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

Q. Mr. Hessler, by whom are you employed and in what capacity?
A. I have been employed for over 28 years by Hessler Associates, Inc., as Vice President and a Principal Consultant. Hessler Associates, Inc. is a family run engineering consulting firm that specializes in the acoustical design and analysis of power generation and industrial facilities of all kinds, including wind energy projects.

Q. Please describe your educational background and your professional experience?
A. I received a Bachelor of Science degree in Mechanical Engineering in 1997, Summa cum Laude, from the A. James Clark School of Engineering, University of Maryland, College Park, Maryland, and a Bachelor of Arts degree, 1982, from the University of Hartford, Hartford, Connecticut. I am a registered Professional Engineer (P.E.) in the Commonwealth of Virginia and I am a member of the Institute of Noise Control Engineering (INCE). My professional specialization is the measurement, analysis, control and prediction of noise from both fossil fueled and renewable power generation facilities. I have been the principal acoustical designer and/or test engineer on hundreds of power station projects all over the
world and on roughly 70 industrial scale wind energy projects. I wrote the chapter on measuring and analyzing wind turbine noise in the book “Wind Turbine Noise”\(^1\), which was published in 2011. I also drafted a set of best practices guidelines\(^2\) for siting new wind turbine projects and testing them once completed for the National Association of Regulatory Utility Commissioners (NARUC). My resume, which contains a list of the cases where I have testified as an expert witness, is also attached for reference as Exhibit DMH-1.

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

A. I have been asked by the Staff of the South Dakota Public Utilities Commission to review and independently evaluate the adequacy of the noise assessment study carried out by EAPC Wind Energy in support of the Crowned Ridge Wind Farm Project.

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

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

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

Q. Can you please summarize your overall opinion of the noise analysis study submitted on behalf of the project?
A. In general, the quality of the work and noise modeling is perfectly satisfactory and consistent with good industry practice. I agree with the modeling methodology and believe that the predictions are realistic, if not somewhat conservative because an explicit 2 dBA uncertainty factor was added to the maximum turbine sound power level. However, I would fault the study for focusing exclusively on regulatory compliance and failing to evaluate or assess the potential noise impact of the project on the community. For example, it is common, but by no means universal, industry practice to perform one or more baseline sound surveys of the existing conditions within the site area and then compare the expected project sound levels at residences to this pre-existing sound level under comparable wind conditions. The amount by which the project sound level exceeds the background level generally determines the project’s perceptibility and potential impact and it is good practice to attempt to minimize this differential. A 5 dBA increase above the baseline background level is often used as an ideal design goal because it limits the prominence and audibility of the project relative to the natural environmental sound level. Such a relative,
ambient-based approach can, and often does, lead to an ideal design target that is lower than the applicable absolute regulatory limit(s).

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

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

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

A. Yes. The modeling indicates that the Codington County noise limit of 50 dBA at non-participating property lines will be met and that the Grant County noise limits of 45 dBA at non-participating residences and 50 dBA at participating residences will also be met, although without much margin in a number of cases.
Q. Do you believe compliance with the Codington and Grant County noise regulations, in this case, is sufficient in and of itself to ensure that project noise will be considered acceptable to everyone?

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

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

A. After carefully reviewing the updated sound contour plots, I believe a strict permit condition of 40 dBA at all non-participating residences would be overly onerous to the project; however, it appears to me, based on my experience doing optimization modeling for new wind projects, that the sound levels at many of the closest non-participating residences, currently with sound levels in roughly the 42 to 45 dBA range, could be significantly reduced to the point of nearly achieving an ideal performance of 40 dBA by relocating a relatively small number of turbines. More specifically, I estimate that the sound level at all non-participants could be reduced to no more than about 41 or 42 dBA if 16 of the primary units
were relocated to any of the 17 sites currently identified as alternate locations in
Figure 2, titled “Project Map and Facilities”, of Appendix A of the Application. The
16 units that I believe are unduly and unnecessarily affecting non-participating
residences are circled in black in Exhibit DMH-2, which is a mark-up of the latest
sound contour plots.

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

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

Q. Is there a specific permit condition on noise that you would advance for the
Commission’s consideration?

A. Yes. I think that at a bare minimum the sound emissions from the entire project,
in both counties, should be limited to the Grant County Ordinance level of no
more than 45 dBA at all non-participating residences. In addition, I believe that
the relocation of the 16 primary units indicated in Exhibit DMH-2 to 16 alternate
sites should be made a precondition of the permit, or the Applicant must provide
the Commission with a satisfactory justification as to why certain units cannot be
moved.
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
practical to test for infrasound as a part of a pre-construction ambient survey. Even operational infrasound can only be detected with great difficulty using exotic and highly specialized equipment.

Q. What about the indoor/outdoor measurements that have been requested?
A. Indoor measurements are never taken in the course of a pre-construction survey of existing exterior environmental sound conditions, nor would they serve any real purpose. This kind of testing only occurs in rare instances, such as in response to a severe complaint situation at a complainant’s residence.

Q. What is the second condition proposed by the Intervenors?
A. That the sound emissions from the project be measured “during construction, operation, maintenance, decommissioning to record the applicant is in compliance.”

Q. Do you agree with this condition?
A. For the most part, no. Construction noise is unavoidable, cannot be easily controlled to any specific sound level at a given receptor point and is therefore normally exempted from most ordinances and noise regulations. Consequently, I don’t believe construction noise monitoring is warranted, nor would it be practical to do over a period of months. Similarly, it would be highly unusual to attempt to measure the sound emissions from maintenance and decommissioning activities. I do agree, however, that a sound survey of normal operational sound should be
carried out if noise from the project generates community complaints to
determine if the project is meeting its permit conditions at the complaint
location(s).

Q. What is the third noise condition proposed by the project Intervenors?
A. In essence, the third condition would impose a noise limit of 40 dBA L10 on the
project and require annual indoor and outdoor testing at every non-participating
residence within 2 miles of the project footprint.

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

Q. What about the recurring, annual nature of the testing?
A. I do not agree that the project must be tested on an on-going basis. One test carefully done under appropriate wind conditions is sufficient to determine if the project is compliant or not.

Q. What is the final noise condition proposed by the Intervenors?
A. It is to limit the project’s sound emissions to no more than 40 dBA L10 at all non-participating property lines within 2 miles of the boundary footprint.

Q. Do you agree with this condition?
A. No. The point of applicability for any noise limit, whatever the actual level may be, should be at residences because the most common issue with wind turbine noise is sleep disturbance.

Q. Does this conclude your testimony?
A. Yes.