

BEFORE THE SOUTH DAKOTA PUBLIC UTILITIES COMMISSION

DOCKET EL19-003

**IN THE MATTER OF THE APPLICATION OF CROWNED RIDGE WIND LLC FOR A
PERMIT OF THE CROWNED RIDGE WIND FARM IN CODINGTON AND GRANT
COUNTIES, SOUTH DAKOTA**

**Direct Testimony of David M Hessler
On Behalf of the Staff of the South Dakota Public Utilities Commission
May 10, 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 EAPC Wind Energy in support of the Crowned Ridge Wind
13 Farm Project.

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

16 A. I have reviewed Section 13.3 of the permit application submitted to the Public
17 Utilities Commission on January 30, 2019 and the underlying sound study dated
18 January 22, 2019, designated as Appendix H, which was carried out by EAPC
19 Wind Energy. In addition, I have reviewed the updated sound modeling, which
20 takes into account certain changes in participation status, that was subsequently
21 submitted by EAPC on February 19, 2019. I have also reviewed the direct

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 testimony of Jay Haley, who was author of both the original and updated sound
2 studies. Lastly, I have reviewed the proposed noise conditions submitted by the
3 Intervenors.

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

7 A. In general, the quality of the work and noise modeling is perfectly satisfactory
8 and consistent with good industry practice. I agree with the modeling
9 methodology and believe that the predictions are realistic, if not somewhat
10 conservative because an explicit 2 dB uncertainty factor was added to the
11 maximum turbine sound power level. However, I would fault the study for
12 focusing exclusively on regulatory compliance and failing to evaluate or assess
13 the potential noise impact of the project on the community. For example, it is
14 common, but by no means universal, industry practice to perform one or more
15 baseline sound surveys of the existing conditions within the site area and then
16 compare the expected project sound levels at residences to this pre-existing
17 sound level under comparable wind conditions. The amount by which the project
18 sound level exceeds the background level generally determines the project's
19 perceptibility and potential impact and it is good practice to attempt to minimize
20 this differential. A 5 dBA increase above the baseline background level is often
21 used as an ideal design goal because it limits the prominence and audibility of
22 the project relative to the natural environmental sound level. Such a relative,

1 ambient-based approach can, and often does, lead to an ideal design target that
2 is lower than the applicable absolute regulatory limit(s).

3
4 **Q. Does that mean you believe a survey should have been done?**

5 A. A survey and a subsequent impact analysis, while not absolutely essential in all
6 cases, would have demonstrated a concern for the community's welfare and
7 acceptance of the project. Importantly, this approach is often combined with
8 optimization modeling where turbines are iteratively moved or eliminated early in
9 the design process when significant changes are still practical in an effort to
10 minimize the community noise impact and realize the ambient-based design
11 target, if lower than the regulatory limit. It is in everyone's best interest, including
12 the project owner/operator, to minimize the potential for noise issues irrespective
13 of any regulatory noise limits.

14
15 **Q. Be that as it may, do you believe that the project will at least meet the noise
16 limits imposed by Codington and Grant Counties?**

17 A. Yes. The modeling indicates that the Codington County noise limit of 50 dBA at
18 non-participating property lines will be met and that the Grant County noise limits
19 of 45 dBA at non-participating residences and 50 dBA at participating residences
20 will also be met, although without much margin in a number of cases.

1 **Q. Do you believe compliance with the Codington and Grant County noise**
2 **regulations, in this case, is sufficient in and of itself to ensure that project**
3 **noise will be considered acceptable to everyone?**

4 A. No. Based on my experience, any time wind turbine sound levels higher than
5 about 40 dBA are predicted at residences I would anticipate complaints - with the
6 number and severity increasing exponentially as the sound level approaches 50
7 dBA.

8
9 **Q. In Docket EL18-026, you recommended that the Commission include a**
10 **noise limit for the Prevailing Wind Park facility at what you consider an**
11 **ideal design goal of 40 dBA because there was obvious opposition to the**
12 **project *and* such a level was reasonably, and unusually, achievable with**
13 **fairly minor modifications to the project layout. Do you believe a similar**
14 **limit for non-participants near this project is warranted and achievable?**

15 A. After carefully reviewing the updated sound contour plots, I believe a strict permit
16 condition of 40 dBA at all non-participating residences would be overly onerous
17 to the project; however, it appears to me, based on my experience doing
18 optimization modeling for new wind projects, that the sound levels at many of the
19 closest non-participating residences, currently with sound levels in roughly the 42
20 to 45 dBA range, could be significantly reduced to the point of nearly achieving
21 an ideal performance of 40 dBA by relocating a relatively small number of
22 turbines. More specifically, I estimate that the sound level at all non-participants
23 could be reduced to no more than about 41 or 42 dBA if 16 of the primary units

1 were relocated to any of the 17 sites currently identified as alternate locations in
2 Figure 2, titled "Project Map and Facilities", of Appendix A of the Application. The
3 16 units that I believe are unduly and unnecessarily affecting non-participating
4 residences are circled in black in Exhibit DMH-2, which is a mark-up of the latest
5 sound contour plots.

6
7 **Q. So you're saying that all of the alternate turbine site locations are more**
8 **favorably located and further from non-participating properties than the 16**
9 **primary units that you have identified in your mark-up?**

10 A. Yes. Simply utilizing those alternate locations and eliminating the units that are
11 currently located fairly close to non-participants would substantially reduce the
12 potential noise impact from the project - presumably without affecting the total
13 power production or economics of the project.

14
15 **Q. Is there a specific permit condition on noise that you would advance for the**
16 **Commission's consideration?**

17 A. Yes. I think that at a bare minimum the sound emissions from the entire project,
18 in both counties, should be limited to the Grant County Ordinance level of no
19 more than 45 dBA at all non-participating residences. In addition, I believe that
20 the relocation of the 16 primary units indicated in Exhibit DMH-2 to 16 alternate
21 sites should be made a precondition of the permit, or the Applicant must provide
22 the Commission with a satisfactory justification as to why certain units cannot be
23 moved.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23

Q. You indicated earlier that you have reviewed the noise conditions proposed by the intervenors to the project?

A. Yes. There are four specific requests.

Q. What is the first request?

A. The first condition asks for a pre-construction sound survey to be carried out by a third party chosen by the PUC that includes an assessment of infrasound and an “analysis of non-participating properties, outside and inside the principle structure.”

Q. Do you agree with the request for a pre-construction sound survey?

A. No. I mentioned earlier that I would have had a much more favorable opinion of the Applicant’s sound study if they had carried out a survey of existing conditions and used the results to establish an ambient-based design target for the project, because such an approach would have demonstrated a desire to make project noise as unobtrusive and acceptable to the community as possible. That ship has now sailed.

Q. What about the infrasound component of the requested survey?

A. The infrasound aspect of the wind turbine noise occurs at a frequency of about 1 Hz, which cannot be measured even with most sophisticated and expensive frequency analyzers normally used for this type of work. Consequently, it is not

1 practical to test for infrasound as a part of a pre-construction ambient survey.
2 Even operational infrasound can only be detected with great difficulty using
3 exotic and highly specialized equipment.
4

5 **Q. What about the indoor/outdoor measurements that have been requested?**

6 A. Indoor measurements are never taken in the course of a pre-construction survey
7 of existing exterior environmental sound conditions, nor would they serve any
8 real purpose. This kind of testing only occurs in rare instances, such as in
9 response to a severe complaint situation at a complainant's residence.
10

11 **Q. What is the second condition proposed by the intervenors?**

12 A. That the sound emissions from the project be measured "during construction,
13 operation, maintenance, decommissioning to record the applicant is in
14 compliance."
15

16 **Q. Do you agree with this condition?**

17 A. For the most part, no. Construction noise is unavoidable, cannot be easily
18 controlled to any specific sound level at a given receptor point and is therefore
19 normally exempted from most ordinances and noise regulations. Consequently, I
20 don't believe construction noise monitoring is warranted, nor would it be practical
21 to do over a period of months. Similarly, it would be highly unusual to attempt to
22 measure the sound emissions from maintenance and decommissioning activities.
23 I do agree, however, that a sound survey of normal operational sound should be

1 carried out if noise from the project generates community complaints to
2 determine if the project is meeting its permit conditions at the complaint
3 location(s).

4
5 **Q. What is the third noise condition proposed by the project intervenors?**

6 A. In essence, the third condition would impose a noise limit of 40 dBA L10 on the
7 project and require annual indoor and outdoor testing at every non-participating
8 residence within 2 miles of the project footprint.

9
10 **Q. Do you agree with this condition?**

11 A. No. Although I would certainly like to see a sound level of no more than 40 dBA
12 at every non-participant, I think it will only be reasonably feasible in this case to
13 get close to that performance – i.e. generally in the 41 to 42 dBA range – after
14 the turbine relocations I described above. Complete compliance with a strict 40
15 dBA limit would require the elimination of a number of units, which I believe
16 would be disproportionately onerous to the project compared to an essentially
17 imperceptible decrease in sound level of 1 to 2 dBA. Moreover, I do not agree
18 with the L10 statistical measure associated with the 40 dBA limit. The L10
19 captures the near-maximum sound level occurring during a given measurement
20 interval and, in a real-world test situation, would largely quantify contaminating
21 noise events, such as leaf rustle and traffic noise rather than the underlying,
22 essentially steady-state, project sound level. If any particular statistical measure

1 must be appended to the allowable sound level, it should be the equivalent
2 average sound level, or Leq.

3

4 **Q. What about the recurring, annual nature of the testing?**

5 A. I do not agree that the project must be tested on an on-going basis. One test
6 carefully done under appropriate wind conditions is sufficient to determine if the
7 project is compliant or not.

8

9 **Q. What is the final noise condition proposed by the Intervenors?**

10 A. It is to limit the project's sound emissions to no more than 40 dBA L10 at all non-
11 participating property lines within 2 miles of the boundary footprint.

12

13 **Q. Do you agree with this condition?**

14 A. No. The point of applicability for any noise limit, whatever the actual level may
15 be, should be at residences because the most common issue with wind turbine
16 noise is sleep disturbance.

17

18 **Q. Does this conclude your testimony?**

19 A. Yes.