NEW YORK STATE BOARD ON ELECTRIC GENERATION SITING AND THE ENVIRONMENT

Application of Canisteo Wind Energy, LLC for a Certificate of Environmental Compatibility and Public Need Pursuant to Article 10 for Construction of a Wind Project Located in Steuben County.	:	Case 16-F-0205

REBUTTAL TESTIMONY OF:

BENJAMIN R. BRAZELL, PRINCIPAL

ENVIRONMENTAL DESIGN & RESEARCH, LANDSCAPE, ARCHITECTURE, ENGINEERING & ENVIRONMENTAL SERVICES, D.P.C. (EDR)
217 MONTGOMERY STREET, SUITE 1000
SYRACUSE, NEW YORK, 13202

AND

JACOB S. RUNNER, PROJECT MANAGER (EDR)

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

A. Benjamin R. Brazell, Environmental Design & Research, Landscape, Architecture, Engineering & Environmental Services, D.P.C. ("EDR"), 217 Montgomery Street, Suite 1000, Syracuse, NY 13202-1942.

Q. Did you file pre-filed testimony in this matter, which contained your credentials

A. Yes. Please see the pre-filed testimony that was filed with the Application.

Q. Can the second witness please state your name, employer, and business address.

A. Jacob S. Runner, Environmental Design & Research, Landscape, Architecture, Engineering & Environmental Services, D.P.C. ("EDR"), 217 Montgomery Street, Suite 1000, Syracuse, NY 13202.

Q. Please describe your educational background and professional experience.

A. I received a Bachelor of Science Degree in Environmental Science with a concentration in Environmental Information and Mapping from State University of New York College of Environmental Science and Forestry (ESF) in 2012. While at ESF I completed advanced coursework in conducting spatial analyses including Principals of Remote Sensing, GIS for Engineers, Spatial Ecology, Geographic Information and Society, and

Cartographic Design. Since my employment with EDR, I have worked in the capacity as Environmental Analyst/GIS Specialist, Senior Environmental Analyst/GIS Specialist, and Project Manager. I have over 5 years of experience performing and/or supervising projects involving environmental surveys, state and federal wetland permitting, spatial analyses, shadow flicker assessments, environmental impact assessments, and preparation of multiple state siting board applications and environmental impact statements. My resume is Exhibit ____ (JSR-1).

Q. Please describe your current responsibilities with EDR.

A. As a Project Manager, I am responsible for conducting and/or overseeing wetland delineations, state and federal wetland permitting, environmental impact assessments, and preparation of numerous state siting board applications. I am also responsible for assigning, scheduling and coordinating staff, overseeing project teams, and providing quality assurance. I have also been responsible for conducting and/or overseeing numerous shadow flicker assessments across multiple states in the northeast and the midwest (New York, Ohio, Colorado, Kansas, Iowa). Additionally, I provided technical expertise to the Vermont Department of Public Service in review of shadow flicker analyses conducted by applicants of proposed wind farms.

Q. Did you file pre-filed testimony in this matter, which contained your credentials?

A. No.

Q. Have you previously testified before the New York State Public Service Commission or Siting Board on Electric Generation?

A. I have previously submitted pre-filed testimony in Case 15-F-0122 and Case 17-F-0282.

Q. What is the scope of the Panel's rebuttal testimony in this proceeding?

A: This testimony is being submitted to rebut certain direct testimony prepared by Andrew C. Davis, New York State Department of Public Service (DPS) Utility Supervisor, and Timothy Brown, Citizens for Maintaining Our Rural environment (CMORE), relating to shadow flicker.

Q. Is the Panel sponsoring any additional evidence with your testimony?

A. Yes. We are sponsoring information from the Danish Wind Industry Association. Exhibit ____ (JSR-2).

Q. Do you agree with the DPS Staff Policy Panel proposed certificate conditions regarding the threshold for limiting shadow flicker operation?

A. Yes. DPS Staff propose that shadow flicker shall be limited to a maximum of 30-hours annually for non-participating receptors. The 30-hour threshold

is consistent with Certificate Conditions set forth by the Siting Board in Case No. 14-F-0490 and is also consistent with thresholds established in other jurisdictions as described in Section 3.3 of Appendix 24b of the October 2018 Application.

Q. In his direct testimony Mr. Davis states that "These provisions do not provide consideration of limiting exposures exceeding 30 minutes daily to avoid or minimize such disturbances at non-participating residences…". Do you agree that the Applicants proposed Certificate Condition 57 and Compliance Filing Attachment A Shadow Package should have addressed a threshold of 30 minutes daily at receptors?

A. No. Mr. Davis references the 2012 NARUC *Wind Energy & Wind Park Siting and Zoning Best Practices and Guidance for States* as the basis for recommending consideration of a 30-minute per day threshold. NARUC provides a Recommended Approach that restricts shadow flicker to 30-hours per year or 30-minutes per day at occupied buildings. The original basis for a 30-minute limit traces back to a 2002 German guideline and a 1999 German government-sponsored study. The 2012 NARUC report Mr. Davis cites, in turn cites two sources (Lampeter 2011 and Ellenbogen et al 2012), both of which only make reference to the 2002 German guideline which suggested a maximum of 30 minutes per day. The German

government-sponsored study (Pohl, et.al., 1999., Annoyance due to shadow flicker from wind turbines- laboratory pilot study [with appendix) and field study (with appendix)] placed 32 students and 25 professionals in either a control setting or an experimental group that was exposed to 60 minutes of shadow flicker. While this study indicates that 60 minutes of shadow flicker elevates annoyance it also states that "*Whether a daily shadow value of more than 30 minutes per day is associated with unacceptable harassment could not be clarified in the context of this investigation due to a too small number of persons with more than 30 minutes per day."* It is our understanding that these conditions were based on the laboratory experiment explained above and not actual field conditions. Moreover, according to the Danish Wind Industry Association, a German court ruled that 30 hours per year was acceptable at a neighbor's property (See Exhibit ____ (JSR-2). Thus, even though NARUC mentions a 30-minute limitation to minimize annoyance, the literature supporting this recommendation is not conclusive and it would appear the 30-hour limitation, which is more widely adopted, is more effective at minimizing annoyance to non-participants from shadow flicker.

Q. Are there practical modeling limitations with using a 30-minute threshold?

A. Yes. The shadow modeling software (WindPro) uses reduction assumptions in which the amount of shadow flicker is refined when used to predict annual shadow exposure but not for daily exposure.

As described in Appendix 24b of the October 2018 Application, *WindPRO* software was used to evaluate shadow flicker. The software uses turbine locations, turbine dimensions, receptor locations, local topography, wind direction frequency, and sunshine frequency to calculate both a "worst-case" and an "expected case" shadow-flicker scenario. The "worst case" shadow-flicker model outputs assumes no clouds or fog, wind conditions allowing for continuous turbine operation, the turbine rotor is continuously perpendicular to the sun, and the turbine rotor is positioned between the receptor and the sun. The "expected case" model runs the analysis utilizing a monthly reduction factor for average sunshine and wind directions, although the blades are still modeled to be moving during all daylight hours when the sun's elevation is more than 3 degrees above the horizon. The *WindPro* software reports shadow flicker in days per year, hours per year, and max hours per day within the "worst case" scenario while only hours per year are reported under the "expected case" scenario because a monthly reduction factor is utilized and no daily reduction factor exists (see Attachment B to Appendix 24b of the October 2018

Application). When assessing receptors for meeting the 30-hour / year threshold the "expected case" scenario is used since this represents more realistic conditions.

Q: What has your experience been with shadow flicker limits in New York?

A: As stated elsewhere in this testimony, the Siting Board ruled that 30 hours per year for non-participants was an acceptable standard. Prior to Article 10, in our experience in New York, 30 hours per year was a common threshold considered by local jurisdictions with operating projects in their review under local zoning and the State Environmental Quality Review Act. As far as we know, there has never been a successful court challenge to this standard in New York.

Q: Has the Siting Board adopted a 30-minute shadow flicker standard in other proceedings?

A. No. To date only one wind project has been approved by the Siting Board (Case No. 14-F-0409), and the certificate includes a 30-hour annual threshold for shadow flicker (Condition 30).

Q: Are there additional recent studies relevant to the topic of shadow flicker thresholds?

A: Yes. The Community Noise and Health Study conducted by Health Canada (Voicescu et. al, 2016. *Estimating annoyance to calculated wind turbine shadow flicker is improved when variables associated with wind turbine noise exposure are considered.* *https://asa.scitation.org/doi/10.1121/1.4942403*). One aspect of this study evaluated annoyance from wind turbine noise and shadow flicker of randomly selected participants (1,238 participants located between 0.25 kilometers and 11.22 kilometers from operational wind turbines). This study concluded that when modeled shadow flicker minutes are evaluated alone (without other annoyance variables such as noise and blinking lights) it provides an inadequate model for estimating annoyance to shadow flicker.

Q: Do you have any additional comments regarding shadow flicker?

A: Yes. In his testimony, CMORE Member Timothy Brown outlines concerns with how shadow flicker is modeled on his residence. He believes the "surface dimensions of an entire dwelling would probably produce a lot more hours of flicker than CWE claims". The receptor size used in this analysis is industry standard and is the recommendation of WindPro (the modeling software). The WindPRO 3.3 User Manual (available at: http://help.emd.dk/knowledgebase/) states "*The default parameters of 1m*

[meter] height and 1m width window, 1m above the ground level can be considered as a standard description of typical windows." The analysis was conducted using "Green House" mode, which is described in the WindPro 3.3 User Manual as "*the receptor will not face any particular direction, but instead will face all directions. This is useful if the actual properties of the receptor are unknown or if there are wind turbines on more sides of the house that may contribute to the flickering impact"*. Based on our experience, it is industry standard to use these parameters in the initial modeling and analysis of shadow flicker.

Following final turbine model selection and layout finalization, the Applicant will prepare an updated shadow flicker analysis. If shadow flicker is modeled to exceed 30 hours per year at any non-participating residences, a "Phase II" shadow flicker analysis will be conducted, which will take into account any screening by existing yard trees, buildings, or proximity to stands of trees and the number and/or orientation of windows in residential receptors. If needed after receiving a complaint, the following mitigation options are available: 1) work with the landowner to become a Facility participant, 2) planting of trees or installation of window blinds to block the shadow flicker, or 2) operational curtailment of turbines so that the 30 hour

per year threshold is not exceeded. These mitigation options can be easily implemented even after the Facility has been constructed.

Q. Does this conclude your testimony at this time?

A. Yes.