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

I. INTRODUCTION AND QUALIFICATIONS

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

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

Q. On whose behalf are you providing this testimony?

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

Q. Briefly describe your educational background and professional experience.

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

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

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

II. OVERVIEW

Q. What is your role in the Project?

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

Q. What is the purpose of your Direct Testimony?

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

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

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

- Section 11.5: Shadow Flicker
- Appendix N: Shadow Flicker Analysis

Q. What exhibits are attached to your Direct Testimony?

A. I am sponsoring the following exhibit:

- Exhibit 1: JoAnne Blank Resume.

III. SHADOW FLICKER ANALYSIS

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

A. Yes.

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

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

Q. What turbine models did you analyze?

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

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

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

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

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

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

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

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

Q. What assumptions were included in your model?

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

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

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

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

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

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

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

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

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

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

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

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

IV. CONCLUSION

Q. Does this conclude your testimony?

A. Yes.

Dated this 28th day of June, 2024

JoAnne J. Blank