

**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 REBUTTAL TESTIMONY OF MIKE HANKARD
ON BEHALF OF DEUEL HARVEST WIND ENERGY LLC**

April 1, 2019

1 **I. INTRODUCTION**

2

3 **Q. Please state your name.**

4 A. My name is Mike Hankard.

5

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

7 A. Yes. I provided prefiled direct testimony with Deuel Harvest Wind Energy LLC's
8 ("Deuel Harvest") Application on November 30, 2018. In addition, I provided prefiled
9 supplemental testimony on behalf of Deuel Harvest on February 14, 2019.

10

11 **II. PURPOSE OF TESTIMONY**

12

13 **Q. What is the purpose of your Rebuttal Testimony?**

14 A. The purpose of my testimony is to discuss an updated Pre-Construction Wind
15 Turbine Noise Analysis ("Updated Sound Analysis") that I conducted for the Deuel
16 Harvest North Wind Farm ("Project"). In addition, I address the prefiled testimony of
17 David Hessler, submitted on behalf of the South Dakota Public Utilities Commission
18 Staff ("Staff"), and a reference to infrasound and low frequency sound in the prefiled
19 testimony of Christina Kilby.

20

21 **Q. What exhibits are attached to your Rebuttal Testimony?**

22 A. The following exhibit is attached to my Rebuttal Testimony:

- 23 • Exhibit 1: Pre-Construction Wind Turbine Noise Analysis for the proposed
24 Deuel Harvest North Wind Farm (March 2019)

25

26 **III. UPDATED SOUND ANALYSIS**

27

28 **Q. Why was an Updated Sound Analysis conducted for the Project?**

29 A. Since the sound analysis provided as Appendix D to the Application was conducted,
30 Deuel Harvest learned of two residences being constructed within the Project
31 vicinity. As a result, Deuel Harvest removed five proposed turbine locations near

32 these residences, and added the planned residences to the list of receptors. I
33 conducted additional sound modeling with the same assumptions used in the
34 original analysis, but using the revised layout and the updated receptor list.

35

36 **Q. Could you summarize the results of your analysis?**

37 A. Yes. Noise levels are predicted to be less than 45 A-weighted decibels (“dBA”) at all
38 non-participating residences, and less than 50 dBA at all participating residences.

39

40 **IV. RESPONSE TO TESTIMONY OF DAVID HESSLER**

41

42 **Q. What is your overall response to Mr. Hessler’s testimony?**

43 A. Overall, based on Mr. Hessler’s prefiled testimony, I believe we agree on the major
44 issues. Mr. Hessler agreed with my modeling methodology and found my modeling
45 predictions to be realistic and accurate (see Hessler Prefiled Testimony at 3:7-8). In
46 addition, Mr. Hessler and I agree that the modeling indicates that the Project will
47 comply with the Deuel County Zoning Ordinance noise requirement for non-
48 participating residences (see *id.* at 4:14-16). Further, Mr. Hessler and I agree that
49 45 dBA at non-participating residences and 50 dBA at participating residences are
50 limits the Commission should apply to the Project (see *id.* at 5:10-20). I also agree
51 with Mr. Hessler that Mr. Homan’s proposal of 35 dBA at non-participating
52 residences is not a reasonable, or achievable, condition for the Project (see *id.* at
53 8:4-15). Finally, I agree with Mr. Hessler that L₁₀ should not be used as the sound
54 level metric for the Project (see *id.* at 6:15 – 8:2). Thus, in essence, Mr. Hessler and
55 I agree on the major sound-related matters before the Commission.

56

57 That said, there are a few statements made by Mr. Hessler where we disagree.
58 First, I disagree with Mr. Hessler that an ambient sound survey should have been
59 conducted, and that such a study should be used to somehow anticipate the
60 community’s potential subjective response to the sound from the Project (see
61 Hessler Prefiled Testimony at 3:9-21 and 4:1-10). Second, I do not share Mr.
62 Hessler’s concerns regarding the modeling results showing levels near the 45 dBA

63 and 50 dBA limits (see, e.g., *id.* at 5:16-18). Finally, I do not agree with Mr. Hessler
64 that it is best if no particular statistical measure is specified in the sound condition
65 (see *id.* at 7:23 – 8:2).

66

67 **Q. Could you explain further why you disagree that an ambient sound survey**
68 **should have been conducted and used to assess potential community**
69 **response to the Project?**

70 A. In this case, an ambient sound level study was not required by the applicable
71 statutes, rules, and local ordinances, nor would conducting ambient sound
72 monitoring have assisted Deuel Harvest in determining compliance with the
73 applicable operational sound requirements and commitments. For likely the same
74 reasons, ambient sound monitoring was not conducted for prior projects permitted
75 by the Commission, including the Dakota Range I and II and the Dakota Range III
76 Projects (see EL18-003 and EL18-046).

77

78 With respect to a community response assessment, such an assessment would be a
79 subjective analysis that would not assist in determining compliance with regulatory
80 standards. Numerous studies have found a person's reaction to a wind project's
81 sound is related to many non-acoustic factors, such as visual appearance, perceived
82 fairness in the permitting process, prior support or opposition to a wind project,
83 personal financial benefit from a wind project, and reported noise sensitivity of the
84 individual.¹ In addition, published community response studies, such as Mr.
85 Hessler's² own work and that of Health Canada³, show that wind turbine projects
86 designed to meet a limit of approximately 45 dBA do not result in significant numbers

¹ See, e.g., Pedersen, E. et al., Response to noise from modern wind farms in The Netherlands, *J. Acoust. Soc. Am.* 126(2) (August 2009); Michaud, D., et al., Exposure to wind turbine noise: Perceptual responses and reported health effects, *J. Acoust. Soc. Am.* 139(3) (March 2016); and Michaud, D., et al., Personal and situational variables associated with wind turbine noise annoyance, *J. Acoust. Soc. Am.* 139(3) (March 2016).

² See 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).

³ See, e.g., Exhibits A11-3, A11-4, and A11-5 to the Supplemental Testimony of Dr. Jeffrey Ellenbogen (Ex. A11).

87 of noise complaints or demonstrated health impacts. Any predictive assessment of
88 who may or may not complain would not only be subjective, but would not assist
89 Deuel Harvest in demonstrating compliance with the 45 dBA standard that local
90 elected officials determined to be protective of the community's welfare.

91

92 **Q. Please explain why you do not have concerns regarding sound levels near the**
93 **45 dBA and 50 dBA limits.**

94 First, as I testified previously, I believe the proposed sound level limits are
95 reasonable, and Mr. Hessler agreed that these sound level limits are appropriate for
96 the Project. Thus, compliance with these limits – even if the modeled level is near
97 the limit – is likewise reasonable. Second, as discussed in my direct testimony, the
98 modeling methodology I employed results in levels that are approximately 3 dBA
99 higher than those that Mr. Hessler used to determine his 40 to 45 dBA noise goal
100 recommendation. Therefore, when adjusted for this, noise levels from the Deuel
101 Harvest Project at non-participating residences are expected to be 42 dBA at most,
102 which is largely in line with the ideal noise level goal that Mr. Hessler recommends.
103 Noise levels of up to 50 dBA at participating residences are extremely common in
104 the U.S. Projects across Minnesota, Nebraska, Iowa, and Colorado have been
105 designed in this manner for years, continue to be permitted using this standard, and
106 have been operated in this manner for decades.

107

108 **Q. Why do you disagree with Mr. Hessler's statement that it is best if no**
109 **particular statistical measure is specified in the sound condition?**

110 The "maximum permissible sound level" can be interpreted different ways by
111 different groups. To be clear for all involved, it is imperative to define how noise
112 level compliance will be measured and demonstrated. Disagreements over the
113 results can cause lengthy and costly delays, repeating of measurement surveys, as
114 well as legal disagreements. In my experience, the best method to apply is that

115 prescribed by American National Standards Institute (“ANSI”) S12.9 Part 3⁴. This
116 standard describes procedures not only for the measurement of noise using the L_{eq} ,
117 but also the subsequent analysis of the data to determine the noise level of the
118 source in question (separation of the turbine noise from that of non-turbine sources,
119 such as the wind and traffic.) While I would also advocate for the use of the L_{90}
120 metric to determine turbine-only noise, I feel it is best to use the L_{eq} to be consistent
121 with ANSI S12.9 Part 3.

122

123 **V. RESPONSE TO TESTIMONY OF CHRISTINA KILBY**

124

125 **Q. Ms. Kilby makes statements regarding low frequency sound and infrasound in**
126 **her testimony. Could you explain what low frequency sound and infrasound**
127 **are?**

128 A. The noise or sound emitted by any source contains energy at different frequencies.
129 Humans can generally hear frequencies between 20 and 20,000 Hertz (“Hz”). A
130 good analogy is the piano. The right-hand keys produce sound at high frequencies
131 (the highest is 4,186 Hz). The left-hand keys produce low frequency sounds, the
132 lowest being 28 Hz. Low frequency sound is generally defined as that between 20
133 and 200 Hz, while infrasound is defined as 0 to 20 Hz. Humans are most sensitive
134 to sound at around 1,000 Hz, and least sensitive to low frequency sounds. Many
135 sources produce infrasound, such as the wind, ocean waves, airplanes, tractors, and
136 wind turbines. The levels produced by all of these sources are below the human
137 hearing threshold by orders of magnitude.

138

139 **Q. Ms. Kilby refers to a document entitled *A Cooperative Measurement Survey***
140 ***and Analysis of Low Frequency and Infrasound at the Shirley Wind Farm in***
141 ***Brown County, Wisconsin* (Kilby, Exhibit B). Have you reviewed this report?**

142 A. Yes.

143

⁴ ANSI S12.9 Part 3, Quantities and Procedures for Description and Measurement of Environmental Sound – Part 3: Short-term Measurements with an Observer Present, 2013.

144 **Q. Do you have any comments regarding the report or Ms. Kilby's references to**
145 **it?**

146 A. The passage Ms. Kilby quotes is from the summary section of one of the
147 researchers, Bruce Walker. In his summary, Mr. Walker describes the results of
148 infrasound, low frequency, and "broadband" noise measurements conducted at three
149 residences located near operating wind turbines in Wisconsin. In the paragraph
150 above the one Ms. Kilby references, Mr. Walker describes the results of the
151 measurements at the closest home (R2 in the Shirley study), and how the results at
152 this one location showed clear evidence of wind turbine noise emissions, including
153 infrasound. He also concludes that these wind turbine-produced noise levels are
154 below the normal human hearing threshold.

155
156 Then, in the paragraph Ms. Kilby references, Mr. Walker is describing the results at
157 the other two residences, which were located much further from the turbines. He
158 does say that "high" levels of infrasound were measured, but goes on to say that the
159 measured levels were not correlated to wind turbine operations. That is, the
160 measured infrasound levels were due to non-turbine sources, such as the wind
161 blowing through vegetation and against the house, passing vehicles, and a passing
162 helicopter. Thus, the high levels of infrasound referenced by Ms. Kilby were not
163 from wind turbines; rather, they were from other sources.

164

165 **VI. CONCLUSION**

166

167 **Q. Does this conclude your Rebuttal Testimony?**

168 A. Yes.

169

170 Dated this 1st day of April, 2019.

171 

172 Mike Hankard

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