BEFORE THE SOUTH DAKOTA PUBLIC UTILITIES COMMISSION

DOCKET EL18-053

IN THE MATTER OF THE APPLICATION OF DEUEL HARVEST WIND ENERGY LLC FOR A PERMIT OF A WIND ENERGY FACILITY AND A 345 KV TRANSMISSION LINE IN DEUEL COUNTY, SOUTH DAKOTA

Direct Testimony of David M Hessler
On Behalf of the Staff of the South Dakota Public Utilities Commission
March 14, 2019

Q. Please state your name and business address.

A. My name is David M. Hessler. The address of my company's administrative offices is 38329 Old Mill Way, Ocean View, Delaware 19970, and my personal office is located at 1012 W Las Colinas Dr., St. George, Utah 84790.

Q. Mr. Hessler, by whom are you employed and in what capacity?

A. I have been employed for over 28 years by Hessler Associates, Inc., as Vice President and a Principal Consultant. Hessler Associates, Inc. is a family run engineering consulting firm that specializes in the acoustical design and analysis of power generation and industrial facilities of all kinds, including wind energy projects.

Q. Please describe your educational background and your professional experience?

A. I received a Bachelor of Science degree in Mechanical Engineering in 1997, *Summa cum Laude*, from the A. James Clark School of Engineering, University of Maryland, College Park, Maryland, and a Bachelor of Arts degree, 1982, from the University of Hartford, Hartford, Connecticut. I am a registered Professional Engineer (P.E.) in the Commonwealth of Virginia and I am a member of the Institute of Noise Control Engineering (INCE). My professional specialization is the measurement, analysis, control and prediction of noise from both fossil fueled and renewable power generation facilities. I have been the principal acoustical designer and/or test engineer on hundreds of power station projects all over the

world and on roughly 70 industrial scale wind energy projects. I wrote the chapter on measuring and analyzing wind turbine noise in the book "Wind Turbine Noise"[1], which was published in 2011. I also drafted a set of best practices guidelines[2] for siting new wind turbine projects and testing them once completed for the National Association of Regulatory Utility Commissioners (NARUC). My resume, which contains a list of the cases where I have testified as an expert witness, is also attached for reference as Exhibit DMH-1.

Q. What is the purpose of your testimony in this case?

A. I have been asked by the Staff of the South Dakota Public Utilities Commission to review and independently evaluate the adequacy of the noise assessment study carried out by Hankard Environmental, Inc. in support of the Deuel Harvest North Wind Farm Project.

Q. What materials have you reviewed in this matter?

A. I have reviewed the "Pre-Construction Wind Turbine Noise Analysis for the proposed Deuel Harvest North Wind Farm", dated November, 2018, prepared by Hankard Environmental, Inc. and included in the permit Application submitted by Deuel Harvest Wind Energy, LLC as Appendix D. I have also reviewed the direct and supplemental testimony of Michael Hankard dated November 30, 2018 and

[1] Bowdler, D., and Leventhall, G., Editors, "Wind Turbine Noise", Multi-Science Publishing Company, Brentwood, Essex, UK, 2011.

[2] Hessler, D., "Assessing Potential Impacts from Proposed Wind Farms & Measuring the Performance of Completed Projects", National Association of Regulatory Utility Commissioners, U.S. Department of Energy, October 2011.

February 14, 2019, respectively. And, lastly, I have reviewed Intervenor John Homan's responses to Staff's first set of data requests, dated February 25, 2019.

Q. Can you please summarize your overall opinion of the noise analysis study submitted on behalf of the project?

A. In general, the quality of the work and noise modeling is perfectly satisfactory and consistent with good industry practice. I agree with the modeling methodology and believe that the predictions are realistic and accurate. However, I would fault the study for focusing exclusively on regulatory compliance and failing to evaluate or assess the potential noise impact of the project on the community. For example, it is common, but by no means universal, industry practice to perform one or more baseline sound surveys of the existing conditions within the site area and then compare the expected project sound levels at residences to this pre-existing sound level. The amount by which the project sound level exceeds the background level generally determines the project's perceptibility and potential impact and it is good practice to attempt to minimize this differential. A 5 dBA increase above the baseline background level is often used as an ideal design goal because it limits the prominence and audibility of the project relative to the natural environmental sound level. Such a relative, ambient-based approach can, and often does, lead to an ideal design target that is lower than the applicable absolute regulatory limit(s).

Q. Does that mean you believe a survey should have been done?

A. A survey and a subsequent impact analysis, while not absolutely essential in all cases, would have demonstrated a concern for the community's welfare and acceptance of the project. This approach is sometimes combined with optimization modeling where turbines are iteratively moved or eliminated early in the design process when significant changes are still practical in an effort to minimize the community noise impact and perhaps realize unilaterally adopted design targets. It is in everyone's best interest, including the project owner/operator, to minimize the potential for noise issues irrespective of any regulatory noise limits.

Q. Be that as it may, do you believe the project will at least meet the County Zoning Ordinance noise limit?

A. Yes. The modeling indicates that the Deuel County Zoning Ordinance noise limit of 45 dBA at non-participating residences will be met, although just barely in two cases where the predicted level is 44.9 dBA.

Q. Although the County Ordinance limits project noise only at non-participating residences, how do the predicted levels at participating residences compare to this limit?

A. Very unfavorably. Table 5-2 of the noise study shows that sound levels as high as 49.8 dBA are expected at some participating properties and that there are at least a dozen residences above 47 dBA. These are very high sound levels in the

sense that the churning, variable aerodynamic noise of the closest units will be clearly audible much of the time. In my experience, such noise levels have led to serious complaints, even from participants. Consequently, I think it's important for participants with predicted sound levels above 45 dBA to know what they're getting into by visiting an existing wind project, if they haven't already, and observing the sound level at their relevant set back distance – not only on a sunny afternoon but, perhaps more importantly, at night. It's just a matter of having realistic expectations.

Q. Michael Hankard's supplemental direct testimony proffers and supports a sound condition consistent with several past projects of 45 dBA at non-participating residences and 50 dBA at participants. Do you believe the Commission should agree to these noise limits and make it a condition of the permit?

A. Yes. I think that's a reasonably fair condition for this project taking into account what I just said about participants with predicted sound levels above 45 dBA. In general, I would have strongly preferred to see predicted sound levels that did not run right up to the 45 and 50 dBA limits. At this point, I don't see any way of significantly reducing receptor sound levels short of thinning the turbine density to the point of likely economic non-viability.

Q. In Docket EL18-026, you recommended that the Commission include a noise limit for the Prevailing Wind Park facility at what you consider an

ideal design goal of 40 dBA. Why should the Commission adopt a different noise limit of 45 dBA for the Deuel Harvest facility than what was recommended for the Prevailing Wind Park facility?

A. The Prevailing Wind Park project was vigorously opposed by a number of Intervenors. In the face of this serious opposition - *and* because the population and turbine densities were low enough that it was reasonably achievable - I felt that it was appropriate to recommend a more demanding noise limit of 40 dBA for that project, rather than the local ordinance limit of 45 dBA, to address to some extent the widespread trepidation about project noise and likely future disturbance. To my knowledge, that level of antipathy does not exist among the residents in the vicinity of the Deuel Harvest project area and, as I just mentioned, the project layout does not lend itself at all to an easy reconfiguration that would drop the sound level to no more than 40 dBA at all non-participants.

Q. Also referring to Docket EL18-026, the Commission ordered that the Prevailing Wind Park project "shall not generate a long-term average sound pressure level (L10), as measured over a period of at least two weeks" at non-participating residences. Mr. Hankard's proposed sound condition is expressed as a long-term average with an Leq measurement. Could you please explain why you do not support L10 as the statistical measurement?

A. Although I recommended a 40 dBA noise limit for the Prevailing Wind Park Project, I deliberately did not associate it with the L10 descriptor. The theory behind the L10 measurement is that such a measure would capture and place a

cap on the momentarily elevated sound levels that wind turbines do produce occasionally during turbulent air flow conditions. The problem is that this theory fails to recognize that wind turbines operate in real world environments filled with contaminating wind-induced noises. Over a typical measurement interval, wind facilities produce a fairly constant and steady underlying sound that is most perceptible during the quiet lulls between interfering noise events.

The L10 descriptor quantifies the sound level that is exceeded only 10% of the time during a measurement interval. As such, it tends to capture the near-maximum sound level that occurred during the measurement. Almost invariably this near maximum sound is generated by contaminating noise events that are completely unrelated to the project, like cars passing by, intermittent man-made noises, or wind gusts rustling nearby foliage. Based on my experience doing pre-construction surveys for wind projects in rural areas, the measured L10 sound level is higher than 40 dBA roughly 80% of the time even before the projects are built. Consequently, even if the project sound emissions were practically negligible, there would be little chance of measuring L10 sound levels lower than 40 dBA during the windy conditions necessary for the project to operate; especially on a consistent basis over the specified two-week period. The statistical measure selected should have the best chance of detecting and quantifying project-only sound levels during the windy conditions necessary for the project to operate. While still not ideal, the Leq measurement is a step in the right direction towards accomplishing this. In general, it is best to not prescribe

any particular statistical measure and simply confine the condition or regulatory limit to the maximum permissible sound level itself.

Q. In Intervenor John Homan's responses to Staff's first set of data requests Mr. Homan outlines quite a number of concerns about the project and, with respect to noise, says he would like to see a noise limit of 35 dBA at non-participating residences, among other things. Do you believe that's a reasonable condition that the Commission should consider imposing on the project?

A. No. While I would certainly like to see such a low sound level at all non-participating properties, I can only think of one wind project that I have been involved with that could have ever made that noise target and that project was located on an uninhabited island. From a practical standpoint, such a level cannot be realistically achieved at this project, or at virtually any project located in a populated area.

Q. Does this conclude your testimony?

A. Yes.