

**BEFORE THE PUBLIC UTILITIES COMMISSION  
OF THE STATE OF SOUTH DAKOTA**

**IN THE MATTER OF THE APPLICATION BY DEUEL HARVEST WIND ENERGY  
SOUTH LLC FOR ENERGY FACILITY PERMITS OF A WIND ENERGY FACILITY  
AND A 345 KV TRANSMISSION FACILITY IN DEUEL COUNTY, SOUTH DAKOTA  
FOR THE SOUTH DEUEL WIND PROJECT**

**SD PUC DOCKET EL24-\_\_\_\_**

**PRE-FILED DIRECT TESTIMONY OF JOANNE BLANK  
ON BEHALF OF DEUEL HARVEST WIND ENERGY SOUTH LLC**

June 28, 2024

1 **I. INTRODUCTION AND QUALIFICATIONS**

2

3 **Q. Please state your name, employer and business address.**

4 **A.** My name is JoAnne Blank. I am a senior scientist and project manager in the  
5 energy market sector at Stantec Consulting Services Inc. (“Stantec”). My business  
6 address is 1165 Scheuring Road, De Pere, Wisconsin 54115.

7

8 **Q. On whose behalf are you providing this testimony?**

9 **A.** I am providing this testimony on behalf of Deuel Harvest Wind Energy South LLC  
10 (“South Deuel Wind”) in support of its Facility Permit Application (“Application”) to  
11 the South Dakota Public Utilities Commission. The Application is for a facility  
12 permit to construct and operate a wind energy facility which will have a nameplate  
13 capacity of up to 260 megawatts (“MW”) and deliver up to 250 MW to the point of  
14 interconnection (“Wind Energy Facility”), and a transmission facility which will  
15 operate at 345 kilovolts (“kV”) and be approximately 6 miles in length  
16 (“Transmission Facility”). The Wind Energy Facility and the Transmission Facility  
17 are collectively referred to as the Project.

18

19 **Q. Briefly describe your educational background and professional experience.**

20 **A.** I have a Bachelor of Science degree in Atmospheric and Oceanic Sciences, a  
21 Master of Science degree in Atmospheric and Oceanic Sciences, and a Master of  
22 Science degree in Environmental Monitoring. I have more than 20 years of  
23 professional experience and have been with Stantec for 14 years.

24

25 I specialize in feasibility, permitting and compliance of power and renewable  
26 energy projects across the United States. I have been involved in the design and  
27 permitting of more than 25.0 gigawatts of wind and other renewable energy  
28 projects. My project and management experience include federal, state, and local  
29 permitting, feasibility analyses, expert witness testimony, project siting,  
30 shadow/flicker analyses, sound studies, environmental permitting, National  
31 Environmental Policy Act documents (Environmental Assessments and

32 Environmental Impact Statements), applications for Certificates of Public  
33 Convenience and Necessity and Certificates of Authority, geospatial information  
34 analysis and management, and post-construction compliance. I lead a team of  
35 engineers and scientists that assess shadow flicker impacts and complete  
36 decommissioning plans for renewable projects across the U.S. A copy of my  
37 curriculum vitae is provided as Exhibit 1.

38

39 **II. OVERVIEW**

40

41 **Q. What is your role in the Project?**

42 **A.** I was retained by South Deuel Wind to conduct a shadow flicker analysis for the  
43 proposed Project. My team and I conducted shadow flicker modeling for the  
44 Project's proposed layout and prepared the associated shadow flicker analysis,  
45 which is provided in Appendix N of the Application to the South Dakota Public  
46 Utilities Commission.

47

48 **Q. What is the purpose of your Direct Testimony?**

49 **A.** The purpose of my testimony is to discuss the methodology and the results of the  
50 shadow flicker modeling conducted for the Project.

51

52 **Q. Please identify the sections of the Application that you are sponsoring for  
53 the record.**

54 **A.** I am sponsoring the following sections of the Application:

- 55 • Section 11.5: Shadow Flicker
- 56 • Appendix N: Shadow Flicker Analysis

57

58 **Q. What exhibits are attached to your Direct Testimony?**

59 **A.** I am sponsoring the following exhibit:

- 60 • Exhibit 1: JoAnne Blank Resume.

61

62 **III. SHADOW FLICKER ANALYSIS**

63

64 **Q. Was the Shadow Flicker Analysis provided as Appendix N to the Application**  
65 **prepared by you or under your supervision and control?**

66 **A.** Yes.

67

68 **Q. What was the purpose of the shadow flicker modeling and analysis**  
69 **discussed in the Shadow Flicker Analysis?**

70 **A.** The purpose of the Shadow Flicker Analysis was to estimate the potential annual  
71 frequency of shadow flicker associated with the operation of the Project wind  
72 turbines and to assess compliance with the shadow requirements of the Deuel  
73 County Zoning Ordinance pursuant to Section 1215.03 of Deuel County's Zoning  
74 Ordinance, Project shadow flicker at existing residences may not exceed 30 hours  
75 annually.

76

77 **Q. What turbine models did you analyze?**

78 **A.** Modeling was completed for three potential turbine models proposed by South  
79 Deuel Wind involving Vestas ("V"), Siemens Gamesa ("SG"), and General Electric  
80 ("GE") wind turbines: specifically, the V163-4.5 turbine; the SG 4.4-164 turbine;  
81 and the GE 3.8-154 turbine models. Seventy-three proposed turbine locations for  
82 the GE 3.8-154 and 71 proposed turbine locations each for the V163-4.5 and SG  
83 4.4-164 were analyzed in the Shadow Flicker Analysis prepared for the  
84 Application. South Deuel Wind will construct and operate a subset of the turbine  
85 locations described in the Shadow Flicker Analysis; therefore, expected annual  
86 shadow flicker hours will be less than the results of the analyses presented.

87 **Q. Describe the methodology used in conducting the shadow flicker modeling.**

88 **A.** The WindPro's Version 3.6 software modeling application was used in the  
89 assessment. WindPRO is physics-based, an industry-accepted modeling program  
90 that calculates the number of hours per year that any given receptor may receive

91 shadow flicker from the source turbines. The application considers the attributes  
92 and positions of the wind turbines in relation to receptors within the area. Shadow  
93 flicker models also consider the sun's position as it passes through the Project  
94 area each day and seasonally in addition to regional climatological information.  
95 Climatological information was acquired from the National Climatic Data Center  
96 and regional meteorological stations. The percentage of sunshine probability was  
97 estimated from an analysis of average sunshine statistics for the Project region.

98  
99 The WindPRO model calculates both a "potential" and "expected" scenario. The  
100 "potential" scenario provides the periods when shadow flicker may occur on a  
101 receptor; however, it is not representative of the shadow flicker that is expected to  
102 occur. The "potential" scenario assumes no cloud cover, the sun is always shining  
103 during daylight hours, and turbines are always operating and rotated to cast  
104 maximum shadow on a receptor. The "expected" amount of annual shadow flicker  
105 considers the percentage of sunshine based on local regional sunshine statistics;  
106 the alignment of the blades in relation to the receptor due to wind direction; and  
107 the amount of time that the blades would not be rotating due to wind speeds  
108 outside of the turbine's operating parameters. The "potential" scenario, as  
109 described, could not realistically occur; however, is useful as an indicator of the  
110 potential times within which shadow flicker may occur. The Shadow Flicker  
111 Analysis uses a conservative 90% operational time for purposes of calculating the  
112 annual hours of expected shadow flicker.

113  
114 The modeling was completed for three different turbine models currently under  
115 consideration: the SG model, containing 71 SG 4.4-164 wind turbines with a 97.5-  
116 meter hub height and a 164-meter rotor diameter; the Vestas model, containing 71  
117 V163-4.5 wind turbines with a 98-meter hub height and a 163-meter rotor diameter;  
118 and the GE model, containing 73 GE 3.8-154 wind turbines with a 98-meter hub  
119 height and a 154-meter rotor diameter.

121 The Shadow Flicker Analysis is conservative in that it does not take into account  
122 existing obstructions between the receptors and turbines, such as buildings or  
123 trees, that will limit the amount of flicker actually experienced at the receptor.

124

125 A total of 132 potential receptors (residences) within 1.25 miles of the proposed  
126 turbine locations were identified by South Deuel Wind and Stantec utilizing aerial  
127 imagery and on-site reconnaissance.

128

129 **Q. What assumptions were included in your model?**

130 **A.** The model utilizes a “greenhouse” approach which defines each receptor as a one-  
131 meter glass cube, representing a window able to receive shadow from all  
132 directions. Vegetation surrounding receptors may block or diminish the effect of  
133 shadow flicker; however, the reduction due to vegetation has not been considered  
134 in the results summarized in the Shadow Flicker Analysis.

135

136 Other obstacles located between a receptor and a turbine, such as garages, out-  
137 buildings, or silos, may reduce or eliminate the duration and/or intensity of shadow  
138 flicker on a receptor. The analyses were performed using conservative model  
139 inputs and did not include the blocking of shadow flicker due to vegetation or other  
140 obstacles.

141

142 Shadow flicker is widely considered imperceptible at a distance greater than 1,500  
143 meters; however, Stantec conservatively analyzed the impact at all distances when  
144 more than 20 percent of the sun would be covered by a turbine blade. Shadow  
145 flicker does not occur when the sun-angle is less than three degrees above the  
146 horizon, due to atmospheric diffusion.

147

148 Further, the results discussed in the Shadow Flicker Analysis assume that all  
149 turbines for each turbine model are operational. South Deuel Wind will construct  
150 and operate a subset of the turbine locations analyzed; therefore, the total

151 expected annual shadow flicker hours will be less than the results of these  
152 analyses.

153

154 **Q. What did the results of the Shadow Flicker Analysis show?**

155 **A.** Results of the analysis indicate that the majority of the 132 identified existing  
156 residences analyzed within approximately 1.25 miles of turbines are expected to  
157 receive 10 hours or less of shadow flicker each year. All receptors are expected to  
158 receive no greater than 30 annual hours of shadow flicker, except that the GE and  
159 SG models indicated that three receptors owned by Project participants may  
160 receive greater than 30 annual hours of shadow flicker, prior to consideration of  
161 vegetative blocking or applied mitigation. Likewise, the Vestas model indicates the  
162 same at two participating receptors.

163

164 **Q. How will South Deuel Wind comply with the Deuel County Ordinance if the  
165 final design of the Project indicates that existing residences will receive  
166 more than the allowed limit of shadow flicker?**

167 **A.** South Deuel Wind has indicated that they will work with the owners of residences  
168 as needed to identify, manage, and mitigate shadow flicker overages using  
169 commercially reasonable mitigation measures. Mitigation measures that may be  
170 offered include, but are not limited to, planting trees and/or vegetative buffers and  
171 turbine curtailment.

172

173 **Q. Based on the results of the Shadow Flicker Analysis, will the Project comply  
174 with the Deuel County shadow flicker limit?**

175 **A.** Yes, using the conservative modeling methodology described above, the Project  
176 is not projected to result in shadow flicker levels above 30 hours per year at all but  
177 five participant receptors. South Deuel Wind has indicated that for any receptor  
178 where predicted shadow flicker is more than 30 hours per year, further site-specific  
179 analyses will be conducted to ensure that shadow flicker is 30 hours or less per  
180 year or take mitigative steps described above to limit shadow flicker at the existing

181 residences to 30 annual hours or less. Therefore, the Project will comply with the  
182 Deuel County Zoning Ordinance.

183

184 **IV. CONCLUSION**

185

186 **Q. Does this conclude your testimony?**

187 **A.** Yes.

188

189

190 Dated this 28<sup>th</sup> day of June, 2024

191

192

  
\_\_\_\_\_

193 JoAnne J. Blank