

BEFORE THE SOUTH DAKOTA PUBLIC UTILITIES COMMISSION

DOCKET EL17-055

**IN THE MATTER OF THE APPLICATION BY CROCKER WIND FARM, LLC FOR A
PERMIT OF A WIND ENERGY FACILITY AND A 345 KV TRANSMISSION LINE IN
CLARK COUNTY, SOUTH DAKOTA, FOR CROCKER WIND FARM**

**Direct Testimony of David M Hessler
On Behalf of the Staff of the South Dakota Public Utilities Commission
March 28, 2018**



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, DE 19970 and my personal office is
4 located at 1012 W Las Colinas Dr., St. George, UT 84790.

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

7 A. I have been employed for over 27 years by Hessler Associates, Inc., as Vice
8 President and a Principal Consultant. Hessler Associates, Inc. is an engineering
9 consulting firm that specializes in the acoustical design and analysis of power
10 generation and industrial facilities of all kinds, including wind energy projects.

11

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

14 A. I received my Bachelor of Science in Mechanical Engineering (B.S.), 1997,
15 *Summa cum Laude*, at the A. James Clark School of Engineering, University of
16 Maryland, College Park, MD, and a Bachelor of Arts (B.A.), 1982, at the
17 University of Hartford, Hartford, Connecticut. I am a registered Professional
18 Engineer (P.E.) in the Commonwealth of Virginia and I am a member of the
19 Institute of Noise Control Engineering (INCE). My professional specialization is
20 the measurement, analysis, control and prediction of noise from both fossil fueled
21 and renewable power generation facilities. I have been the principal acoustical
22 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. My resume is also
2 attached for reference as Exhibit_DMH-1.

3
4 **Q. Have you ever testified as an expert witness before any court or
5 administrative body? If so, what was the nature of your testimony?**

6 A. Yes, on a number of occasions. For example, I have provided both written and
7 extensive oral testimony before the Ohio Energy Facility Siting Board on behalf of
8 the Applicant in support of the Buckeye Wind Farm project in Champaign County,
9 OH. I prepared the noise impact assessment study for that project and testified
10 with regard to that study. On another occasion I testified before the Wisconsin
11 Public Service Commission on behalf of Clean Wisconsin, Inc., a non-profit
12 environmental advocacy organization, with regard to the proposed Highland
13 Wind Farm project in St. Croix County, WI where I was tasked with reviewing and
14 evaluating the validity of the Applicant's noise assessment study for that project.
15 A further listing of all cases where I have testified is included in Exhibit_DMH-1.

16
17 **Q. What is the purpose of your testimony in this case?**

18 A. In this instance I have been asked by the Staff of the South Dakota Public
19 Utilities Commission to review and evaluate the adequacy of the noise
20 assessment study carried out by RSG, Inc. in support of the Crocker Wind Farm
21 project, to consider any public comments on the project regarding noise, and to
22 review and comment on, as appropriate, any testimony relevant to noise issues
23 filed by or on behalf of the Applicant.

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

2 A. I have reviewed Section 9.5.4 of the Application submitted by Crocker Wind
3 Farm, LLC/Geronimo Energy, which briefly summarizes the noise study for the
4 project. In addition, I have reviewed Appendix E of the Application, which
5 contains the actual noise assessment report, “Noise Compliance Report, Crocker
6 Wind Farm”, 12/13/17, prepared by RSG, Inc. I have also read the direct
7 testimony of Eddie Duncan, the author of the noise study, which was filed on
8 12/15/17. Finally, I have read the Intervenor comments and recommendations
9 on noise issues in response to Staff Data Request 1-2.¹

10

11 **Q. Can you please summarize your overall opinion of the noise assessment**
12 **report (Appendix E of the Application) submitted on behalf of the project?**

13 A. In general, the quality of the field work and noise modeling is perfectly
14 satisfactory and consistent with good industry practice. However, the study is
15 entirely focused on simply determining whether the project will comply with
16 Section 4.21.03 of the Clark County Zoning Ordinance, which limits the sound
17 emissions from wind energy projects to no more than 50 dBA at “off-site
18 residences”, rather than assessing or addressing in any way the potential for an
19 adverse community reaction to project noise.

20

21

22

¹ See Exhibit_DK-2 for the Intervenor’s response to Staff Data Request 1-2.

1 **Q. Does the County Zoning Ordinance noise limit automatically protect the**
2 **community from harm due to noise from wind turbines?**

3 A. No. My experience testing and observing the community reaction to completed
4 wind turbine projects in rural settings like this indicates that, although very
5 commonly seen in many local noise ordinances, a limit of 50 dBA is too high to
6 ensure that a wind project will have only a minimal or acceptable impact. When
7 such a sound level actually occurs at a residence, whether participating or not,
8 there is a distinct possibility of complaints and dissatisfaction.

9
10 **Q. According to the Crocker noise study, is a sound level of 50 dBA predicted**
11 **at any residences?**

12 A. Yes, but only at one participating residence. Levels in the 46 to 49 dBA range,
13 which I would consider fairly high, are predicted at 17 other participating
14 residences.

15
16 **Q. Would you expect participants to be generally tolerant and accepting with**
17 **regard to project noise?**

18 A. For the most part, yes. In fact, I've found, in the course of doing sound
19 compliance tests at about a half dozen newly operational sites and through
20 talking with residents living within or near wind projects like this one, that the vast
21 majority of people aren't bothered at all by noise and wave it away as nothing.
22 However, when the average, long-term sound level is generally in the 46 to 50
23 dBA range, there is a danger that the noise will end up being a lot louder than

1 might have been expected. Community reaction generally depends partially on
2 the actual sound level and partially on one's expectations about the predicted
3 sound level. If people are led to believe that project noise will be insignificant or
4 practically inaudible, they tend to be upset if it turns out to be even slightly
5 audible. On the other hand, if they're realistically expecting the turbines to
6 produce a plainly audible, variable, churning, swishing sound, then they are often
7 fine with it. My concern in this case is that some of the closer participants may
8 be surprised just how loud a sound level of 46 to 50 dBA actually is because the
9 noise assessment is completely silent on the matter and essentially fosters the
10 impression that compliance with the County Zoning Ordinance is tantamount to
11 the sound level being totally acceptable.

12
13 **Q. Do you have any advice on expectations for residents where fairly high**
14 **sound levels (i.e. greater than about 45 dBA) are predicted?**

15 A. Yes. In order to better know what to expect, it would be a good idea to visit a
16 nearby existing wind project and subjectively observe the sound level at the
17 participating setback distance of 1000 feet. It is important that this should be
18 done not only on a beautiful sunny day but also in the evening and at night. If
19 there is going to be an issue with wind turbine noise, it is typically at night.

1 **Q. Since you believe a sound level of 50 dBA is too high, would you**
2 **recommend a lower noise limit for this project?**

3 A. Although I fully understand it would move the goal posts and go beyond the 50
4 dBA limit contained in both the Clark County Zoning Ordinance, I believe the
5 community would be better served and protected with a 45 dBA noise limit as a
6 definite maximum at non-participating residences and as an earnest design goal
7 at participating residences. I would add that even this noise limit would not
8 guarantee that no one would be bothered by project noise. In fact, I generally
9 recommend limiting the average sound level from a wind project to 40 dBA at
10 non-participating residences as an *ideal* design goal, because at that point the
11 sound level is so low in absolute terms that complaints or issues with noise
12 become quite rare.

13
14 **Q. Is your suggested maximum sound level of 45 dBA and ideal design goal of**
15 **40 dBA currently being met at non-participating residences?**

16 A. Yes. I was very pleased to see that the recent extension of the setbacks to non-
17 participants to 3,960 feet has for all intents and purposes brought the project
18 sound level down to 40 dBA or less at all non-participants. This represents a
19 substantial improvement relative to the sound levels predicted at non-
20 participating properties in the original application submitted in Docket EL17-028.
21 As I just mentioned, a project sound level of 40 dBA or less is generally
22 considered quite acceptable and I would anticipate few, if any, complaints from
23 non-participants.

1 **Q. Have you seen the Intervenor recommendation that project noise be**
2 **effectively limited to 50 dBA during the day and 40 dBA at night?**

3 A. Yes. This recommendation effectively implies that the project sound level should
4 not exceed 40 dBA at a given point of observation, since there is no practical way
5 of reducing the nighttime sound emissions from the turbines by 10 dBA at will,
6 short of idling nearly all of the units. While it is only very rarely achievable, a
7 level of about 40 dBA or less is currently anticipated at all non-participants due to
8 the enlarged setback distance, meaning that the project is essentially meeting
9 the recommendation. It should be noted that significantly higher levels are still
10 expected at many participating residences, as discussed above.

11
12 **Q. Have you also read the concerns about potential adverse health impacts**
13 **raised by commenters in this docket?**

14 A. Yes. Assertions were made that low frequency or infrasonic sound from wind
15 turbines causes a range of adverse health effects. This issue is discussed in
16 Appendix D of the revised noise assessment report. I have reviewed this
17 assessment, which was very well prepared and researched, and fully concur with
18 its conclusions that no adverse health impacts from low frequency noise are
19 likely to result from this project. Although severe complaints about adverse
20 health effects have certainly arisen on a small number of projects, no cause and
21 effect link has ever been discovered that could even begin to explain the
22 observed issues. I have personally measured the nighttime sound levels inside
23 the homes of individuals that were severely disturbed by the sound from nearby

1 wind turbines and found that the low frequency and infrasonic sound levels were
2 essentially the same whether the turbines were operating or turned off and
3 dramatically below the threshold of human perception. At this time, no one in the
4 wind turbine acoustics field has been able to definitively explain or identify any
5 link whatsoever to the complaints that have occurred. To my knowledge such
6 issues have occurred at only a handful of projects amidst many hundreds of wind
7 projects worldwide; consequently, I think the only reasonable conclusion that can
8 be drawn is that adverse health impacts associated with the Crocker Wind
9 project are highly improbable.

10
11 **Q. Do you have any other comments on the Applicant's noise study?**

12 A. Yes, I would add that, despite what was probably a costly undertaking, no use
13 whatsoever was made of the background sound level data collected during the
14 field survey. The fundamental purpose of such surveys is to determine what the
15 pre-existing sound levels are throughout the proposed project area so that these
16 baseline levels can be used to establish a relative increase design goal for the
17 project. A 5 dBA increase is often used as a design target because, very broadly
18 speaking, such a change in sound level is only moderately perceptible. In other
19 words, if the change in sound level is kept to a minimum then one would expect
20 little adverse reaction. Whereas if the differential between the measured
21 background level and the predicted project level at a given location is large, it
22 means that project noise will be quite prominent, if not dominant. This latter case
23 isn't a desirable situation for either the community or the project.

1 **Q. What do the survey results suggest here?**

2 A. Normally, the residual, L90 statistical sound level is used to conservatively define
3 the pre-existing background level. At monitor positions B and C, which weren't
4 utterly contaminated by local noise as at Position A, the average L90 sound
5 levels were reported in the 15 to 21 dBA range, irrespective of time of day. In
6 qualitative terms, such extremely low levels may essentially be described as total
7 silence and indicate a complete lack of any natural masking sound that might
8 partially obscure or cover up project noise. Obviously, the predicted maximum
9 sound levels in the 46 to 50 dBA range at some participating residences
10 represents a relative increase of far more than 5 dBA and suggests a situation
11 where project noise will be totally dominant. I would add, however, that the
12 reported background sound levels were measured during low wind conditions
13 (<11 mph), which are largely irrelevant to a wind project because the turbines will
14 be either idle or operating at a low output, so the comparison is not on an apples-
15 to-apples basis. Based on my experience correlating wind turbine sound levels
16 to wind speed (without any upper limit), significantly higher background levels will
17 exist during the moderate to high wind conditions necessary for the project to
18 operate at full power. Nevertheless, the survey seems to indicate that the project
19 area is extremely quiet, as I'm sure would not be surprising to the residents, so I
20 believe there is a good chance that some of the participants where levels above
21 45 dBA are expected may not find the project sound level completely acceptable.
22 The sound levels at non-participants, which are now essentially at 40 dBA or

1 less, are so quiet in absolute terms that the absence of any masking noise is
2 basically irrelevant and unimportant.

3
4 **Q. The Applicant requests that the permit allow turbines to be shifted within**
5 **1,000 feet of their current proposed location. How would any changes to**
6 **the layout, such as turbine relocations or eliminations, affect your**
7 **conclusions about the sound study?**

8 A. At this stage I find that layout changes are usually minor and, if made, don't
9 substantially alter the exposure of residents to project noise, so I would not
10 expect any last minute alterations to significantly change the nature of the project
11 or affect my current opinions about it. However, if for some reason a number of
12 significant changes are made or desired that move turbines closer to residences,
13 I would want to see a revised noise model and an accompanying write-up re-
14 evaluating the project's sound emissions, not only from a strict Ordinance
15 compliance standpoint but also in terms of the actual expected community
16 impact. If any potential future changes involve eliminating (by using fewer, more
17 powerful units) or moving turbines in an effort to lower the sound levels
18 participating residences, I would view that as a very positive development.

1 **Q. Do you believe that the Commission should require a sound test once the**
2 **project is operational to verify that it is actually producing the predicted**
3 **sound levels?**

4 A. No, I don't think such a survey is warranted as a firm prerequisite in this instance
5 because the expected sound levels at non-participating residences are far
6 enough below my suggested maximum sound limit of 45 dBA that a violation of
7 that limit is highly unlikely. Moreover, it would be technically difficult to clearly
8 measure the sound emissions exclusively associated with the project, and
9 exclusive of natural background noise, at a setback distance of 3,960 feet.
10 However, it would advisable for the Commission to reserve the right to require a
11 verification/investigative survey if serious and on-going complaints should arise
12 from any party, participating or not.

13
14 **Q. Does this conclude your testimony?**

15 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)
National Council of Acoustical Consultants (NCAC)

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.
3862 Clifton Manor Place
Haymarket, VA 20169

Years in present position: 26

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, 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 14 years have performed noise impact evaluations and siting optimization studies for roughly 70 large wind turbine projects in

the United States and Canada, involving nearly all current makes and models of wind turbines. 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. Have carried out field tests of wind turbine sound power level in strict accordance with the IEC 61400-11 test methodology. Have carried out field measurement studies of operating wind turbines to evaluate their low frequency sound emissions, nacelle noise sources and radial directivity characteristics. Have testified as an expert witness at permitting hearings for proposed wind projects. Attended six bi-annual Wind Turbine Noise conferences.

Recent 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.