

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**



1 **Q. Please state your name and business address.**

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

5
6 **Q. Mr. Hessler, by whom are you employed and in what capacity?**

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

12
13 **Q. Please describe your educational background and your professional
14 experience?**

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

1 world and on roughly 70 industrial scale wind energy projects. I wrote the
2 chapter on measuring and analyzing wind turbine noise in the book “Wind
3 Turbine Noise”¹, which was published in 2011. I also drafted a set of best
4 practices guidelines² for siting new wind turbine projects and testing them once
5 completed for the National Association of Regulatory Utility Commissioners
6 (NARUC). My resume, which contains a list of the cases where I have testified
7 as an expert witness, is also attached for reference as Exhibit DMH-1.

8
9 **Q. What is the purpose of your testimony in this case?**

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

14
15 **Q. What materials have you reviewed in this matter?**

16 A. I have reviewed the “Pre-Construction Wind Turbine Noise Analysis for the
17 proposed Deuel Harvest North Wind Farm”, dated November, 2018, prepared by
18 Hankard Environmental, Inc. and included in the permit Application submitted by
19 Deuel Harvest Wind Energy, LLC as Appendix D. I have also reviewed the direct
20 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.

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

3
4 **Q. Can you please summarize your overall opinion of the noise analysis study**
5 **submitted on behalf of the project?**

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

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

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

11

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

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

17

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

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

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

9
10 **Q. Michael Hankard's supplemental direct testimony proffers and supports a**
11 **sound condition consistent with several past projects of 45 dBA at non-**
12 **participating residences and 50 dBA at participants. Do you believe the**
13 **Commission should agree to these noise limits and make it a condition of**
14 **the permit?**

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

21
22 **Q. In Docket EL18-026, you recommended that the Commission include a**
23 **noise limit for the Prevailing Wind Park facility at what you consider an**

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

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

14
15 **Q. Also referring to Docket EL18-026, the Commission ordered that the**
16 **Prevailing Wind Park project “shall not generate a long-term average sound**
17 **pressure level (L10), as measured over a period of at least two weeks” at**
18 **non-participating residences. Mr. Hankard’s proposed sound condition is**
19 **expressed as a long-term average with an Leq measurement. Could you**
20 **please explain why you do not support L10 as the statistical measurement?**

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

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

7
8 The L10 descriptor quantifies the sound level that is exceeded only 10% of the
9 time during a measurement interval. As such, it tends to capture the near-
10 maximum sound level that occurred during the measurement. Almost invariably
11 this near maximum sound is generated by contaminating noise events that are
12 completely unrelated to the project, like cars passing by, intermittent man-made
13 noises, or wind gusts rustling nearby foliage. Based on my experience doing
14 pre-construction surveys for wind projects in rural areas, the measured L10
15 sound level is higher than 40 dBA roughly 80% of the time even before the
16 projects are built. Consequently, even if the project sound emissions were
17 practically negligible, there would be little chance of measuring L10 sound levels
18 lower than 40 dBA during the windy conditions necessary for the project to
19 operate; especially on a consistent basis over the specified two-week period.
20 The statistical measure selected should have the best chance of detecting and
21 quantifying project-only sound levels during the windy conditions necessary for
22 the project to operate. While still not ideal, the Leq measurement is a step in the
23 right direction towards accomplishing this. In general, it is best to not prescribe

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

3
4 **Q. In Intervenor John Homan's responses to Staff's first set of data requests**
5 **Mr. Homan outlines quite a number of concerns about the project and, with**
6 **respect to noise, says he would like to see a noise limit of 35 dBA at non-**
7 **participating residences, among other things. Do you believe that's a**
8 **reasonable condition that the Commission should consider imposing on**
9 **the project?**

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

16
17 **Q. Does this conclude your testimony?**

18 A. Yes.

CURRICULUM VITAE

DAVID M. HESSLER

Title: Principal Consultant, Vice-President
Hessler Associates, Inc.

Professional Affiliations: Professional Engineer (P.E.), Commonwealth of Virginia
Member Institute of Noise Control Engineering (INCE)

Education: Bachelor of Science in Mechanical Engineering (B.S.), 1997
Summa cum Laude
A. James Clark School of Engineering
University of Maryland, College Park, MD

Bachelor of Arts (B.A.), 1982
University of Hartford, Hartford, CT

Employer: Hessler Associates, Inc.
38329 Old Mill Way, Unit 8
Ocean View, DE 19970

Years in present position: 28

Office Location: St. George, UT

Current Job Description: Acoustical engineer specializing in the prediction, assessment and mitigation of environmental noise from new and existing power generation and industrial facilities. Typical tasks include:

- Field measurement studies of existing ambient sound levels in the vicinity of proposed project sites
- Computer noise modeling of new facilities prior to construction
- Environmental impact assessments for new projects
- Noise mitigation design studies of new facilities
- Verification measurements of completed facilities
- Diagnostic studies of facilities with existing noise problems
- Design and specification of noise mitigation measures
- Educational lectures on noise issues for private corporations
- Expert witness testimony

General Experience: As an outside consultant to nearly all the major power industry EPC contractors, developers and OEM's, I have been the principal acoustical designer of over 400 power plants and industrial facilities worldwide ranging from a 3900 MW power station in Saudi Arabia to numerous combustion turbine combined cycle plants to refineries and wind turbine projects. Typically, the focus of the work on these projects was to anticipate potential noise impacts at sensitive receptors near the project and recommend practical noise abatement measures to avoid them. In addition, extensive verification measurements in and around the completed power plants and wind farms have been performed to confirm that the design recommendations have been successfully executed.

Wind Turbine Experience: Over the past 16 years I have performed noise impact evaluations and siting optimization studies for roughly 70 large wind turbine projects in the United States, Canada and the Caribbean, involving nearly all current makes and models of wind turbines. I have developed test protocols and conducted long-term field measurement surveys of numerous newly completed wind projects to evaluate compliance with applicable permit conditions, to investigate complaints and/or to verify the accuracy of pre-construction noise modeling. I have carried out field tests of wind turbine sound power level in strict accordance with the IEC 61400-11 test methodology. I have carried out field measurement studies of operating wind turbines to evaluate their low frequency sound emissions, nacelle noise sources and radial directivity characteristics. I have testified as an expert witness at permitting hearings for proposed wind projects. I have attended six bi-annual Wind Turbine Noise conferences organized by INCE Europe.

Representative Papers and Publications:

“Wind Turbine Noise”, Chapter 7 *Measuring and Analyzing Wind Turbine Sound Levels*, Multi-Science Publishing Co., Brentwood, Essex, UK, Jan. 2012. Comprehensive book on all aspects of wind turbine noise. Each chapter written by a recognized expert in that subject.

Teleseminar “Wind Turbine Siting and Best Practices”, National Regulatory Research Institute (NRRI), Invited speaker, Jan. 2012.

“Best Practices Guidelines for Assessing Sound Emissions from Proposed Wind Farms and Measuring the Performance of Completed Projects”, Prepared for the Minnesota Public Utilities Commission under the auspices of the National Association of Regulatory Utility Commissioners (NARUC), Oct. 2011.

“Accounting for Background Noise when Measuring Operational Noise from Wind Turbines”, Fourth International Meeting on Wind Turbine Noise, Rome, Italy, Apr. 2011.

“Recommended noise level design goals and limits at residential receptors for wind turbine developments in the United States”, *Noise Control Engineering Journal*, J.59 (1), January-February 2011.

“Wind tunnel testing of microphone windscreen performance applied to field measurements of wind turbines”, Third International Meeting on Wind Turbine Noise, Aalborg, Denmark, June 2009.

“Experimental study to determine wind-induced noise and windscreen attenuation effects on microphone response for environmental wind turbine and other applications”, *Noise Control Engineering Journal*, J.56, July-August 2008.

Expert Witness Cases:

Before the Washington State Energy Facilities Siting Board (EFSEC) on behalf of Bechtel and the Cherry Point Cogeneration Project, Bellingham, WA, 2003. Permitting support for a proposed combined cycle power plant facility.

Before the Public Service Commission of West Virginia on behalf of the Longview Power Project near Morgantown, WV, 2006. Permitting support for a proposed coal-fired power plant facility.

Before the Pennsylvania Department of Environmental Protection on behalf of Waste Management and the Alliance Sanitary Landfill in Taylor, PA, 2006. Support in defending against a Class Action Lawsuit brought by neighbors of the landfill.

Before the Office of the Attorney General of New York on behalf of the Hudson Valley Community College Cogeneration (Diesel) Plant. Support in defending against a Class Action Lawsuit brought by neighbors.

Before the Hanover County (VA) Board of Supervisors on behalf of Martin Marietta Materials and the Doswell Quarry, 2008. Permitting support for a proposed quarry expansion.

Before the New Hampshire Site Evaluation Committee on behalf of Granite Reliable Power, LLC, 2008. Docket No. 2008, July 2008. Permitting support for a proposed wind turbine project in Northern New Hampshire.

Before the Public Utilities Commission of Ohio, Ohio Power Siting Board on behalf of EverPower Renewables and the Buckeye Wind Project, 2008. Permitting support for a proposed wind turbine project in Ohio.

Before the Wisconsin Public Service Commission on behalf of Clean Wisconsin with regard to the proposed Highland Wind Farm in Forest, WI. Docket No. 2535-CE-100. Engaged as an independent expert to evaluate the Applicant's sound studies and the testimony of opposition groups.

Before the Public Utilities Commission of Ohio, Ohio Power Siting Board on behalf of EverPower Renewables and the Buckeye II Wind Project, 2012. Permitting support for a proposed wind turbine project in Ohio.

Before the Maine State Government Energy, Utilities and Technology Committee on behalf of Patriot Renewables and the Beaver Ridge Wind Project, 2014. Peer review of operational sound testing by others.

Before the South Dakota Public Utilities Commission, serving as an outside expert to the PUC Staff reviewing the noise aspects of the Dakota Range Wind permit application, Docket EL 18-003, June 2018.

Before the South Dakota Public Utilities Commission, serving as an outside expert to the PUC Staff reviewing the noise aspects of the Prevailing Wind Park permit application, Docket EL 18-026, October 2018.

Before the Rhode Island Energy Facility Siting Board, serving as an outside expert to the Town of Burrillville, RI reviewing the noise aspects of the Clear River Energy Center permit application, Docket SB-2015-06, December 2018.