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PUBLIC UTILITIES COMMISSION

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September 10, 2018

Patricia Van Gerpen
Executive Director
SD Public Utilities Commission
500 E. Capitol Ave.
Pierre, SD 57501

Ms. Van Gerpen,

Attached for filing please find the Prefiled Testimony and related exhibits and attachments of the following witnesses:

- 1) Darren Kearney
- 2) David Hessler
- 3) David Lawrence

Staff reserves the right to supplement this testimony should new or unforeseen issues arise, as well as to file rebuttal testimony in accordance with the procedural schedule. By copy of this correspondence, on today's date, the foregoing was served upon all persons identified on the Commission's service list in the above-captioned docket. Thank you for your time and attention to this matter. Should you have any questions or concerns, please do not hesitate to contact me.

Sincerely,

Kristen N. Edwards
Staff Attorney

BEFORE THE SOUTH DAKOTA PUBLIC UTILITIES COMMISSION

DOCKET EL18-026

**IN THE MATTER OF THE APPLICATION BY PREVAILING WIND PARK, LLC FOR A
PERMIT OF A WIND ENERGY FACILITY IN BON HOMME, CHARLES MIX AND
HUTCHINSON COUNTIES, SOUTH DAKOTA, FOR THE PREVAILING WIND PARK
PROJECT**

**Direct Testimony of David M Hessler
On Behalf of the Staff of the South Dakota Public Utilities Commission
September 10, 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. Most recently I have reviewed, on behalf of the
7 South Dakota Public Utilities Commission Staff, the noise aspects of the
8 applications for the Crocker and Dakota Range Wind projects in South Dakota
9 and provided written and oral testimony in those cases. In addition, I have
10 provided both written and extensive oral testimony before the Ohio Energy
11 Facility Siting Board on behalf of the Applicant in support of the Buckeye Wind
12 Farm project in Champaign County, OH. I prepared the noise impact
13 assessment study for that project and testified with regard to that study. On
14 another occasion I testified before the Wisconsin Public Service Commission on
15 behalf of Clean Wisconsin, Inc., a non-profit environmental advocacy
16 organization, with regard to the proposed Highland Wind Farm project in St.
17 Croix County, WI where I was tasked with reviewing and evaluating the validity of
18 the Applicant's noise assessment study for that project. A further listing of all
19 cases where I have testified is included in Exhibit DMH-1.

20
21 **Q. What is the purpose of your testimony in this case?**

22 A. I have been asked by the Staff of the South Dakota Public Utilities Commission
23 to review and evaluate the adequacy of the noise assessment study carried out

1 by Burns & McDonnell Engineering Company in support of the Prevailing Wind
2 Park Project, to consider any public/intervenor comments on the project
3 regarding noise, and to review and comment on, as appropriate, any testimony
4 relevant to noise issues filed by or on behalf of the Applicant.

5
6 **Q. What materials have you reviewed in this matter?**

7 A. I have reviewed Appendix M of the Application, which is the noise impact
8 assessment prepared for the Project by Burns & McDonnell Engineers ("Sound
9 Study, Prevailing Wind Park", Rev. 5, 5/30/18) and the responses to data
10 requests recently submitted to the PUC Staff by Intervenors.

11
12 **Q. Can you please summarize your overall opinion of the sound study
13 submitted on behalf of the project?**

14 A. In general, the noise modeling methodology and assumptions are satisfactory but
15 the graphical presentation is fairly primitive in the sense that the turbines, sound
16 contours and houses are not shown over a base map or aerial image, so it is
17 virtually impossible to identify specific residences. More importantly, however, I
18 would fault the study for focusing entirely on whether the Project complies with
19 the Bon Homme County noise limit of 45 dBA at occupied residences rather than
20 assessing or addressing in any way the potential for an adverse community
21 reaction to project noise or discussing other aspects of wind turbine noise, such
22 as issues potentially associated with low frequency sound emissions.

1 **Q. Does the modeling indicate that the project will meet the Bon Homme**
2 **County 45 dBA noise limit at all residences, including those in Charles Mix**
3 **and Hutchinson Counties where no noise limit is in force?**

4 A. Yes. The maximum predicted sound level at any residence is 43 dBA.
5

6 **Q. Is that sufficient to adequately protect the health, safety and welfare of the**
7 **community?**

8 A. In my experience 45 dBA is an appropriate and reasonably fair regulatory noise
9 limit for wind projects at non-participating residences generally balancing the
10 interests of the both the community and developers; however, it does not
11 guarantee that everyone will be completely satisfied with the sound emissions
12 from the turbines or rule out the small potential for adverse health effects, such
13 as sleep disturbance or vertigo. In general, in the course of testing newly
14 operational wind projects for noise compliance and talking with residents at the
15 closest and most impacted houses, I find that noise is not an issue for the vast
16 majority of residents living in or near the turbine array, but also that it is not
17 possible to please everyone. At almost every project that I'm familiar with there
18 is one person or a few people that are extremely upset with project noise, largely
19 irrespective of the specific sound level at their house. Consequently, there really
20 isn't a regulatory sound level that would satisfy everyone.
21
22

1 **Q. In your experience how does a typical community's expectations about the**
2 **noise from a wind project compare to how it is viewed once in operation?**

3 A. During the development phase there is often a lot of fear and resistance that is
4 largely attributable to highly biased, even scary, anti-wind websites. Formal
5 opposition groups are sometimes formed complete with their own websites.
6 However, once the project becomes operational it is usually realized that many of
7 the fears were unfounded and the large opposition groups evaporate leaving a
8 few people who not only remain adamantly opposed but who are legitimately
9 disturbed. Additionally, there are also sometimes people who were for the
10 project but become unexpectedly irritated by it. The bottom line is that some
11 level of discontent is practically inevitable from a typical wind project.

12
13 **Q. Could this perhaps be avoided with large setbacks of, say, several miles?**

14 A. It takes quite some distance for a typical wind turbine project to become
15 completely imperceptible under all wind and atmospheric conditions, which vary
16 with time. Based on some long-distance wind turbine complaint cases I am
17 familiar with, I would estimate that the setback necessary to result in a miniscule
18 possibility of disturbance would be on the order of 2 miles. However, the
19 immediate problem with that is such a huge setback on a project-wide basis
20 would leave few or no viable turbine sites and make it impossible to site most
21 projects - and it does not appear to be a viable or realistic option in this case
22 either. As far as I can determine with some difficulty from the very crude sound

1 contour plot¹ in the sound study, about 5 to 8 turbines would need to be
2 eliminated or relocated just to satisfy this condition at two Intervenor residences.
3 To be fair, wind turbines cannot simply be located in remote, unpopulated areas
4 because transmission lines or other infrastructure are lacking in those areas.
5

6 **Q. Have you read the response to the Staff's data request to Intervenor Karen**
7 **Jenkins, dated August 24, 2018?**

8 A. I have. In response to Staff Data Request 1-5, Ms. Jenkins expresses concerns
9 about audible noise, infrasound and negative health effects and asks for the
10 Prevailing Wind Application to be denied or, if approved, for a maximum noise
11 level of 35 dBA to be imposed.
12

13 **Q. Do you believe Ms. Jenkins' concerns about low frequency noise and**
14 **health effects are warranted?**

15 A. Yes, to a certain extent. I believe, based on some recent research², that a very
16 small minority of people are susceptible to vertigo and nausea symptoms that are
17 apparently caused by inaudible pressure pulsations at the blade passing
18 frequency of wind turbines, which is typically just below 1 Hertz. When this
19 occurs it is severely problematic and has forced people to move from, or even
20 abandon, their homes. However, my view is that this is an extremely rare

¹ No roads are shown and no addresses are given for the receptors in the tabular results, nor are the coordinates for the receptors given in a form that can be accessed through conventional mapping programs.

² Cooper, Steven E., "Subjective perception of wind turbine noise – The stereo approach", 174th meeting of the Acoustical Society of America, New Orleans, LA, December 2017.

1 phenomenon. According to the latest quarterly report³ of the American Wind
2 Energy Association there are now over 90,000 MW of installed wind power in this
3 country involving more than 50,000 wind turbines. To my knowledge, instances
4 of apparent adverse health effects from wind turbines have occurred at only a
5 small handful of sites with only a few turbines each, such as Falmouth in
6 Massachusetts (three 1.5 MW GE units) and Shirley Wind in Wisconsin (eight 2.5
7 MW Nordex units). I have been to the latter site and taken sound measurements
8 in the middle of the night inside the homes of those complaining of ill effects from
9 the project. In one instance the wife was very disturbed by the noise while the
10 husband said he's never noticed, heard or felt anything. If a large proportion of
11 the population were susceptible to this effect it would be a major issue disrupting
12 the entire industry, but the fact of the matter is that health issues from low
13 frequency noise are quite rare. There is a risk here at Prevailing Winds but the
14 evidence suggests that it is very small.

15
16 **Q. What about Ms. Jenkins' proposed conditions of 35 dBA?**

17 A. While I sympathize with everyone who is currently opposed to the project and
18 would certainly like to see sound levels of 35 dBA or less at all residences,
19 because such a level is so utterly quiet that most people wouldn't hear anything
20 at all, its implementation would most likely force the elimination of so many
21 turbines that the project would become unfeasible. As an impartial technical
22 advisor to the PUC Staff I have no interest in whether this project goes forward or

³ American Wind Energy Association, Second Quarter 2018 Market Report, AWEA Data Services, July 26, 2018.

1 not, but I believe it is incumbent upon me to fairly balance the interests of both
2 the community and the project. I am not aware of any wind project being
3 designed to such a low standard.
4

5 **Q. Have you read the response to the Staff's data request to Intervenor**
6 **Sherman Fuerniss, dated August 21, 2018?**

7 A. I have. In response to Staff Data Request 1-4, Mr. Fuerniss recommends
8 modeling the project sound levels in terms of the C-weighted sound level in order
9 to take into account the low frequency content of the project's sound emissions.
10

11 **Q. Would you agree with this recommendation?**

12 A. No. The low frequency sound emissions that appear to be associated with
13 adverse health effects are so low in frequency (less than 1 Hz) that they are
14 below the range of all weighting networks, which only go down to 10 Hz, and
15 even beyond the ability of normal instrumentation to measure. Consequently, in
16 addition to other serious technical problems, C-weighting would not capture or
17 represent in any way the frequency of concern.
18

19 **Q. Did Mr. Fuerniss have any other concerns?**

20 A. Yes. He refers to the work of Dr. Alec Salt who claims to have found a possible
21 physiological link between very low frequency sound and various adverse health
22 effects and goes on to assert, based on Dr. Salt's theories, I believe, that larger

1 wind turbines, presumably like those proposed for this project, produce more or
2 worse low frequency noise than earlier smaller models.

3
4 **Q. Would you agree with this assertion?**

5 A. No. In fact, it is remarkable how similar the sound emissions are from all the
6 various turbine models irrespective of rotor diameter. One of the worst sites for
7 low frequency noise issues was Falmouth, which used very early GE 1.5 MW
8 turbines with a rotor diameter of about 77 meters, about half the diameter of the
9 GE 3.8-137 unit proposed for Prevailing Wind. All more recent projects normally
10 involve rotors well over 100 meters in diameter with a power output of 2.5 MW or
11 more each.

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

14 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.