feeder lines associated with the project may be overhead or underground, dependant on site conditions. Any above ground feeder lines, if used, would be wood-pole, 34.5 kV typical of wind project feeder lines in the Buffalo Ridge area. The feeder lines will deliver the energy from the wind farm to the project substation. Placement of collector and feeder lines is addressed in the site permit at III.E.7. and 8.

58. The project will require the use of public roads to deliver construction supplies and materials to the work site. Site permit condition III.B.8. addresses this topic. Construction of the project requires the construction of access roads that will be located on private property. The access roads will be routed in a manner that minimizes disturbance of agricultural activities while maintaining a short, direct route. The typical permanent access road will be 16 feet in width and covered in Class 5 gravel (or similar material). The access roads will be low profile roads to allow for the movement of agricultural equipment. The site permit at III.B. 8 (b) addresses this topic. During operation and maintenance of the wind plant, operation and maintenance crews, while inspecting and servicing the wind turbines, will use the access roads. Periodic grading or other methods are necessary to maintain road integrity. The Permittee may do this work or contract it out.

59. If access roads must be installed across waterways that are considered public waters, the Permittee in consultation with the Minnesota Department of Natural Resources will design, shape and locate the road so as not to alter the original water flow or drainage patterns. Any work required below the ordinary high water line, such as road crossings or culvert installation, will require a permit from the Minnesota Department of Natural Resources.

60. The proposed wind farm will not affect water supplies, railroads, telecommunication facilities, and radio reception. The presence or operation of the wind plant could potentially impact the quality of television reception in the area. Previous work on television reception issues indicates that in some cases new antennas or relocation of existing antennas can restore television signal strength reception. MinnDakota Wind, LLC will address the concerns of residents in the area of the project site before and after the project construction to document and mitigate any television reception impacts that might occur. This is addressed in the site permit at III.D.3.

61. Construction, operation, and maintenance of the proposed wind plant will comply with all of the required federal and state permit requirements.

**Community Benefits**

62. The project will provide local tax revenues from a production tax on the wind energy produced by the turbines. No significant adverse impact on public services is expected. Wear and tear on roads will occur as a result of the transport of heavy equipment and other materials. The site permit at III.B.8. addresses road damages. Landowners with turbine(s) or associated infrastructure on their property will receive payments from MinnDakota Wind, LLC, for wind rights and land easements.

63. To the extent that local workers and local contractors are capable, qualified, and available, MinnDakota Wind, LLC will seek to hire them to construct the proposed project. The hiring of local people will expand employment opportunities in this area of the state and keep money in the local economy. Once constructed, the project will be staffed with several full time site technicians and a wind plant supervisor. Short term construction spending will provide local economic benefits. Long term operations, maintenance, production taxes, and lease payments will also have positive local economic benefits.

**Effects on Land-Based Economies**

64. The project will permanently displace approximately 32 to 44 acres of agricultural land. The site permit at III.B. 2., 3., 4., 5., 6., 7., 8(c)., 9., and 10. addresses mitigation measures for agricultural lands. The proposed project does not affect any sand or gravel operations.

**Archaeological and Historical Resources**

65. HDR Engineering, Inc., conducted a Cultural Resources Literature Review included in the MinnDakota Wind, LLC, Amended Application, Appendix B. The Literature Review relies on a review of the Minnesota State Historic Preservation Office (SHPO) computer database which indicates that 11 known cultural resources and 15 archaeological resources have been documented inside the boundaries of or within 1 mile of the MinnDakota Wind project. Many of these resources were discovered or reported upon conducting environmental review of previously permitted wind facilities in the area. HDR recommended a Phase I archeological resources survey for all the proposed turbine locations, access roads, and other construction elements to document any previously unrecorded archaeological sites within the project site. The site permit at III.D.2. requires MinnDakota Wind, LLC, to consult with the Minnesota Historical Society upon completion of cultural resources surveys.

66. If any archaeological sites are found during the Phase I survey, their integrity and significance should be addressed in terms of the site's potential eligibility for placement on the National Register of Historic Places (NRHP). If such sites are found to be eligible for the NRHP, appropriate mitigation measures will need to be developed in consultation with the Minnesota State Historic Preservation Officer (SHPO), the State Archaeologist, and consulting American Indian communities. The site permit also requires the Permittee to stop work and notify the Minnesota Historical Society and PUC if any unrecorded cultural resources are found during construction. See the site permit at III.D.2.

**Air and Water Emissions**

67. No harmful air or water emissions are expected from the construction and operation of the LWECS.

**Animals and Wildlife**

68. MinnDakota Wind, LLC, has consulted with the Minnesota Department of Natural Resources and the United States Fish and Wildlife Service about the project’s design and mitigation measures on natural communities, fish and wildlife.

69. The Topeka Shiner, a species of endangered fish, may be present in streams within the project boundary. Best management practices shall be implemented to minimize impacts to Topeka Shiner habitat and are attached to the site permit.

70. Neither construction nor operation of the project is expected to significantly impact wildlife. Based on studies of existing wind power projects in the United States and Europe, the only impact of concern to wildlife would primarily be to avian and bat populations. The final report on avian monitoring studies at Buffalo Ridge, Minnesota “Final Report-Avian Monitoring Studies at the Buffalo Ridge, Minnesota Resource Area: Results of a 4-Year Study” (September 2000) identified the following impacts:

a) Following construction of the wind turbines, there is a reduction in the use of the area within 100 meters of the turbines by seven of 22 species of grassland breeding birds. It was hypothesized that lower avian use may be associated with avoidance of turbine noise, maintenance activities, and less available habitat. The researchers stated "on a large scale basis, reduced use by birds associated with wind power development appears to be relatively minor and would not likely have any population consequences on a regional level."(p. 44)

b) Avian mortality appears to be low on Buffalo Ridge, compared to other wind facilities in the United States, and is primarily related to nocturnal migrants. Resident bird mortality is very low and involves common species. The researchers stated that "based on the estimated number of birds that migrate through Buffalo Ridge each year, the number of wind plant related avian fatalities at Buffalo Ridge is likely inconsequential from a population standpoint." (p. iv)

71. Bat mortality was also studied at Buffalo Ridge, instigated by bat collision victims found during the avian monitoring studies. The bat study was conducted in 2001 and 2002. ("Bat Interactions with Wind Turbines at the Buffalo Ridge, Minnesota Wind Resource Area," November 2003). The overall conclusion is that bat activity at turbines and the numbers of bat fatalities do not share a statistical relationship. Bat collisions were found to be very rare, given the amount of bat activity documented at the turbines. Most fatalities involved migrating bats, a wind-plant related mortality "is possibly not sufficient to cause significant, large-scale population declines." (p. 61)

72. Mitigation measures are also prescribed in the site permit and include but are not limited to: a) a pre-construction inventory of existing biological resources, native prairie, state listed and threatened species and wetlands in the project area; b) turbines and associated facilities will not be constructed in wildlife management areas, recreation and state and scientific natural areas; c) landowner approval will be negotiated prior to any removal of trees during construction; d) sound water and soil conservation practices will be implemented during construction and operation of the project to protect topsoil and adjacent resources and to minimize soil erosion. This also applies to any work in proximity to watercourses.

**Vegetation**

73. Removal of groves of trees or shelterbelts will be minimized. Native prairie will also be avoided. If native prairie cannot be avoided, the site permit, at III. C.6. provides for preparation of a prairie protection and management plan.

**Soils**

74. Construction of the wind turbines and access roads increases the potential for erosion during construction and converts prime farmland to industrial use. The site permit at III. B. 9. requires a soil erosion and sediment control plan. The project will also require a storm water run-off permit from the Minnesota Pollution Control Agency.

**Surface Water and Wetlands**

75. No towers, access roads or utility lines will be located in Public Waters or wetlands, unless licensed or permitted by the DNR. See site permit at III.C.5.

**Future Development and Expansion**

76. While large-scale projects have occurred elsewhere (California and Iowa), little systematic study of the cumulative impact has occurred. Research on the total impact of many different projects in one area has not occurred. DOC EFP staff continues to monitor for cumulative impacts and issues related to wind energy development.

77. The PUC and DOC anticipate more site permit applications under Minnesota Statutes section 116C.694 (a). The PUC is responsible for siting of LWECS "in an orderly manner compatible with environmental preservation, sustainable development, and the efficient use of resources." Minnesota Statutes section 116C.693.

78. Minnesota Statutes section 116C.57, subd. 4 requires consideration of design options that might minimize adverse environmental impacts. By using larger turbines, fewer turbines are required, reducing siting needs for turbines and related facilities. Turbines must also be designed to minimize noise and aesthetic impacts. Buffers between strings of turbines are designed to protect the turbines' production potential. The site permit also provides for buffers between adjacent wind generation projects to protect production potential. See site permit at III.C.1.

79. The location and spacing of the turbines are critical to the issues of orderly development and the efficient use of wind resources. Turbines are likely to be located in the best winds, and the spacing dictates, among other factors, how much land area the project occupies.

80. One efficiency issue is the loss of wind in the wake of turbines. Wind flow behind the turbine is not as fast and is more turbulent than the free-flowing wind. This condition persists for some distance behind the turbine as normal wind flow is gradually restored. If a turbine is spaced too close downwind of another, it produces less energy and is less cost-effective. This is the wake loss effect. If the spacing is too far, wind resources are wasted and the projects' footprint on the land is unnecessarily large.

81. For this project, turbine spacing maximizes use of the available wind resources and minimizes wake and array losses within the topographical context of the site. Site topography and wind resources resulted in a layout involving long strips of turbines running parallel to each other and perpendicular to the prevailing wind. The objective is to capture the most net energy possible from the best available wind resource. Allowing for setback from roads and residences and avoiding sensitive areas, MinnDakota Wind, LLC, arrived at an average turbine spacing of at least 3 rotor diameters in the east-west direction and at least 5 rotor diameter spacing in the north-south direction, with respect to the predominant energy production directions. Given the prevalence for southerly and

northerly winds at this site, the spacing between turbines is greatest in the north-south direction for this project.

**Maintenance**

82. Maintenance of the turbines will be on a scheduled, rotating basis. Additional unscheduled maintenance will be conducted on an as needed basis. Maintenance on the interconnection points will be coordinated with Xcel Energy. The MinnDakota Wind, LLC, project will be staffed with site technicians and a wind plant supervisor. The Permittee may construct a facility to house the operation and maintenance efforts for the Project.

**Site Restoration**

83. Decommissioning and site restoration activities will include (1) removal of all turbines and towers; (2) removal of all pad mounted transformers; (3) removal of all above-ground distribution facilities; (4) removal of foundations to a depth of three feet below grade; and (5) removal of surface road material and restoration of the roads and turbine sites to previous conditions to the extent feasible.

**Decommissioning Economics**

84. MinnDakota Wind, LLC, will be responsible for all costs to decommission the Project and associated facilities and will begin decommissioning the facility within 8 months from the time the facility ceases to operate. Decommissioning will be completed within 15 months from the time the facility ceases to operate. See site permit at III.G.

85. The estimated decommissioning cost for the MinnDakota Wind, LLC, project is approximately $10,000 to $30,000 per turbine in current dollars. The Permit requires MinnDakota Wind, LLC, to submit a Decommissioning Plan to the PUC that describes how the Permittee will ensure that the resources are available to pay for decommissioning the project at the appropriate time. See site permit at III.G.

**Site Permit Conditions**

86. Nearly all of the conditions contained in this site permit were established as part of the site permit proceedings of other wind turbine projects permitted by the Environmental Quality Board and the Public Utilities Commission. Minor changes that provide for clarifications of the draft site permit conditions have been made.

87. The proposed MinnDakota Wind, LLC, project meets the site permit setback requirements from existing wind turbines and lands which MinnDakota Wind, LLC, does not hold wind rights.

88. The site permit contains conditions that apply to site preparation, construction, cleanup, restoration, operation, maintenance, abandonment, decommissioning and all other aspects of the project.

Based on the foregoing findings, the Minnesota Public Utilities Commission makes the following:

## CONCLUSIONS OF LAW

1. Any of the foregoing findings, which more properly should be designated as conclusions, are hereby adopted as such.

2. The MinnDakota Wind, LLC, application for a site permit was properly filed and noticed as required by Minnesota Statutes section 116C.94 and Minnesota Rules parts 4401.0460 subp. 2 and 4401.0550 subp. 2.

3. The Minnesota Public Utilities Commission has afforded all interested persons an opportunity to participate in the development of the site permit and has complied with all applicable procedural requirements of Minnesota Statutes section 116C.694 and Minnesota Rules Chapter 4401.

4. While a siting concern was raised, no objections were filed with the Minnesota Public Utilities Commission by any governmental unit, affected landowner or any other interested person during the 30-day comment period and no contested case hearing was requested.

5. The Commission concludes that the 5 rotor diameter (RD) set back from existing wind turbines adequately protects owners of existing wind turbines in the area. The 3 RD east-west and 5 RD north-south project boundary set back adequately protects the wind and property rights of persons outside the project boundary and/or persons within the project boundary but not participating the MinnDakota Wind, LLC project.

6. The Minnesota Public Utilities Commission has jurisdiction under Minnesota Statutes section 116C.694 over the site permit applied for by MinnDakota Wind, LLC. Minnesota Public Utilities Commission is the agency directed to carry out the legislative mandate to site LWECS in an orderly manner compatible with environmental preservation, sustainable development and the efficient use of resources.

7. The MinnDakota Wind, LLC, LWECS project will not create significant human or environmental impacts and is compatible with environmental preservation, sustainable development, and the efficient use of resources.

8. The Minnesota Public Utilities Commission has the authority under Minnesota Statutes section 116C.694 to establish conditions in site permits relating to site layout and construction and operation and maintenance of an LWECS. The conditions contained in the site permit issued to MinnDakota Wind, LLC, are appropriate and necessary and within the Minnesota Public Utilities Commission's authority.