Ex. A24

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION BY DEUEL HARVEST WIND ENERGY LLC FOR ENERGY FACILITY PERMITS OF A WIND ENERGY FACILITY AND A 345-KV TRANSMISSION LINE IN DEUEL COUNTY, SOUTH DAKOTA FOR THE DEUEL HARVEST NORTH WIND FARM

SD PUC DOCKET EL18-053

PRE-FILED SURREBUTTAL TESTIMONY OF MIKE HANKARD
ON BEHALF OF DEUEL HARVEST WIND ENERGY LLC

April 11, 2019

I. INTRODUCTION

Q. Please state your name.

A. My name is Mike Hankard.

Q. Did you previously provide prefiled testimony in this docket?

A. Yes. I provided prefiled direct testimony with Deuel Harvest Wind Energy LLC's ("Deuel Harvest") Application on November 30, 3018, prefiled supplemental testimony on February 14, 2019, and prefiled rebuttal testimony on April 1, 2019.

II. PURPOSE OF TESTIMONY

Q. What is the purpose of your Surrebuttal Testimony?

A. The purpose of my testimony is to address the prefiled rebuttal testimony of Robert Rand, submitted on behalf of Christina Kilby. My testimony focuses primarily on topics not already covered by my prior prefiled testimony.

III. RESPONSE TO TESTIMONY OF ROBERT RAND

Q. In his testimony, Mr. Rand asserts that your sound level study "reveals professional omissions and does not assure compliance with regulatory requirements and limits" (page 1). What is your response?

A. By "omissions", I believe Mr. Rand is referring to the fact that I did not assess how the noise levels expected to be generated by the Deuel Harvest North Wind Farm ("Project") compare to guidelines and standards other than the County's 45 A-weighted decibel ("dBA") limit. If so, I completely disagree that there were any omissions. There are a multitude of noise standards and guidelines in existence, including those of the U.S. Environmental Protection Agency ("EPA"), the World Health Organization ("WHO"), American National Standards Institute ("ANSI"), International Organization for Standardization ("ISO"), and others. There are also numerous metrics, such as A-weighting, C-weighting, one-hour averages, weighted

24-hour averages, and maximum levels. If I had any reason to believe that the County's 45 dBA limit was misguided, I could understand the need to assess noise impacts differently. But that is not the case. Based on my experience working on more than 40 wind projects across the U.S., the Project is being designed to be quieter than many others. Most of the wind projects in the U.S. have, to date, been designed to maximum noise levels of 45 to 50 dBA. More importantly, I am informed by health experts that 45 dBA is a level consistent with health-based standards.

Q. In his testimony, Mr. Rand references ANSI S12.9 Parts 4&5 (*see, e.g.,* pages 2 and 10). What are those standards and are they applicable to the Project?

A. These standards define acoustical metrics and procedures for the assessment of community response to noise and land use compatibility with respect to noise. First, there is no requirement to apply these standards to the Project, nor is it common professional practice on wind projects.

Further, if ANSI S12.9 Parts 4 and 5 were to be applied, I would do so properly. First, referring to the table on page 10 of his testimony, the day-night sound level is the standard (55 dBA before adjustments). Mr. Rand inappropriately asserts that there are also corresponding limits for the daytime and nighttime. That is not the case; there are no such provisions in the standard. Second, I do not agree that one should take the full 15 dBA correction Mr. Rand shows in the tables on page 10 of his testimony (10 dB for quiet rural settings and 5 dB for unfamiliar intrusive noise). Wind turbines operate mainly when it is windy, so it is not quiet during their operations, as it would be for a traditional power plant that would operate on calm, quiet nights. Also, wind turbines may be new to this area, but they are not so unique as to warrant a full correction. Thus, a more appropriate application of the standard would be to take 10 of the 15 dBA correction. This establishes an allowable day-night ("L_{dn}") sound level of 45 dBA for "compatibility" and 50 dBA for "marginal compatibility". However, Mr. Rand fails to note that these are annual-average values. Wind turbine noise levels at residences will fluctuate greatly over the course of the year, from the "loudest-hour" value of almost 45 dBA at the closest residences to

nothing when they are off. Even when turbines are operating at full capacity, the atmosphere can greatly reduce the amount of noise that reaches residences. When all of this is taken into account, the annual average noise level is approximately 5 dBA less than the loudest-hour value. Therefore, to compare apples to apples, one must convert the Project's maximum one-hour noise level of 45 dBA at non-participating residences to an annual average one-hour value of 40 dBA. Then, one must convert this to a L_{dn}, which equals to 46.4 dBA. This is on the low end of the range that Mr. Rand's aggressive application of ANSI S12.9 Parts 4 and 5 would suggest.

Q. In his testimony, Mr. Rand asserts that your sound level study demonstrates compliance with "the Deuel County sound level limits by 0.1 dB, a design margin so small it is dwarfed by the +/- 1-dB tolerance of Type 1 sound level meters used in noise surveys" (page 2). Do you have a response?

A. It is my job to advise Deuel Harvest on the layout of the Project, such that if and when noise measurements are taken once the Project becomes operational, the measured Project-related levels are always 45 dBA or less (when measured on 10-minute or one-hour basis with all turbines operating fully). Because of the conservative nature of my calculations, and my long history of checking my calculations against actual measurements, I have complete confidence that even at those locations where the predicted noise levels are nearly 45 dBA, actual levels will be less. This includes accounting for the +/- 1 dB tolerance of Type 1 sound meters, which is minimized by keeping the equipment expertly maintained, calibrated, and operated.

Q. In his testimony, Mr. Rand criticizes your sound level study for not including a noise impact assessment and asserts that conducting such an assessment "is best practice for noise control consulting . . . and is supported by ANSI and ISO standards" (page 3; *see also* pages 11-12). Do you agree?

A. "Best practice" on wind farms in the U.S., based on my involvement on more than 40 wind farm projects, as well as my review of dozens of wind farm noise analysis

reports conducted by other respected acoustical consultants, is to ensure that the "loudest-hour" noise levels produced by the Project comply with all applicable regulatory limits. For the reasons discussed in my Rebuttal Testimony, conducting a subjective, anticipatory analysis of a community's potential response to a Project once it is operational – which may or may not be related to sound – is not "best practice" (*see* Ex. A17 at 3:67 – 4:90 (Hankard Rebuttal Testimony)).

Q. In his testimony, Mr. Rand references the ISO Technical Committee ("TC")/43 scale for community response (page 3). Please explain what this scale is and whether it is applicable to the Project?

A. The ISO TC 43 document that Mr. Rand references describes a method to predict a community's reaction to noise based on decades-old research regarding transportation noise. It discusses how noticeable a new source of noise will be relative to background noise. However, wind turbines are unique in that they only operate when it is windy, and when it is windy it is often loud at residences. In fact, noise from the wind is often equal to or greater than that of the turbines. Given this, there is often no change in the noise level due to the turbines. Further, as Health Canada and other studies have shown, noise levels are but one factor contributing to how people react to or complain about wind turbines. For these reasons, I do not believe that it is appropriate or useful to apply the ISO TC/43 scale to wind projects.

Q. Mr. Rand makes references to noise level thresholds published by the WHO (*see, e.g.*, pages 4 and 13-14). From an acoustic perspective, could you discuss the referenced noise level thresholds?

A. In 2009 the WHO issued a recommendation of 40 dBA to protect against sleep interference. It was not developed specific to wind turbines, but intended to be applied generally. The 40 dBA guideline is an annual average nighttime noise level. In other words, the average noise level measured over the nine nighttime hours over the course of one year. In 2018, WHO published a "conditional" recommendation of 45 dBA. This recommendation is specific to wind turbines. This guideline level is specified in terms of the metric called the day-evening-night level, or L_{den}. It is the

average over the course of 24 hours, with a 5 dBA “penalty” added to the evening hours and a 10 dBA “penalty” added to the nighttime hours to account for heightened noise sensitivity at those times. Furthermore, this too is an annual average.

Q. Should the WHO noise level thresholds be applied to the Project?

A. No. As discussed in the Surrebuttal Testimony of Dr. Ellenbogen (Ex. A25), since the 2018 WHO recommendation is “conditional”, it is based on low quality research and is recommended for further analysis (*see* Ex. A25 at 1:18 – 4:118 (Ellenbogen Surrebuttal)). Additionally, the 45 dBA limit being applied to the Project is, according to Doctors Ellenbogen and Roberts, protective of human health. Finally, annual average standards are technically challenging, if not impossible, to measure, given the fact that background noise will often be greater than that from the turbines.

Q. In his testimony, Mr. Rand seems to assert that your sound level study and supporting testimony fail to adhere to the Institute of Noise Control Engineering (“INCE”) Rules of Practice and Canon of Ethics (see pages 5-6). What is your response?

A. I am a proud 25-year member of INCE. I am confident that I have assisted Deuel Harvest in designing a project that will not only satisfy the requirements of the law, but one that will cause no harm to the community. Therefore, I strongly disagree with Mr. Rand’s assertion.

Q. Mr. Rand asserts that your sound level study does not account for “the 3 dBA estimated accuracy of calculation listed in ISO-9613-2” (page 7) and the failure to include the calculation is a “professional error” (page 8). Mr. Rand also discusses certain “standard uncertainties” referenced by Health Canada in 2014 for calculations using ISO 9613-2 (page 9). Do you have a response?

A. My study does account for the estimated accuracy of the ISO 9613-2 method. My own work and that of others has demonstrated that the conservative manner in which I applied the ISO 9613-2 method on this Project will ensure that actual levels

will be less than predicted levels. First, I have compared my own post-construction measurement and modeling results, and have refined my application of ISO 9613-2 to ensure that predicted levels will be equal to or greater than actual levels, resulting in my high level of confidence in the accuracy of the ISO 9613-2 method I apply. Mr. Rand may have reservations about the accuracy of ISO 9613-2, because he has not conducted the long-term, in-depth measurement validation studies that I have. In addition, my findings are consistent with two oft cited published papers that compare measurement and modeling results (*see* Evans and Cooper[1]; Hessler[2]).

Q. On pages 15-18 of his testimony, Mr. Rand references certain EPA documents. Are these EPA documents relevant to the discussion of sound for the Project?

A. No. EPA's research is decades old and based on the study of transportation noise in mainly urban and suburban environments. Far more recent and relevant research exists, primarily the Health Canada study.

Q. In "Attachment 8" of his testimony (pages 24-32), Mr. Rand asserts that the Deuel County sound level requirement of 45 dBA at non-participating residences and other specified structures should be viewed as a L_{max}. Do you agree?

A. The strict definition of the term "L_{max}" in environmental acoustics is the instantaneous (i.e. split-second) maximum noise level over a stated interval. For example, over the course of 10 minutes or one hour the L_{max} is the very highest level measured. When measuring compliance on wind turbine projects, the L_{max} is invariably the result of something non-turbine, like a wind gust, a car pass-by, or a dog barking. As described in my Rebuttal Testimony regarding application of L_{10}, this is the exact opposite metric of what should be applied. If by L_{max} Mr. Rand meant the loudest 10-

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1 Tom Evans, et al., Comparison of Predicted and Measured Wind Farm Noise Levels and Implications for Assessments of New Wind Farms, *Acoustics Australia*, 28 - Vol. 40, No. 1 (April 2012).

2 David Hessler, *Best Practice Guidelines for Assessing Sound Emissions from Proposed Wind Farms and Measuring the Performance of Completed Projects,* Section 3.0, Recommended Design Goals (2001) at 17.

minute or one-hour turbine-only level with all turbines operating and atmospheric conditions conducive to sound propagation, then I agree.

Q. In "Attachment 9" of his testimony (pages 33-35), Mr. Rand appears to assert that it would be more appropriate to use a C-weighted scale than an A-weighted scale for predicting and measuring sound produced by wind turbines. Do you agree?

A. No. It is well understood by acoustic professionals that C-weighted and A-weighted noise levels from wind turbines are well correlated. By regulating A-weighted levels, C-weighted levels are also controlled. Second, C-weighted levels are appropriate for assessing the impact of noise sources with strong low frequency content. Turbines are not such a source. Freight trains, aircraft taking off, large gas compressor stations – these are sources that can and do literally shake a house due to their strong low frequency content. Wind turbines simply do not produce these levels of low frequency noise.

Q. What is your overall response to Mr. Rand's testimony?

A. It seems that there are two fundamental questions that should be considered with respect to sound and the Project: (1) How accurate is the pre-construction sound level study I conducted in comparison to what the actual sound output will be from the Project?; and (2) Are the noise levels produced potentially injurious to the residents living nearby?

Regarding the former, I rely heavily on my first-hand experience with the comprehensive measurement of noise levels from operating wind farms. I have designed more than 40 wind farms, measured compliance at 10, and based on this experience know with an extremely high degree of scientific certainty that noise from the Project will comply with the County's 45 dBA limit at non-participating residences and other specified receptors at all times and under all conditions when measured on a 10-minute or one-hour average basis. In contrast, Mr. Rand does not rely on first-hand experience. Instead, he theorizes about margins of error and a

community's potential subjective reaction to noise, and attempts to apply myriad standards that are not applicable to wind turbines.

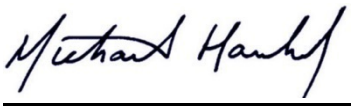
As for the impact to the health and the well-being of the community, Mr. Rand makes health impact claims contrary to doctors and the conclusions of the Health Canada study, yet he lacks the medical qualifications or evidence to do so. Since I also lack medical qualifications, I defer to the testimony and knowledge of Doctors Ellenbogen and Roberts, as well as the results of modern wind turbine-specific studies, such as Health Canada. I will only add that: (1) Deuel County's 45 dBA limit is on the low end of the range of U.S. wind farm limits that I am familiar with based on working on projects in 14 states and dozens of counties; and (2) it is often hard to discern wind turbine noise at 45 dBA in the presence of noise from the wind blowing through vegetation (trees, grass, crops), the noise level of which ranges from 35 to 55 dBA.

IV. CONCLUSION

Q. Does this conclude your Surrebuttal Testimony?

A. Yes.

Dated this 11th day of April, 2019.



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