

**STATE OF MINNESOTA  
PUBLIC UTILITIES COMMISSION**

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Chair  
Commissioner  
Commissioner  
Commissioner  
Commissioner

In the Matter of the Application of  
Oak Glen Wind Farm, LLC for a Site  
Permit for a 44 Megawatt  
Large Wind Energy Conversion  
System in Steele County

**ISSUE DATE:**

**DOCKET NO.  
IP-6838/WS-10-119**

**FINDINGS OF FACT, CONCLUSIONS  
OF LAW, AND ORDER, ISSUING A  
SITE PERMIT TO OAK GLEN WIND  
FARM, LLC FOR THE OAK GLEN  
WIND FARM**

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The above-entitled matter came before the Minnesota Public Utilities Commission (Commission) on February 5, 2010, pursuant to an application submitted by Oak Glen Wind Farm, LLC (Oak Glen or Applicant) for a site permit to construct, operate, maintain, and manage the Oak Glen Wind Farm (Project), a 44 Megawatt (MW) nameplate capacity Large Wind Energy Conversion System (LWECS), including associated facilities, in Steele County.

All of the proposed wind turbines and associated facilities will be located in Steele County. Associated facilities will include pad mounted step-up transformers for each wind turbine, access roads, an electrical collection system, project substation, and a permanent meteorological tower. The energy from the proposed 44 MW project will be delivered from the project substation to the electrical grid at the existing River Point Substation via the new Ellendale Switching Station.

**STATEMENT OF ISSUE**

Should the Applicant be granted a site permit under Minnesota Statutes section 216F.04 to construct a 44 MW Large Wind Energy Conversion System in Steele County?

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

## FINDINGS OF FACT

### Background and Procedure

1. Oak Glen submitted a site permit application to construct the proposed 44 MW Oak Glen Wind Farm in Steele County. Oak Glen is a wholly owned subsidiary of Minnesota Municipal Power Agency (MMPA), serving 11 member communities. Each MMPA member is a publicly owned electric utility. Avant Energy, Inc., serves as the agent for MMPA and will oversee and administer all aspects the project, including design, construction, and operation and maintenance.
2. On February 5, 2010, Oak Glen filed an application with the Public Utilities Commission for up to 44 megawatts of nameplate wind power generating capacity identified as the Oak Glen Wind Farm in Steele County.<sup>1</sup> On March 9, 2010, Oak Glen filed supplemental information to the LWECS site permit application.<sup>2</sup>
3. Office of Energy Security (OES) Energy Facility Permitting (EFP) staff reviewed and determined that the application, combined with the supplemental information, complied with the application requirements of Minnesota Rule 7854.0500. In its comments and recommendations to the Commission, EFP staff recommended that the Commission accept the application.<sup>3</sup>
4. On March 22, 2010, a Commission Order accepted the application for the Oak Glen Wind Farm.<sup>4</sup> On March 25, 2010, the Commission issued an Erratum Notice.<sup>5</sup>
5. Published notice of site permit application acceptance and opportunity to comment on the permit application and issues to consider in the development of a Draft Site Permit appeared in the *Blooming Prairie Times* on April 6, 2010, and the *Owatanna Peoples Press* on April 4, 2010.<sup>6</sup> The published notice provided: a) description of the proposed project; b) deadline for public comments on the application; c) description of the site permit review process; and d) identification of the public advisor. Notice also appeared on the Commission web site on March 26, 2010. The notice published meets the requirements of Minnesota Rule 7854.0600, subpart 2.
6. On March 30, 2010, the applicant distributed copies of the site permit application and notice of application acceptance to government agencies and residences.<sup>7</sup> The notice and application distribution met the requirements of Minnesota Rules 7854.0600, subparts 2 and 3.

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<sup>1</sup> Exhibit 1

<sup>2</sup> Exhibit 2

<sup>3</sup> Exhibit 4

<sup>4</sup> Exhibit 5

<sup>5</sup> Exhibit 5

<sup>6</sup> Exhibit 6

<sup>7</sup> Exhibits 7 - 9

7. Public comments on the site permit application and issues to consider in the development of a Draft Site Permit were accepted until April 14, 2010. No comments were received.
8. On April 22, 2010, EFP staff recommended that a Draft Site Permit be issued and distributed for public comment.<sup>8</sup>
9. On May 4, 2010, a Commission Order made a preliminary determination that a Draft Site Permit may be issued.<sup>9</sup> The Commission Order asked the Applicant, EFP staff, and any other participants to consider and address the potential impact of noise, sub-audible noise, and shadow flicker as those issues relate to setback requirements and other siting considerations in addition to impacts on non-participating landowners and other non-participating persons likely to be affected.<sup>10</sup>
10. On May 12, 2010, EFP staff issued a Notice of Draft Site Permit Issuance and Public Information Meeting. The published notice provided: a) name and address of the Applicant; b) location and date of the public information meeting; c) description of the proposed project; d) deadline for public comments on the draft site permit; e) description of the Commission site permit review process; f) location where a copy of the application may be reviewed and how a copy can be obtained; and g) identification of the public advisor. The notice met the requirements of Minnesota Rule 7854.0900, subpart 1. This notice was sent to interested persons and governmental agencies on as required by Minnesota Rule 7854.0900, subpart 2.<sup>11</sup>
11. Published notice of draft site permit and public information meeting appeared in the *Blooming Prairie Times* on May 18, 2010, the *Owatanna Peoples Press* on May 18, 2010, and the *EQB Monitor* on May 17, 2010, as required by Minnesota Rule 7854.0900, subpart 2.<sup>12</sup> Notice also appeared on the Commission web site on May 14, 2010.
12. The EFP staff held a public information meeting on the evening of June 7, 2010, in Blooming Prairie, Minnesota, to provide an overview of the Commission permitting process and to receive comments on the draft site permit. Approximately 27 people attended the meeting. The applicant's representatives were also present. EFP staff provided an overview of the LWECs site permitting process, the draft site permit, and responded to questions. EFP staff and the applicant responded to project specific questions and general questions about wind energy. Project specific questions were related to soil type and impacts, noise, crop damage, and mitigation regarding drainage tile damage.<sup>13</sup> The deadline for submitting comments on the draft site permit was June 18, 2010.

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<sup>8</sup> Exhibit 10

<sup>9</sup> Exhibit 11

<sup>10</sup> Exhibit 11

<sup>11</sup> Exhibits 12 and 15

<sup>12</sup> Exhibits 13 and 14

<sup>13</sup> Exhibit 17

13. Four written comments were received, including a letter from the Applicant addressing the Commission Order issued on May 4, 2010.<sup>14</sup> The three other comment letters were from two state agencies (Department of Natural Resources and Department of Transportation) and Steele County.

### **Site Criteria**

14. Minnesota Statutes chapter 216F and Minnesota Rules chapter 7854 apply to the siting of LWECS. The rules require an applicant to provide a substantial amount of information to allow the Commission 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.<sup>15</sup> Pursuant to Minnesota Statutes section 216F.02, certain sections in Minnesota Statutes chapter 216E (Minnesota Power Plant Siting Act) apply to siting LWECS. The analysis of the environmental impacts required by Minnesota Rule 7854.0500, subpart 7, satisfies the environmental review requirements; no environmental assessment worksheet or environmental impact statement is required for a proposed LWECS project.<sup>16</sup> Therefore, environmental review is based on the application and the record. The following analysis addresses the relevant criteria that are to be applied to a LWECS project.

### **Certificate of Need**

15. The Applicant is not seeking a certificate of need because the project is not a large energy facility as defined by Minnesota Statutes section 216B.2421.<sup>17</sup> The electricity generated from the Oak Glen Wind Farm will be for the sole use of the residential and business customers within the 11 member communities of MMPA.<sup>18</sup>

### **Project Description**

16. Oak Glen Wind Farm will be comprised of up to 44 MW consisting of up to 24 Vestas V90 1.8 MW wind turbine generators mounted on freestanding tubular towers and associated facilities.<sup>19</sup> The towers will be 80 meters in (262.5 feet) in height.<sup>20</sup> Turbine rotor diameter for the Vestas turbines will be 90 meters (295 feet) across.<sup>21</sup> The overall height of the tower, nacelle, and blade will be approximately 125 meters (410 feet) when one blade is in the vertical position.<sup>22</sup> The rotor swept area for the Vestas V90 is 68,477 square feet.

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<sup>14</sup> Exhibit 18

<sup>15</sup> Minn. Stat. § 216F.03 and Minn. R. 7854.0500

<sup>16</sup> Minn. R. 7854.0500, subp. 7

<sup>17</sup> Exhibit 1 at p. 4

<sup>18</sup> Exhibit 1 at p. 2

<sup>19</sup> Exhibit 16 and exhibit 1

<sup>20</sup> Exhibit 1 at p. 12

<sup>21</sup> Id.

<sup>22</sup> Id.

17. Associated facilities for the project include an underground automated supervisory control and data acquisition system (SCADA) for communication purposes.<sup>23</sup> A permanent meteorological tower will also be used as part of the communication system.<sup>24</sup> 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, an energy collection system, and a project substation.<sup>25</sup>
18. A 69 kV transmission line, approximately three miles in length along the existing right-of-way for County Road 26 (118<sup>th</sup> Street), will move the electricity from the project substation to the point of interconnection.<sup>26</sup> The point of interconnection will be at the new Ellendale switching station, which will connect to the existing River Point Substation. The transmission line is planned to be a dedicated double circuit incorporated with the existing Great River Energy 69 kV overhead transmission line.<sup>27</sup> The transmission line will be permitted on the local level.
19. The electricity will run from the wind turbines through the underground collection lines to the project substation.<sup>28</sup> The collection system feeds the power to the independent breaker positions at the proposed project substation. The project substation steps up the voltage from the 34.5 kV collection systems to the transmission system level. All of the proposed collection lines would connect to the proposed project substation within the site permit boundaries.
20. The project substation is proposed to be constructed approximately three miles east of the River Point Substation and adjacent to County Road 26 (118<sup>th</sup> Street).<sup>29</sup>
21. The permanent meteorological tower will be free standing and made of galvanized steel, with lighting required by the Federal Aviation Administration. The tower will be constructed at a site selected based upon the final locations of the wind turbines. The impact from constructing the meteorological tower will be approximately 400 by 400 feet; however, the permanent impacted area is expected to be much smaller.<sup>30</sup>
22. The Vestas 1.8 MW wind turbine is a three-bladed, upwind, active yaw, and active aerodynamic control regulated wind turbines 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.

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<sup>23</sup> Exhibit 1 at pp. 10-11

<sup>24</sup> Id.

<sup>25</sup> Id.

<sup>26</sup> Exhibit 1 at pp. 10-11, 15

<sup>27</sup> Exhibit 1 at p. 11

<sup>28</sup> Exhibit 1 at p. 15

<sup>29</sup> Exhibit 1 at p. 16

<sup>30</sup> Exhibit 1 at p. 17

23. 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.
24. 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.
25. All turbines and a permanent meteorological tower 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 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. The Permittee will maintain a computer program and database for tracking each wind turbine's maintenance history and energy production.
26. 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.
27. The overall project costs for construction are expected to be approximately \$118 million.<sup>31</sup> Annual operating costs are contingent upon various factors.<sup>32</sup>

### **Site Location, Characteristics, and Topography**

28. The proposed Project will be located in Steele County in the township of Blooming Prairie. The project area is located three miles northwest of the city of Blooming Prairie near U.S. Highway 218 and encompasses 3,215 acres, which is mostly agricultural land.<sup>33</sup> Major crops for Steele County include corn, soybeans, vegetables, hay, and sweet corn.<sup>34</sup> Elevation varies from 1,331 to 1,208 feet above mean sea level.<sup>35</sup>
29. Construction of the turbines sites and access roads will involve temporarily disturbing land within the project area. Temporary roads will be approximately 40 to 45 feet wide.<sup>36</sup> Permanent roads are expected to be approximately 16 feet wide.<sup>37</sup> The

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<sup>31</sup> Exhibit 1 at p. 19

<sup>32</sup> Id.

<sup>33</sup> Exhibit 1 at p. 3

<sup>34</sup> Exhibit 1 at p. 21

<sup>35</sup> Exhibit 1 at p. 52

<sup>36</sup> Exhibit 1 at p. 16

permanent displacement for turbine access roads and for towers and transformers and areas around them is about five to six acres, which does not include the underground collector system.<sup>38</sup>

30. Construction of the turbines associated facilities, access roads, and collection and transmission lines will require grading.<sup>39</sup> The site has good access from existing public roadways, which will make it possible for the Applicant to minimize the overall length of access roads.<sup>40</sup> Significant impacts to existing topography are not anticipated because steep slopes comprise only 88 acres of the project area.<sup>41</sup> Grading within steep slopes will be avoided by the Applicant.<sup>42</sup>

### **Wind Resource Considerations**

31. The project area has an annual average wind speed of 7.97 meters per second (17.53 miles per hour) at the 82 meter (269 foot) hub height.<sup>43</sup> The Applicant anticipates that the average monthly wind speed will be within 8 percent of the yearly average approximately 90 percent of the time.<sup>44</sup> Wind speeds are generally greater in the night and early morning hours and decline at midday. Regionally, the prevailing wind directions are generally southeast and northwest. Of the annual energy budget, a higher percentage results from southerly winds, which are most frequent in the warmer weather months. The north and northwest winds typically occur in winter.
32. For this project, turbines will be sited to optimize generation while minimizing the impact on land and other potentially sensitive resources. The wind turbines are sited to have good exposure to winds from all directions with emphasis on exposure to the prevailing southerly and northwesterly wind directions. According to the application, areas of steep slopes will be avoided to the degree possible. The turbines are typically oriented west-southwest to north-northeast, which is roughly perpendicular to the prevailing southerly and northwest winds. Turbine placement, aside from other resource features where setbacks or wind access buffers are required, will be designed to provide sufficient spacing between the turbines to minimize internal wake losses. Given the prevalence for southerly and northerly winds, the spacing is widest in the north-south direction. Greater or lesser spacing between the turbines or turbine strings may be used in areas where the terrain dictates the spacing. This is addressed in the site permit at condition III.E.5. Sufficient spacing between the turbines is utilized to minimize wake losses when the winds are blowing parallel to the turbines.
33. According to the application, projected average net annual output will be approximately 145,000 MWh (megawatt hours) per year.<sup>45</sup>

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<sup>37</sup> Id.

<sup>38</sup> Exhibit 1 at p. 17

<sup>39</sup> Exhibit 1 at p. 52

<sup>40</sup> Id.

<sup>41</sup> Id.

<sup>42</sup> Id.

<sup>43</sup> Exhibit 1 at p. 4

<sup>44</sup> Exhibit 1 at p. 5

<sup>45</sup> Exhibit 1 at pp. 19-20

## **Land Rights and Easement Agreements**

34. In order to build a wind plant, a developer needs to secure site leases or easement 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. Land and wind rights will need to encompass the proposed wind farm and all associated facilities, including but not limited to, wind and buffer easements, wind turbines, access roads, meteorological towers, electrical collection system and electric lines located on or along public road rights-of-way.
35. The Applicant has executed option agreements that provide Oak Glen with the option to enter into easement agreements with landowners within the project site boundary. To date, Oak Glen has negotiated the easement agreements, which are necessary within the site to build the Project, encompassing approximately 3,070 acres with the affected landowners, but has not yet executed the easement agreements. Permit condition III.J.1 requires the Applicant to demonstrate at the time it submits its site plan that it has obtained the wind rights necessary to construct and operate the Project.

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

36. The site is in an area of relatively low population density, characteristic of rural areas throughout southeastern Minnesota. Steele County has an ordinance establishing a setback of 750 feet to any resident, regardless of whether that landowner is a participating in the project, which has been incorporated in permit condition III.N.1.<sup>46</sup> According to Applicant's comment letter, dated June 16, 2010, the minimum distance a turbine will be from a residence is 931 feet in the preliminary layout.<sup>47</sup> Oak Glen will also be required to set back its turbines a minimum of five rotor diameters (1,475 feet) on the prevailing wind axis from non-participating landowners' property lines and three rotor diameters (885 feet) on the non-prevailing wind axis (permit condition III.C.1). Oak Glen's proposed project design must comply with the Minnesota Pollution Control Agency (PCA) noise standards pursuant to Minnesota Rules Chapter 7030. As a result, the impact of the proposed LWECS on human settlement and public health and safety will be minimal. Section III.C of the site permit contains conditions for setbacks from residences and roads. The proposed wind turbine layout will meet or exceed those requirements.
37. There will be no displacement of existing residences or structures in siting the wind turbines and associated facilities.
38. Oak Glen has not identified any potential air hazards that may be created by the Project.<sup>48</sup> However, a "No-Hazard Determination" for this Project has yet to be issued. The project

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<sup>46</sup> Exhibit 18, Steele County comment letter

<sup>47</sup> Exhibit 18, Applicant's comment letter

<sup>48</sup> Exhibit 1 at p. 41

must comply with the Federal Aviation Administration requirements with respect to lighting (permit condition III.E.4).

39. The Applicant will provide landowners and interested persons with safety information about the project and its facilities and provide any necessary safety measures, such as warning signs and gates to restrict public access (permit condition III.B.15).
40. 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 during the winter months.
41. 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 emergency response plan (permit conditions III.B.16 and III.B.17).

## **Noise**

42. Background noise levels in the project area are typical of those in a rural setting, where existing nighttime noise levels are commonly in the low to mid-30 dBA. The dBA scale represents A-weighted decibels based on the range of human hearing. Higher levels exist near roads and other areas of human activity. Wind conditions in the project area tend to increase ambient noise levels compared to other rural areas.
43. Wind turbines, when in motion, do generate sound or noise. The level of sound (noise) varies with the speed of the turbine and the distance of the listener or receptor from the turbine. On relatively wind days, the turbines create more noise; however, the ambient or natural wind noise levels tend to override the turbine noise as distance from the turbine increases.
44. The Applicant analyzed noise for the Vestas V90 wind turbine model using the WindPRO version 2.6.1.252.<sup>49</sup> According to the manufacturer's noise data, sound power levels at a 80 meter hub height ranges from less than 94.4 dB (at 4 m/s wind speed) to less than or equal to 104.0 dB (at >8 m/s wind speed).<sup>50</sup>
45. Noise impacts to nearby residents and other potentially affected parties will be factored into the turbine micro-siting process. The Applicant must demonstrate the project can meet the noise standard pursuant to Minnesota Statutes chapter 7030. See permit condition III.E.3. Prior to the construction, the Applicant will complete additional noise

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<sup>49</sup> Exhibit 1 at p. 26

<sup>50</sup> Id.

modeling using final turbine locations.<sup>51</sup> See permit condition III.A.1 and Permit Compliance Filings (Attachment 4), Filing Number 1. Noise levels predicted by noise modeling program, such as Windfarm and WindPRO 2, will be compared to the PCA Daytime and Nighttime L<sub>10</sub> and L<sub>50</sub> Limits as stated in Minnesota Rule 7030.0040. These standards describe the limiting levels of sound established on the basis of present knowledge for the preservation of public health and welfare. These standards are consistent with speech, sleep, annoyance, and hearing conversation requirements for receivers within areas grouped according to land activities by the Noise Area Classification (NAC) system established in Minnesota Rule 7030.0050. The NAC-1 was chosen for receivers in the project area since this classification includes farm houses as household units. Daytime and nighttime limits for this classification are: (1) an L<sub>50</sub> limit of 60 dBA and an L<sub>10</sub> limit of 65 dBA in daytime, and (2) an L<sub>50</sub> limit of 50 dBA and an L<sub>10</sub> limit of 55 dBA at nighttime. The nighttime L<sub>50</sub> limit of 50 dBA is the most stringent state limit.

46. During the public meeting, a member of the public inquired about noise impacts, which were addressed at the public meeting.<sup>52</sup>
47. According to the Applicant's comment letter, the average distance from a turbine to the nearest residence is 1,459 feet.<sup>53</sup> Only two residences are closer than 1,000 feet, and both landowners are participating in the project.<sup>54</sup> The minimum distance from a residence of a non-participating landowner is 1,457 feet.<sup>55</sup> The average distance from a turbine to the nearest residence of a non-participating landowner is 2,430 feet.<sup>56</sup>
48. Oak Glen will conduct a post-construction noise study. The noise study will determine the noise levels at different frequencies and at various distances from the turbines at various wind directions and speeds. See permit condition III.F.2. The turbine supply agreement with Vestas includes provisions that guarantee the sound level performance by the manufacturer.<sup>57</sup> The purpose of the post-construction noise study is to confirm the PCA noise standards have been met.

### **Shadow Flicker**

49. The issue of shadow flicker was not raised during the public comment period. However, the Commission Order issued May 4, 2010, asked the Applicant and EFP staff to consider the potential impact of shadow flicker.<sup>58</sup> Shadow flicker is described as a moving shadow on the ground resulting in alternating changes in light intensity. Shadow flicker computer models simulate the path of the sun over the year and assess at regular time intervals the possible shadow flicker across a project area. The outputs of the model are useful in the design phase of a wind farm. Generally, shadow flicker usually occurs in

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<sup>51</sup> Id.

<sup>52</sup> Exhibit 17

<sup>53</sup> Exhibit 18, Applicant's comment letter

<sup>54</sup> Id.

<sup>55</sup> Id.

<sup>56</sup> Id.

<sup>57</sup> Id.

<sup>58</sup> Exhibit 11

the morning and evening hours when the sun is low in the horizon and the shadows are elongated. Shadow flicker does not occur when the turbine rotor is oriented parallel to the receptor, or when the turbine is not operating. In addition, no shadow flicker will be present when the sun seen from a receptor is obscured by clouds, fog, or other obstacles already casting a shadow such as buildings and trees.

50. Shadow intensity, or how “light” or “dark” a shadow appears at a specific receptor, will vary with the distance from the turbine. Closer to a turbine, the blades will block out a larger portion of the sun’s rays and shadows will be wider and darker. Receptors located farther away from a turbine will experience much thinner and less distinct shadows since the blades will not block out as much sunlight. Shadow flicker will be greatly reduced or eliminated within a residence when buildings, trees, blinds, or curtains are located between the turbine and receptor. Shadow flicker consultants generally agree that flicker is not noticeable beyond about 10 rotor diameters from a wind turbine.<sup>59</sup> Evidence of shadow flicker effects is hard to find, which indicates it is more of a nuisance issue. Minnesota has no published standards for shadow flicker and no examples of turbines causing photosensitivity related problems. A few jurisdictions in other countries have established guidelines for acceptable levels of shadow flicker based on certain assumptions.
51. In the Applicant’s letter, dated June 16, 2010, the Applicant describes the potential shadow flicker impacts resulting from the Oak Glen Wind Farm.<sup>60</sup> The closest residence of a non-participating landowner from a turbine is 1,457 feet; the mean distance is 2,430 feet.<sup>61</sup> Distances from turbines to residences of non-participating landowners are greater than residences of participating landowners to lessen the potential for shadow flicker on non-participating landowners.<sup>62</sup> In Minnesota, turbine shadows occur mostly to the north of the turbine because Minnesota is in the northern hemisphere.<sup>63</sup> In the few instances where turbines are sited less than 1,200 feet from residences, the turbines are generally not sited south of the residence where shadow flicker would be more likely to occur.<sup>64</sup> Using data available from an October 1, 2008, DNV-GEC study for the Glacier Hills Wind Project, Oak Glen anticipates its worst-case scenario to be 72 hours of potential shadow flicker from a turbine sited 1,000 feet from residence to the northeast of a turbine.<sup>65</sup> This assumes the turbine is always spinning, that it is always facing the sun, and half the days of the year are cloudy.<sup>66</sup> The closest proximity of turbine to a residence is 931 feet to the southwest of a turbine, which would likely result in zero hours of shadow flicker due to the location of the residence to the turbine.<sup>67</sup> The site permit does

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<sup>59</sup> Environmental Health Division, Minnesota Department of Health, *Public Health Impacts of Wind Turbines*, May 22, 2009, at 14, available at <http://energyfacilities.puc.state.mn.us/documents/Public%20Health%20Impacts%20of%20Wind%20Turbines,%205.22.09%20Revised.pdf>

<sup>60</sup> Exhibit 18, Applicant’s comment letter

<sup>61</sup> Id.

<sup>62</sup> Id.

<sup>63</sup> Id.

<sup>64</sup> Id.

<sup>65</sup> Id.

<sup>66</sup> Id.

<sup>67</sup> Id.

not consider shadow flicker. However, setback requirements from residences and non-participating landowners would mitigate shadow flicker disturbances.<sup>68</sup>

### **Visual Values**

52. The placement of up to 24 Vestas turbines for the Oak Glen Wind Farm will affect the appearance of the area. The wind turbines will be mounted on tubular towers that are approximately 262 feet tall. The rotor blades will have a diameter of 295 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 highway 218 and nearby roads. The Steele County Board of Commissioners supports the preliminary turbine layout for the project.<sup>69</sup>
53. 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 (permit condition III.E.4). All site permits issued by the Commission require the use of tubular towers; therefore, the turbine towers will be uniform in appearance. Blades used in the proposed project will be white or grey. The wind turbines in this project, while prominent on the landscape, also blend in with the surrounding area. The turbines and associated facilities necessary to harvest the wind for energy are not inconsistent with existing agricultural practices.
54. From one perspective, the proposed project might be perceived as a visual intrusion on the natural aesthetic value on the landscape. Wind plants have their own aesthetic quality, distinguishing them from other non-agricultural uses. Existing wind plants have altered the landscape elsewhere in Minnesota from agricultural to wind plant/agricultural. This project will modify the visual character of the area. Because wind generation development is likely to continue in Steele County, this visual presence will continue to increase as wind development occurs. To date, the presence of the wind turbines in other parts of Minnesota has been well accepted by the people who live and work in those areas.
55. Visually, the Oak Glen Wind Farm will be similar to other LWECS projects located on Buffalo Ridge and southeastern Minnesota.

### **Recreational Resources**

56. Recreational opportunities in Steele County include boating, fishing, snowmobiling, hunting, bird and wildlife viewing, camping, and hiking. The general area includes several Wildlife Management Areas (WMAs), Wildlife Production Areas (WPAs), recreational lakes and trails, and a game refuge.<sup>70</sup>
57. Four WMAs are located within two miles of the project boundary: Myron Buelow WMA, Oak Glen WMA, Pogones Marsh WMA, and the Aurora WMA.<sup>71</sup> Hunting is

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<sup>68</sup> See Exhibit 19 for the map showing a preliminary turbine layout with setbacks.

<sup>69</sup> Exhibit 18, Steele County comment letter

<sup>70</sup> Exhibit 1 at p. 37

<sup>71</sup> Exhibit 1 at pp. 37-38

permitted in designated Minnesota Department of Natural Resources (MnDNR) WMAs, unless otherwise posted. WMAs are also managed to provide wildlife habitat and improve wildlife production. These MnDNR lands were acquired and developed primarily with hunting license fees. WMAs are closed to all-terrain vehicles and horses because of detrimental effects on wildlife habitat. The Straight Creek WPA is located immediately west of the Pogones Marsh WMA.<sup>72</sup>

58. Neither turbines nor access roads will be sited in proximity to navigable waterways or trout streams; and those features will not be impacted by the Project. At least 5 rotor diameters on the prevailing wind axis and at least 3 rotor diameters on the non-prevailing wind from WMAs or other public lands are required (permit condition III.C.4). Turbine operations are not expected to directly affect the natural areas in any material way and no adverse impact on wildlife management areas or practices is expected.
59. The 711-acre Rickert Lake State Game Refuge is located partially within the far eastern border of the project boundary. The site permit application states that the refuge is open to Canada Goose hunting during early September.<sup>73</sup> The two parcels within the project area designated a State Game Refuge are actively farmed and no encumbrances exist on the property in relation to the State Game Refuge.<sup>74</sup> MnDNR suggested that turbines be located outside of the State Game Refuge if possible due to possible use of the area by ducks and geese.<sup>75</sup> If re-location is not possible, the MnDNR suggests Oak Glen notify them for any additional coordination.<sup>76</sup> The site permit does not prohibit turbines on private land used as a State Game Refuge.

### **Public Services and Infrastructure**

60. The proposed project is expected to have minimal effects on existing public infrastructure. The proposed project would not generate an increase in traffic volumes or daily human activity, except for a short period of time during construction and occasionally during operation and maintenance activities. The construction contractor will repair any road damage that may occur during the construction of the project. See permit condition III.B.8.
61. Other than short-term impacts, no significant permanent changes in road traffic patterns or volume are expected. The busiest traffic would occur when the majority of the foundation and tower assembly is taking place. Township and county officials will receive advance notice of the construction schedule, including the timing of the delivery of towers and turbines and arrival of the crane to erect project equipment. See permit condition III.B.8.
62. Construction of the proposed project requires the addition of access roads that will be located on private property. Access roads would be built adjacent to the turbine towers, allowing access both during and after construction. The access roads will be sited in

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<sup>72</sup> Id.

<sup>73</sup> Exhibit 1 at p. 38

<sup>74</sup> Id.

<sup>75</sup> Exhibit 18, MnDNR comment letter

<sup>76</sup> Id.

consultation with local landowners and completed in accordance with specified design requirements, and will be located to facilitate both construction (e.g., cranes) and continued operation and maintenance. Siting roads in areas with unstable soil will be avoided wherever possible. Roads may include appropriate drainage and culverts while still allowing for the crossing of farm equipment. The permanent access roads would be approximately 16 feet wide and low profile to allow cross-travel by farm equipment. Local requirements would be followed wherever access roads join state or local roadways. During construction only, temporary access roads will be approximately 40 to 45 feet wide to accommodate delivery of turbines, towers, and other related equipment.<sup>77</sup> Once construction is completed, the roads will be re-graded, filled, and dressed as needed.

63. If access roads are installed across streams or drainage ways, the Applicant in consultation with MnDNR, 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 MnDNR. See permit condition at III.K.7.
64. 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 Applicant will address the concerns of residents in the area of the project site before and after project construction to document and mitigate any television reception impacts that might occur. This is addressed in the permit condition at III.D.3.
65. No microwave beams paths were identified within 2 miles of the project area.<sup>78</sup>
66. Construction, operation, and maintenance of the proposed wind plant will comply with all of the required federal, state, and local permit requirements. See site permit at III.K.7.

### **Community Benefits**

67. Oak Glen will pay a Wind Energy Production Tax to the county and townships each year, which is expected to be between \$170,000 and \$180,000.<sup>79</sup> Landowners with wind easements on their property will also receive payments from the Applicant. The project is expected to create new job opportunities within the local community, both during construction and operation.

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

68. The wind turbines and access roads will be located so that the most productive farmland will be left as intact as possible. However, on average each turbine and all associated

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<sup>77</sup> Exhibit 1 at p. 13

<sup>78</sup> Exhibit 1 at p. 31

<sup>79</sup> Exhibit 1 at p. 24

access roads will permanently displace approximately 0.5 to 1.0 acre of agricultural land. The site permit at conditions III.B. 2, 3, 4, 5, 6, 7, 8(c), 9, 10, and 11 addresses mitigation measures for agricultural lands. The proposed project does not adversely affect any sand or gravel operations.

### **Archaeological and Historical Resources**

69. A review of the Minnesota State Historic Preservation Office (SHPO) computer database review indicates that five structures of historic significance are present within one mile of the project area. Four of the historical structures are located just outside the project boundary, and one is located within the project boundary.<sup>80</sup>
70. An archaeology survey is recommended for all the proposed turbine locations, access roads, junction boxes, and other areas of project construction impact to document any previously unrecorded archaeological sites within the project site. The site permit at condition III.D.2 requires the Applicant to conduct an archaeological reconnaissance survey (Phase I). A Phase I archaeology survey consists of the following tasks: consultation, documentation, and identification. A Phase I survey provides enough information to allow consideration of avoidance if a site is to be impacted by an undertaking and to gather enough information to allow for reasonable recommendations for more detailed work should it be necessary.
71. 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 SHPO, the State Archaeologist, and consulting American Indian communities. The site permit condition III.D.2 also requires the Applicant to stop work and notify the Minnesota Historical Society and the Commission if any unrecorded cultural resources are found during construction.

### **Air and Water Emissions**

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

### **Wildlife**

73. The majority of the project area and surrounding landscape is used for agricultural purposes with crop land comprising a significant portion of the vegetative cover. Wildlife habitat impacts are expected to be minimal because turbines and access roads will be placed exclusively on agricultural land. Because the project area has a similar general habitat and wildlife species composition as many other wind farms in the Upper Midwest, the Applicant anticipates that bird fatality rates documented at other locations

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<sup>80</sup> Exhibit 1 at pp. 35-36

will be similar to the Oak Glen Wind Farm. The Applicant sited the project to make use of an agricultural core area between more sensitive landscape features.<sup>81</sup>

74. With proper planning, neither construction nor operation of the project is expected to have a significant impact on 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)
  - c. 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)
75. The Applicant completed a Site Characterization Study, Wildlife Baseline Studies, and Loggerhead Shrike and Henslow’s Sparrow Surveys.<sup>82</sup> MnDNR has reviewed the data regarding the site and does not consider the site a high risk for wildlife impacts.<sup>83</sup> MnDNR encourages the Applicant to conduct the bat studies recommended by the Site Characterization Study.<sup>84</sup> The Site Characterization Study referenced in the MnDNR

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<sup>81</sup> Exhibit 1 at p. 61 and Exhibit 2

<sup>82</sup> Exhibit 3

<sup>83</sup> Exhibit 18, MnDNR comment letter

<sup>84</sup> Id.

comment letter was conducted in 2009 and evaluated a site boundary different than the current site boundary for this Project. As a result of the pre-construction surveys and Site Characterization Study, the Applicant adjusted the boundaries of the project area prior to submitting its site permit application.<sup>85</sup> Further, the study's recommendation of bat mortality monitoring was not due to specific findings in the area, but due to more of a general lack of knowledge regarding wind turbine impacts on bats.

76. Mitigation measures are prescribed in the site permit and include, but are not limited to: a) submission of any biological survey or studies conducted (permit condition III.D.1 and III.F.3); b) turbines and associated facilities will not be constructed in wildlife management areas, recreation and state scientific and natural areas or parks (permit condition III.C.4); and c) a 5 by 3 rotor diameter setback is provided (permit condition III.C.1).

### **Rare and Unique Natural Resources**

77. Some rare species have been recorded near the project area.<sup>86</sup> The endangered Henslow's sparrow was reported in the original project area prior to submittal of the site permit application.<sup>87</sup> The threatened loggerhead shrike was found in the vicinity of the project site.<sup>88</sup> However, as stated in Finding 75, the site was moved and rare and unique natural resources are less likely to be found in this project area. The Applicant is required to submit any additional studies or surveys. See permit conditions III.D.1 and III.F.3.

### **Vegetation**

78. No public waters, wetlands, or forested land are expected to be adversely 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, permit condition III. C.6 provides for preparation of a prairie protection and management plan.

### **Soils**

79. The site permit has requirements to implement sound water and soil conservation practices during construction and operation of the project throughout the project's life in order to protect topsoil and adjacent resources and to minimize soil erosion. The project will be subject to the requirements of the National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS) Construction Stormwater Permit. An erosion and sediment control plan and Storm Water Pollution Prevention Plan (SWPPP) will also be prepared for the project and the disturbed areas will be seeded after construction to stabilize the area. See permit condition III.B.9.

### **Geologic and Ground Water Resources**

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<sup>85</sup> Exhibit 2 at p. 4

<sup>86</sup> Exhibit 1 at pp. 63-64

<sup>87</sup> Exhibit 3, Loggerhead Shrike and Henslow's Sparrow Surveys at p. 1 and Exhibit 2

<sup>88</sup> Exhibit 2, MnDNR letter, dated February 18, 2010

80. The project area is relatively flat, partially tilled farmland. The construction of the foundations for each wind turbine and transformers will be done without affecting the local subsurface water resources. The terrain affected by the proposed project has very little surface water. Steele County contains karst geology. The karst geology is categorized as areas underlain by carbonate bedrock with more than 100 feet of sediment cover.<sup>89</sup> The project area contains one domestic well; however, there may be additional wells.<sup>90</sup> The proposed project is not expected to affect any water wells (used, unused or unsealed) or any rural water system that services the area.<sup>91</sup> Impacts to geologic and groundwater resources are not anticipated.

### **Surface Water and Wetlands**

81. Access roads or utility lines will not be located in surface water or wetlands, unless authorized by the appropriate permitting agency. See permit condition III.C.5.

### **Future Development and Expansion**

82. The applicant has not indicated any plans for future development or expansion of this proposed LWECS site.

### **Maintenance**

83. Maintenance of the turbines will be on a scheduled, rotating basis with one or more units normally off for maintenance each day, if necessary. Maintenance on the interconnection points will be scheduled for low wind periods. The Oak Glen Wind Farm will have on-site service and maintenance activities, including routine inspections, regular preventive maintenance, unscheduled maintenance and repair, and routine minor maintenance on the wind turbines and associated facilities. There will not be an operations and maintenance facility in the project area.<sup>92</sup>

### **Decommissioning and Restoration**

84. The easement agreement between the Applicant and landowners defines the term of the agreement to be effective in perpetuity.<sup>93</sup> There are provisions within the easement agreement that enable the agreements to be transferred and reassigned.<sup>94</sup> The Oak Glen Wind Farm is to be owned and operated by MMPA and generated electricity is intended to serve MMPA member cities.<sup>95</sup> Decommissioning activities will include: (1) removal of all wind turbine components and towers; (2) removal of all pad mounted transformers; (3) removal of all above-ground distribution facilities; (4) removal of foundations; and

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<sup>89</sup> Exhibit 1 at p. 54

<sup>90</sup> Exhibit 1 at pp. 54-55

<sup>91</sup> Exhibit 1 at pp. 54-55

<sup>92</sup> Exhibit 1 at p. 14

<sup>93</sup> Exhibit 1 at p. 20

<sup>94</sup> Id.

<sup>95</sup> Id.

(5) removal of surface road material and restoration of the roads and turbine sites to previous conditions to the extent feasible.

85. As provided in permit condition III.G.1, the applicant will ensure that it carries out its obligations to provide for the resources necessary to fulfill its requirements to properly decommission the project at the appropriate time. Permit condition III.G.1 requires the applicant to submit a Decommissioning Plan to the Commission prior to commercial operation. In addition to any requirements under the site permit, each individual land lease requires proper decommissioning of turbines. The owner will be responsible for costs to decommission the project and associated facilities.
86. Upon expiration of the permit, or upon earlier termination of operation of the proposed LWECS, the Applicant would have the obligation to dismantle and remove from the site all towers, turbine generators, transformers, overhead and underground cables, foundations, buildings, and ancillary equipment to a minimum depth of four feet. To the extent possible the Applicant will restore and reclaim the site to its pre-project topography and topsoil quality. All access roads will be removed unless written approval is given by the affected landowner requesting that one or more roads, or portions thereof, be retained. Any agreement for removal to a lesser depth or for no removal shall be recorded with the county and will show the locations of all such foundations. The project site would be restored within 18 months after project expiration (see permit condition III.G.2).

### **Site Permit Conditions**

87. All of the above findings pertain to the Applicant's requested permit for a 44 MW LWECS project.
88. Most 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 Office of Energy Security Energy Facility Permitting and the Public Utilities Commission. Comments received by the Commission have been considered in development of the site permit. Minor changes and special condition additions that provide for clarification or additional requirements have been made.
89. The site permit contains conditions that apply to site preparation, construction, cleanup, restoration, operation, maintenance, abandonment, decommissioning, and all other aspects of the project.
90. The site permit condition III.M.1 requires the Applicant to comply with the practices set forth in its application.

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 over this matter under Minnesota Statutes section 216F.04. The Minnesota Public Utilities Commission has the authority under section 216F.04 to place conditions in a permit and may deny, modify, suspend, or revoke a permit.
3. The Applicant, the Office of Energy Security Energy Facility Permitting, and the Minnesota Public Utilities Commission have complied with all procedural requirements required of Minnesota Statutes chapter 216F and Minnesota Rules chapter 7854.
4. The Minnesota Public Utilities Commission has considered all the pertinent factors relative to its determination of whether a site permit should be approved.
5. The Oak Glen Wind Farm is compatible with the policy of the state to site LWECS in an orderly manner compatible with environmental preservation, sustainable development, and the efficient use of resources under Minnesota Statutes section 216F.03.
6. The conditions in the site permit are reasonable and appropriate.

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

### **ORDER**

A LWECS Site Permit is hereby issued to Oak Glen Wind Farm, LLC to construct and operate the 44 MW Oak Glen Wind Farm in Steele County in accordance with the conditions contained in the site permit and in compliance with the requirements of Minnesota Statutes section 216F.04 and Minnesota Rules chapter 7854 for PUC Docket No. IP-6838/WS-10-119.

The site permit is attached hereto, with a map showing the approved site.

BY THE ORDER OF THE COMMISSION

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Burl W. Haar  
Executive Secretary

( S E A L )

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