

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.

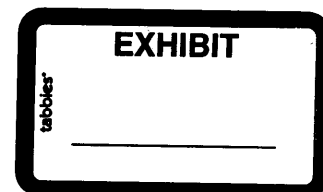
Before the Rhode Island Energy Facility Siting Board, serving as an outside expert to the Town of Burrillville, RI reviewing the noise aspects of the Clear River Energy Center permit application, Docket SB-2015-06, December 2018.

BEFORE THE NORTH DAKOTA PUBLIC SERVICE COMMISSION

DOCKET PU-18-344

**IN THE MATTER OF THE APPLICATION BY BURKE WIND, LLC FOR A PERMIT OF
A WIND ENERGY FACILITY IN BURKE COUNTY, NORTH DAKOTA, FOR THE
BURKE WIND ENERGY CENTER**

**Direct Testimony of David M Hessler
On Behalf of the Staff of the North Dakota Public Service Commission
March 6, 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 North Dakota Public Service Commission
11 (PSC) to independently review and evaluate the adequacy of the noise
12 assessment study carried out by Epsilon Associates, Inc. in support of the Burke
13 Wind Energy Center.
14

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

16 A. I have reviewed the original "Sound Level Assessment Report", dated August 31,
17 2018, prepared by Epsilon Associates, Inc. for the Burke Wind Energy Center
18 project, the amended version of that study resubmitted on November 6, 2018 and
19 an additional addendum dated February 4, 2019, revising the noise model
20 predictions for a second time.
21

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 **Q. Can you please summarize your overall opinion of the sound study and its**
2 **subsequent revisions submitted on behalf of the project?**

3 A. In general, the study is well done and I completely agree with the modeling
4 methodology and all of the assumptions that went into the sound contour
5 mapping done for all three versions of the report. However, I would fault the
6 study for focusing exclusively on regulatory compliance and for not making any
7 effort to evaluate or assess the potential noise impact of the project on the
8 community. For example, it is common, but by no means universal, industry
9 practice to perform a baseline sound survey of existing conditions within the site
10 area and then compare the expected project sound levels at residences to this
11 pre-existing sound level. The amount by which the project sound level exceeds
12 the background level generally determines the project's perceptibility and
13 potential impact and it is good practice to attempt to minimize this differential. A
14 5 dBA increase is often used as an ideal design goal because it limits the
15 prominence and audibility of the project relative to the background level. Such a
16 relative, ambient-based approach can, and often does, lead to an ideal design
17 target that is lower than the applicable absolute regulatory limit(s).

18
19 **Q. Does that mean you believe a survey should have been done?**

20 A. A survey and a subsequent impact analysis, while not absolutely essential in all
21 cases, would have demonstrated a concern for the community's welfare and
22 acceptance of the project. As it is, no thought appears to have been given to
23 residents in the area; particularly non-participants who are not receiving any kind

1 of benefit from the project. It is in everyone's best interest, including the project
2 owner/operator, to minimize the potential for noise issues.

3
4 **Q. Be that as it may, do you believe the project will at least meet all the**
5 **applicable regulatory limits?**

6 A. Yes and no. The most recent modeling in the February 2019 addendum
7 indicates that the project, with maximum predicted receptor levels of 46 to 47
8 dBA, will meet the State's 50 dBA noise limit within 100 feet of any inhabited
9 residence; however, the project's compliance with the Burke County/EPA limit of
10 Ldn 55 dBA is debatable. Let me explain. The rather esoteric day night average,
11 or Ldn, sound level is a derived quantity that logarithmically averages 24 hourly
12 sound levels with a 10 dB penalty or factor added to the nighttime levels to take
13 into account the increased sensitivity to noise at night. In fact, the quantity's
14 whole reason for being is to address this nighttime sensitivity, which is why it is
15 called the day night sound level. The general intent of the EPA's recommended
16 55 dBA Ldn sound level for residential land uses was to limit noise levels to 45
17 dBA during the nighttime hours and 55 dBA during the day. Consequently, a 55
18 dBA Ldn limit implies that the nighttime sound level should not exceed 45 dBA.
19 As it is, a few residences are predicted to experience sound levels slightly above
20 that, including two non-participants at 46 dBA.

1 **Q. But the noise study says that 55 dBA Ldn translates to a sound level of 49**
2 **dBA, so the project is compliant. Where does this 49 dBA value come**
3 **from?**

4 A. There are many ways 24 hourly sound level values can be plugged into the Ldn
5 formula and yield an answer of 55 dBA. One way is to for all the nighttime values
6 to be 45 dBA and all the daytime levels to be 55 dBA. That equals an Ldn of 55
7 dBA. Another is to input 24 equal values all at 49 dBA. That also equals an Ldn
8 of 55 dBA, *but* it subverts the intent of the limit, which was to keep sound levels
9 low at night when people are much more sensitive to noise and allow the sound
10 level to be higher during the day. Consequently, the project sound level that
11 would meet both the letter and spirit of the EPA's 55 dBA Ldn noise limit at
12 residences would be 45 dBA, if not on a continuous basis, at least at night.

13
14 **Q. According to the noise study is the project meeting a level of 45 dBA at all**
15 **residences?**

16 A. Almost. As far as I can see from Figure 2, Sheet 1 of the February addendum,
17 there are 2 non-participants (Receptors 11 and 30) and 2 participants (23 and
18 34) with predicted sound levels in excess of 45 dBA.

19
20 **Q. Would you recommend doing anything to try to remedy this situation?**

21 A. I would suggest that the Applicant use the noise model to investigate the
22 potential benefits of eliminating/vacating some of the alternate turbine sites near
23 Receptors 30 and 34 and shifting Turbine 9 to the Alt 1 site in order to reduce the

1 sound levels at Receptors 11 and 23, among other possibilities. However, it is
2 difficult to tell what the outcome of such changes would be just by looking at the
3 current sound level plot. Some iterative optimization modeling would be required
4 to properly investigate this idea, but it is conceivable that these changes could
5 bring the project sound level down to 45 dBA or less at all receptors.

6
7 **Q. Is there anything else that might be tried to lower the project sound levels**
8 **at the closest homes?**

9 A. Yes. Some of the closest units to the residences currently over 45 dBA could, in
10 theory, be operated in low noise mode (also known as noise reduced operation
11 (NRO)) at night. To my knowledge, the blade pitch in any new turbine model can
12 be programmed and controlled so that the unit produces less aerodynamic noise
13 – albeit at the expense of electrical output. A reduction of up to 5 dBA is
14 normally attainable with this approach, which should be more than enough to
15 achieve levels of 45 dBA or less at the residences that are currently over this
16 threshold.

17
18 **Q. From the project's point of view would these suggested changes have**
19 **adverse consequences?**

20 A. Yes. I suggest these actions with a full awareness that they come with a
21 significant economic downside. Operation in low noise mode is definitely linked
22 to a lower electrical output. Moreover, the possible relocation of units from sites
23 close to the homes with relatively high predicted sound levels to more remote

1 sites would almost certainly take lease money away from the landowners of the
2 original locations. I can see that as being a big issue for those affected and
3 something that would favor a more robust consideration of the low noise
4 operation option.

5
6 **Q. If the Applicant were able to get the predicted sound level down to 45 dBA**
7 **or less at all occupied residences, whether participating or not, would you**
8 **consider the project to be in compliance with both the letter and spirit of**
9 **the County's 55 dBA Ldn noise limit?**

10 A. Yes

11
12 **Q. Does this conclude your testimony?**

13 A. Yes.