

**STATE OF MINNESOTA  
PUBLIC UTILITIES COMMISSION**

In the Matter of the Application of  
enXco Development Corporation for  
a Site Permit for a 205.5-Megawatt  
Large Wind Energy Conversion  
System and Associated Facilities in Mower  
County, Minnesota

**FINDINGS OF FACT, AND  
CONCLUSIONS AND ORDER**

**PUC DOCKET NO.  
IP6646/WS-07-839**

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The above-entitled matter came before the Minnesota Public Utilities Commission (PUC), pursuant to an application by enXco Development Corporation (enXco), for a site permit to construct, operate, maintain and manage a 205.5-Megawatt (MW) nameplate capacity Large Wind Energy Conversion System (LWECS) and associated facilities in Mower County in Clayton, Marshall, Dexter, Grand Meadow, Pleasant Valley and Sargeant Townships. enXco applied for the permit on behalf of the Wapsipinicon Wind Project and the Grand Meadow Wind Farm. The first permit is to be issued in the name of Grand Meadow Wind Farm, which when completed will be sold to and owned by Northern States Power Company, a Minnesota Corporation and wholly owned subsidiary of Xcel Energy (Xcel Energy) as a complete “turnkey” project.

All of the proposed wind turbines and associated facilities will be located in Mower County. The energy from the proposed 205.5 MW project will be delivered from the project substation to the Pleasant Valley Substation located in section 19 of Pleasant Valley Township via approximately 6 miles of overhead 161 kV transmission line. Other associated facilities will include pad mounted step-up transformers for each wind turbine, access roads and a 34.5 kV electrical collection and feeder system, project substation, and permanent meteorological towers.

**STATEMENT OF ISSUE**

Should enXco Development Corporation, be granted a site permit under Minnesota Statutes section 216F.04 to construct in phases a 205.5-Megawatt (MW) Large Wind Energy Conversion System in Mower County, Minnesota, with the first phase identified as the 100.5 MW Grand Meadow Wind Farm, which will be sold to and owned by Northern States Power Company, upon completion of construction?

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

## FINDINGS OF FACT

### Background and Procedure

1. On June 25, 2007, enXco Development Corporation (enXco) filed a complete application with the Public Utilities Commission for up to 205.5 megawatts of nameplate wind power generating capacity identified as the Wapsipinicon Wind Project in Mower County in southeastern Minnesota (Exhibit 1).
2. Department of Commerce staff determined that the June 25, 2007, application complied with the application requirements of Minnesota Rules, part 4401.0450 (renumbered at Minnesota Rules, part 7836.0500). In a briefing paper to the PUC, dated July 18, 2007, DOC Energy Facility Permitting staff recommended that the PUC accept the application (Exhibit 2).
3. On August 7, 2007, a PUC Order accepted the application for the Wapsipinicon Wind Project/Grand Meadow Wind Farm and associated facilities. On August 7, 2007, the PUC also issued a draft site permit for review and comment (Exhibit 3).
4. DOC EFP staff prepared a notice for the public information and scoping meeting to receive comments on the site permit application, the draft site permit and the scope of the environmental report required for the Grand Meadow Certificate of Need Proceeding (PUC Docket # E0022/CN-07-873) (Exhibit 4).
5. enXco's site permit application was distributed to the Public Utilities Commission, the Minnesota Historical Society, the auditor of Mower County, County Commissioners and township clerks. Each landowner affected by the proposed project also received a copy of the application, notice of application acceptance and public information meeting, and a copy of the draft site permit during the week of September 2, 2007 (Exhibit 5)
6. The DOC published notice of the site permit application, DOC public information and scoping meeting and opportunity to comment on the draft site permit in the *Bluff County Reader* and *Austin Daily Herald* on September 3, 2007 (Exhibits 6 & 7). The published notice provided: a) location and date of the public information meeting; b) description of the proposed project; c) deadline for public comments and scoping comments on the application and draft site permit (October 10, 2007); 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 7836.0900 subp2.
7. On September 10, 2007, the EFP staff published in the *EQB Monitor* notice of the September 19, 2007, public information and scoping meeting in Elkton, Minnesota, and the availability of the draft site permit, Volume 31, No. 19, September 10, 2007 (Exhibit 8). The published notice contained all of the information required by Minnesota Rules part 7836.0900 subp. 1. Notice also appeared on the PUC web site.

8. The DOC EFP held a public information meeting on September 19, 2007, in Elkton, to receive comments on the site permit application, draft site permit and Scoping Comments. Approximately 50 people attended the meeting. Representatives from enXco, Inc., and Northern States Power Company were also present. DOC EFP staff responded to questions about the permitting process and enXco staff responded to questions about the project. Questions were asked about access roads, project timing, easement agreements and conditions, location of distribution and feeder lines, and project decommissioning. No significant issues or concerns were raised about the permitting process, the proposed project, or conditions in the draft site permit at the public meeting. The public comment period on the project closed on October 10, 2007.

### **The Permittee**

9. enXco Development Corporation has been in the process of developing the Wapsipinicon site since 2001. enXco's Wapsipinicon Site Permit Application is for a 205.5 Megawatt LWECS project. At this time, the Project will be completed using a "build-transfer" approach. Xcel Energy has contracted with enXco for the development and construction of the facility, with an expected in-service date of November 1, 2008. After the facility is completed, the ownership of the project will transfer to Northern States Power Company.
10. There are two primary agreements between Xcel Energy and enXco, which cover ownership of the site and the construction and development of the project, and several supporting agreements. The two primary agreements are:
  - a. the Acquisition and Sale Agreement ("ASA"), and
  - b. the Turnkey Engineering, Procurement and Construction Agreement ("TEPC").
11. The ASA obligates enXco to complete and transfer to Xcel Energy all project development and land rights associated with the site. This agreement is effective upon execution but will not close until an extensive list of development activities has been completed by the developer and regulatory approvals have been achieved.
12. The TEPC is a traditional Turnkey Engineering, Procurement and Construction contract obligating the developer to design and build the facility at the site per the specifications. This agreement is effective upon execution, but construction will not begin at the site until after the CON and Site permit have been granted.
13. Each of these contracts set out payment schedules, completion schedules, remedies and recourses for failure by either party to perform their obligations under these agreements.
14. In addition, the parties will enter into separate agreements related to the interconnection rights associated with the project and to cover other ancillary aspects of the project. The parties are also considering entering into an Operation and Maintenance agreement but anticipate that this agreement would be negotiated at a later date.

## Project Description

15. As proposed, the 205.5-megawatt Wapsipinicon Wind Project/Grand Meadow Wind Farm will consist of up to 137 General Electric 1.5-megawatt wind turbine generators or similar turbine mounted on freestanding tubular towers. The proposed turbine model and specifications may change because the project will not be built until 2008 and any other phases at a later date depending on future Certificate of Need requirements.
16. The towers will be 80-meters (262 feet) in height. The blades on the wind turbine are 38.5-meters (126 feet) long. Turbine rotor diameter will be 77 meters (253 feet) across. The overall height of the tower, nacelle and blade will be approximately (118.5 meters) 389 feet when one blade is in the vertical position. The project will also include an underground-automated supervisory control and data acquisition system (SCADA) for communication purposes. Up to five permanent meteorological towers 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 collection system and a project substation.
17. The GE Wind 1.5 MW wind turbine is a three blade, upwind, active yaw, and active aerodynamic control regulated wind turbine with power/torque control capabilities. The rotor utilizes blade pitch regulation and variable speed operation to achieve optimum power output at all wind speeds. The variable speed operation minimizes power and torque spike delivered from the rotor to the drive train resulting in improved long-term reliability. Each turbine is equipped with a wind direction sensor. The wind direction sensor communicates with the computer system, which evaluates the measured wind parameters, and within a specified time interval, activates the yaw drives to align the nacelle to the wind direction.
18. Each turbine is interconnected through an underground electrical collection system at 34.5 kV. The 34.5 kV feeder lines from the project collection system feed the power to the independent breaker positions at the proposed project substation. The substation steps up the voltage from the 34.5 kV collection systems to the transmission system level of 161 kV. The applicant is proposing to place the 34.5 kV feeder lines on public road rights-of-way where possible. Depending on conditions the feeder lines may be either overhead or underground. All of the proposed feeder lines would connect to the proposed substation within the site permit boundaries.
19. The blades are made of fiberglass with a smooth layer of gel coat that provides ultraviolet protection. The blades will be either white or grey in color. The blades will be equipped with lightning protection. The entire turbine is also grounded and shielded to protect against lightning.
20. Each tower will be secured by a concrete foundation that will vary in size depending on the soil conditions. A control panel that houses communication and electronic circuitry is placed in each tower. In addition, a step-up, pad-mounted transformer is necessary for

each turbine to collect the power from the turbine and transfer it to a 34.5 kV collection system via underground cables.

21. All turbines and up to 5 permanent meteorological towers will be interconnected with fiber optic communication cable that will be installed underground. The communication cables will run back to a central host computer which will be located either at the Pleasant Valley Substation, 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 in California. This computerized supervisory control and data acquisition network will provide detailed operating and performance information for each wind turbine. The Permittee will maintain a computer program and database for tracking each wind turbine's maintenance history and energy production.
22. Housed inside the fiberglass nacelle that sits on the top of the tower are the generator, brake system, yaw drive system and other miscellaneous components.

### **Wind Resource Considerations**

23. The 205.5 MW Wapsipinicon/Grand Meadow Wind Farm will be located in central Mower County on both sides of I-90 and include portions of Pleasant Valley, Sargeant, Grand Meadow, Dexter, Marshall and Clayton Townships. The Grand Meadow Wind Farm portion of the Wapsipinicon Wind Project will be built on the south side of I-90 and the Wapsipinicon portion will be located on the north side of I-90. The cities of Elkton and Dexter are within the site permit boundaries for the proposed project. Land use in the project area is agricultural with intensive farming and 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 Mower County area is well documented by the Wind Resource Analysis Program (WRAP) Report (2002) prepared by the Minnesota Department of Commerce. The WRAP Report presents wind analysis data from monitoring stations across the state of Minnesota.
24. For this project the wind turbines will be sited in clusters along hilltops and ridgelines within the site boundaries. The 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 wind directions. The turbine spacing, according to enXco's application, maximizes use of the available wind and minimizes wake and array losses within the topographical context of the site. The turbines are typically oriented west-southwest to north-northeast, which is roughly perpendicular to the prevailing southerly and northwest winds. Turbine placement has been designed to provide 3 rotor diameters spacing in the non-prevailing (WSW/SW to NNE/NE) direction and 6 rotor diameters spacing in the north-south direction, with respect to the predominant energy production directions. Given the prevalence for southerly 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 turbines.

25. The gross annual energy output per turbine is estimated to be approximately 700 GWh (gigawatt hours) or 700,000 MWh (megawatt hours). Assuming an efficiency of approximately 86 percent when the wind is blowing, the net annual energy output per turbine is expected to be 5,109 MWh. If 137 turbines are used, the project will produce approximately 700,000 MWh per year. The base energy calculation presented assumes a normal or average wind year. The maximum variation in energy is within +/- 15 percent. Based on the data, one would expect the annual variation in energy at the project site to be within 10 percent of the mean during most years.
26. Most of the land within the project site is actively farmed. Around 80 percent of the land in Mower County is used for agricultural purposes. Corn and soybeans are the dominant crops. Oats and hay are additional crops within the Project site.
27. The project site as proposed includes approximately 51,200 acres. The land is predominately agricultural, with some scattered wooded areas, and wetlands. It is estimated that the proposed facilities will result in the permanent disturbance of approximately 137 acres of land, primarily for roads and towers. Construction of the turbines sites and access roads will involve temporarily disturbing at the most approximately 5-10 acres of land per turbine. This equates to 670-1,340 acres of temporary disturbance for contractor staging areas, foundation construction, underground power lines, and tower and turbine assembly. Roads are expected to be about 16 feet wide
28. Wind turbine and road access will be sited to take into account the contours of the land and prime farmland locations to minimize impact. An erosion and sediment control plan and Storm Water Pollution Prevention Plan (SWPPP) will be prepared for the Project and the disturbed areas will be seeded after construction to stabilize the area. The Project will also be subject to the requirements of the NPDES Construction Permit.

### **Land Rights and Easement Agreements**

29. In order to build a wind plant, a developer needs to secure 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 the execution of the proposed project.
30. enXco 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 used

to site the turbines and all associated facilities and provide the necessary buffers and setbacks.

### **Written Comments and Letters Received by October 10, 2007**

31. No public comments or letters were received by the close of the comment period on October 10, 2007, or after the close of the comment period.

### **Site Criteria**

32. Minnesota Rules chapter 7836 applies to the siting of Large 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. Minn. Rules parts 7836.0500 through 7836.0600. The following analysis addresses the relevant criteria that are to be applied to a LWECS project.

### **Human Settlement, Public Health and Safety**

33. 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, at part III. C., has conditions for setbacks from residences and roads. The proposed wind turbine layout will meet or exceed those requirements. The proposed project is not expected to affect any water wells (used, unused or unsealed) or any rural water system that services the area. The Project is not expected to have any adverse impacts on the communities of Elkton, Dexter and Grand Meadow that are within or adjacent to the site.
34. There will be no displacement of existing residences or structures in siting the wind turbines and associated facilities.
35. The project will comply with the Federal Aviation Administration requirements with respect to lighting. See site permit condition III.E.4.
36. The Permittee will provide security during construction and operation of the project, including fencing, warning signs, and locks on equipment and facilities. The Permittee will also provide landowners and interested persons with safety information about the project and its facilities. See site permit condition III.B.15.
37. In winter months ice may accumulate on the wind turbine blades when the turbines are stopped or operating very slowly. Furthermore, the anemometer may ice up at the same time, causing the turbine to shut down during any icing event. As weather conditions change, any ice will normally drop off the blades in relatively small pieces before the turbines resume operation. This is due to flexing of the blades and the blades' smooth surface. Although turbine icing is an infrequent event, it remains important that the

turbines are not sited in areas where regular human activity is expected below the turbines or in the immediate proximity during the winter months.

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

## **Noise**

39. Wind turbines do generate noise. GE Wind and noise consultants suggest a maximum noise threshold of 45 dBA at occupied homes. According to sound pressure level tests and estimations provided by enXco in its application for a site permit, the sound pressure level is expected to be lower than the Pollution Control Agency noise standard of 50 dBA measured at the closest residence. See Minn. Rules part 7030.0040. For this project, the site permit application indicates that at a distance of 1,000 feet from the turbines, the noise measured at a home will be less than 50 dBA.

## **Visual Values**

40. The placement of up to 137 turbines will affect the appearance of the area. The wind turbines will be mounted on tubular towers that are up to 265 feet tall. The rotor blades will have a diameter of up to 254 feet. The turbine towers and rotor blades will be prominent features on the landscape. There will be intermittent, expansive views of the turbines to passing motorists on highways I-90, and Trunk Highway 16 between Dexter and Grand Meadow. Motorists and drivers on local township and county roads will travel within 300 feet of some turbines.
41. The visual impact of the 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. These wind turbines will be the dominant visual features on the landscape. The turbine towers will be similar to those used on the Fenton, Chanarambie and Moraine wind projects in Murray and Nobles counties. Blades used in the proposed project will be white. The wind turbines in this project, while prominent on the landscape, 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 and agricultural practices.
42. From one perspective, the proposed project might be perceived as a visual intrusion on the natural aesthetic value on the landscape, characterized by up to 137 tubular steel structures approximately 265 -feet high, standing on formerly undisturbed ridgelines, with 126 -foot blades, for an overall height of 389 feet when one blade is in the vertical position. Wind plants have their own aesthetic quality, distinguishing them from other non-agricultural uses. In the last several years most of the overhead electric distribution lines and telephone lines in Murray and Nobles counties have been placed underground, which does open up the view shed for people traveling through the area. The existing wind plants have altered the landscape in the area from agricultural to wind

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

43. Several other measures will also be taken to minimize visual intrusion such as: low profile access roads, project access roads will avoid cuts and fill, the areas affected by construction will be restored after construction is completed, turbines will not be illuminated unless required by FAA regulations, and the turbine rotor size will require sufficient turbine spacing to minimize wake loss. The visual scale will be similar to the other projects in Mower County.

### **Recreational Resources**

44. Recreational opportunities in Mower County include hunting, fishing, and snowmobiling, camping, and hiking. Hunting is permitted in designated Minnesota Department of Natural Resources wildlife management areas (WMA's), unless otherwise posted.
45. Schwerin Creek Wildlife Management Area (WMA) is a 37-acre site located within the southwestern portion of the study area. Schwerin Creek flow through the WMA and hunting is allowed. Wild Indigo Scientific and Natural Area (SNA) is a 150-acre site located west of the study area and contains one of the best examples of mesic tallgrass prairie left in Southwestern Minnesota. It stretches for 12 miles between Dexter, Brownsdale, and Ramsey. Turbines will not be located within these two sites. The only impact expected is visual. WMA's are managed to provide wildlife habitat, improve wildlife production and provide public hunting and trapping opportunities. These MDNR lands were acquired and developed primarily with hunting license fees. WMA's are closed to all-terrain vehicles and horses because of detrimental effects on wildlife habitat.
46. The turbines will be noticeable to persons using the WMA's. Turbines will not be located in WMA's or in any local parks. Turbine operations are not expected to affect the natural areas in any material way and no adverse impact on wildlife management areas or practices is expected.

### **Infrastructure**

47. The proposed wind farm 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 are currently planned to be underground. Any aboveground feeder lines, if used, would be wood-pole, 34.5 kV typical of wind project feeder lines in the area that tie into existing windfarm substations. The feeder lines will deliver the energy from the wind farm to the

Pleasant Valley Substation. Placement of collector and feeder lines is addressed in the site permit at III.E.7. and 8.

48. 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 addition of several miles of access roads that will be located on private property. The access roads will be routed along the wind turbine strings, fence lines, and field edges to minimize disturbance to agricultural activities. The typical access road will be 15 to 20 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 access roads. Periodic grading or other methods will maintain the roads necessary to maintain road integrity. The Permittee may do this work or contract it out.
49. If access roads must be installed across streams or drainage ways, 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.
50. 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. The Permittee 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.
51. Construction, operation, and maintenance of the proposed wind plant will comply with all of the required federal and state permit requirements.

### **Community Benefits**

52. The project will provide local tax revenues from a production tax on the wind 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) on their property will also receive payments from the Permittee for energy generated by the turbine(s).
53. To the extent that local workers and local contractors are capable, qualified, and available, enXco 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 site technicians and a wind plant supervisor.

### **Effects on Land-Based Economies**

54. The wind turbines and access roads will be located so that the most productive farmland will be left as intact as possible. However, the project will displace approximately 137 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**

55. A review of the Minnesota State Historic Preservation Office (SHPO) computer database indicates that four recorded archaeological sites are within the project site and one adjacent to the site. Thirty-one historical structures are recorded with the Development site.
56. A Phase I Archaeology survey is recommended for all the proposed turbine locations, access roads, junction boxes and areas of construction impact for the transmission line to document any previously unrecorded archaeological sites within the project site. The site permit at III. D.2. requires the Permittee to conduct an archaeological reconnaissance survey. A Phase I archaeology survey consists of the following tasks: consultation, documentation, and identification.
57. 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 mitigative 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.

### **Air and Water Emissions**

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

### **Animals and Wildlife**

59. Neither construction nor operation of the Project is expected to 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:

60. 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)
61. 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)
62. 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 or dispersing bats occur in the fall. Fatality estimates at Buffalo Ridge indicate that the population of bats susceptible to turbine collisions is large, and that the observed number of fatalities “is possibly not sufficient to cause significant, large-scale population declines.” (p. 6-1)
63. 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 scientific and natural areas; c) trees and shrubs that are important to the wildlife present in the area will not be disturbed; 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**

64. No public waters, wetlands or forested land are expected to be affected by the project. No groves of trees or shelterbelts will need to be removed to construct and operate the system. 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**

65. 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**

66. No towers, access roads or utility lines will be located in surface water or wetlands. See site permit at III.C.5.

## **Future Development and Expansion**

67. Other wind projects (High Prairie I and High Prairie II) have been installed in Mower County. Current information suggests Mower County's windy areas are large enough to accommodate more wind facilities. In the future, turbines used in Mower County likely will consist of several types and sizes supplied by different vendors and installed at different times.
68. While large-scale projects have occurred elsewhere (California, Texas 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 will continue to monitor for impacts and issues related to wind energy development.
69. The PUC anticipates more site permit applications under Minnesota Statutes section 216F.04 (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 216F.03.
70. Minnesota Statutes section 216E.03, subd. 7 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.
71. 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. There is strong public support for orderly development.
72. One efficiency issue is the loss of wind in the wake of turbines. When wind is converted to rotational energy by the blades of a wind turbine, energy is extracted from the wind. Consequently, the 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.

73. 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 did not lead to a layout involving long strips of turbines running parallel to each other and perpendicular to the prevailing wind. Instead, the site uses shorter strings. The objective was to capture the most net energy possible from the best available wind resource. Allowing for setback from roads and residences and avoiding native prairie and other sensitive areas, enXco Development Corporation arrived at a nominal turbine spacing of 3 rotor diameters in the non-prevailing wind directions and 6 rotor diameters in the prevailing wind directions, north-south direction, with respect to the predominant energy production directions. Given the prevalence for southerly winds, the spacing between turbines will be greater in the prevailing winds in the north-south direction for projects in Mower County. enXco's wake investigation shows that the estimated wake losses for the proposed Wapsipinicon Wind Project, which includes the Grand Meadow Wind Farm will be around 5 to 6 percent.
74. Other factors that lead to discounts were assumed to be identical for all arrays and include turbine availability (2 %); blade soiling (1%), icing (1%), high wind hysteresis (0.20), cold weather shutdown (1.40 %), electrical efficiency (2%), parasitic 0.90 %). Total losses are calculated at 14 to 15 percent.

## **Maintenance**

75. Maintenance of the turbines will be on a scheduled, rotating basis with one or two units normally off for maintenance each day, if necessary. Maintenance on the interconnection points will be scheduled for low wind periods and coordinated with Xcel Energy. The Wapsipinicon Wind Project will be staffed with six to eight technicians and a wind plant supervisor. An operations and maintenance facility will also be built in Mower County.

## **Decommissioning and Restoration**

76. The estimated decommissioning cost for the Wapsipinicon Wind project is approximately one million dollars. Decommissioning 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. The Permit requires the Permittee 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. Decommissioning funds will be set aside as specific budget item. A set-aside guarantee will be executed on behalf of the project owner with an independent

administrator for the funds. During year 20 of operation of the wind power plant, approximately \$5,000 per turbine will be set aside for decommissioning. The independent administrator will report annually to the project owner on the status of decommissioning funds. The project owner will report every eight years to the independent administrator with an updated budget for the cost of decommissioning the plant in current-year and decommissioning-year dollars. See Exhibit 1, page 39.

### **Site Permit Conditions**

77. All of the above findings pertain to the Applicant's requested permit for a 205.5 megawatt wind project. Xcel Energy has obtained a Certificate of Need for 100.5 megawatts that will be generated by the initial phase of the Wapsipinicon/Grand Meadow Wind Farm Project. Currently there is no Certificate of Need application pending for the 105 megawatts that is not part of the Grand Meadow Wind Farm, and the Applicant has provided no power purchase agreement or other enforceable mechanism for sale of the power to be generated by the second phase of the project. Expansion of the Project to include this additional 105 megawatts will require proof of compliance with all rules of the Public Utilities Commission. Final action on this future phase of the project should be delayed until the Applicant has complied with Minn. R. 7836.1000, subp. 3 (requiring compliance with Chapter 7836), and Minn. R. 7836.0500, subp. 2 (requiring a certificate of need or other commitment).
78. All of the other 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. No significant comments were received concerning the requirements in the draft site permit distributed for comment on July 26, 2007. Minor changes that provide for clarifications of the draft site permit conditions have been made.
79. 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 Minnesota Public Utilities Commission has jurisdiction under Minnesota Statute 216F.04 over the site permit applied for by enXco Development Corporation for the 205.5-megawatt Wapsipinicon Wind Project of which 100.5-megawatts is the Grand Meadow Wind Farm which will be sold to Northern States Power Company as a turnkey project upon completion of construction.

3. The enXco Development Corporation application for a site permit was properly filed and noticed as required by Minnesota Statutes 216F.04 and Minnesota Rules 7836.0600 subp 2 and 7836.0900 subp 2.
4. 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 Chapter 216F and Minnesota Rules Chapter 7836.
5. 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 public hearing was requested or is required.
6. The 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. The proposed 205.5-megawatt LWECS Wapsipinicon Wind Project, which includes the 100.5 Grand Meadow Wind Farm, will not create significant human or environmental impacts and is compatible with environmental preservation, sustainable development, and the efficient use of resources.
7. The Minnesota Public Utilities Commission has the authority under Minnesota Statutes section 216F.04 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 enXco Development Corporation for the Grand Meadow Wind Farm are appropriate and necessary and within the Minnesota Public Utilities Commission's authority.

Based on the foregoing Findings of Fact and Conclusions of Law, the Minnesota Public Utilities Commission issues the following:

**ORDER**

The Public Utilities Commission hereby issues a site permit to enXco Development Corporation in the form attached hereto. The site permit issued by the PUC authorizes enXco Development Corporation to construct and operate 100.5-megawatt Grand Meadow Wind Farm Large Wind Energy Conversion System in Mower County in accordance with the conditions contained in the site permit and in compliance with the requirements of Minnesota Statute 216F.04 and Minnesota Rules Chapter 7836 for PUC Docket No. PT 6646/WS-07-839.

Approved and adopted this \_\_\_\_\_ day of \_\_\_\_\_

BY THE ORDER OF THE COMMISSION

\_\_\_\_\_  
Burl W. Haar  
Executive Secretary