

BEFORE THE PUBLIC UTILITIES COMMISSION  
OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE APPLICATION OF DAKOTA RANGE I, LLC AND DAKOTA  
RANGE II, LLC FOR AN ENERGY FACILITY PERMIT TO CONSTRUCT  
A WIND ENERGY FACILITY

SD PUC DOCKET EL-18-003

PREFILED REBUTTAL TESTIMONY OF DR. MARK ROBERTS  
ON BEHALF OF DAKOTA RANGE I, LLC AND DAKOTA RANGE II, LLC

May 21, 2018

1 **I. INTRODUCTION**

2

3 **Q. Please state your name and business address.**

4 A. My name is Dr. Mark Roberts.

5

6 **Q. Have you provided Direct Testimony in this Docket?**

7 A. Yes. I provided pre-filed testimony on April 6, 2018.

8

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

10 A. The purpose of my Rebuttal Testimony is to respond to the testimony of David  
11 Hessler submitted on behalf of South Dakota Public Utilities Commission Staff  
12 (“Staff”). In addition, I will respond to the testimony of Ms. Kristi Mogen as it relates  
13 to her concerns about the Project and epilepsy.

14

15 **Q. Are there any exhibits attached to your Rebuttal Testimony?**

16 A. No.

17

18 **Q. Do you have any updates to your Direct Testimony?**

19 A. No.

20

21 **II. RESPONSE TO TESTIMONY OF DAVID HESSLER**

22

23 **Q. With respect to low frequency sound, Mr. Hessler testifies that “Cooper’s**  
24 **experimental results now convince me that a minority of people do have a**  
25 **sensitivity to the minute pressure pulsations associated with the blade**  
26 **passing frequency, which is typically extremely low.” Are you familiar with the**  
27 **work to which Mr. Hessler is referring?**

28 A. Yes. Based on Mr. Hessler’s description, I believe that he is referring to the Cape  
29 Bridgewater Study that was performed in Australia in 2014. It was an evaluation of  
30 three households (six adults) who had previously lodged multiple complaints with the  
31 wind turbine operator relative to noise levels of the Cape Bridgewater Wind Farm.

1 The individuals had reported subjective complaints relative to the wind farm for more  
2 than six years prior to participating in the evaluation.

3  
4 **Q. As an epidemiologist, do you believe it is reasonable to reach a conclusion**  
5 **about the potential health effects of low-frequency sound based on a single**  
6 **study?**

7 A. Absolutely not, and especially not based on the Cape Bridgewater Study. The Cape  
8 Bridgewater Study has not undergone a peer-review process as would happen when  
9 a study is published in a scientific journal. In addition, the following methodology  
10 flaws make the evaluation’s “results” suspect and unreliable:

- 11 • Because Mr. Cooper evaluated individuals who have already made  
12 complaints about the wind farm, there was a selection bias in who  
13 participated in the study. With respect to selection bias, the  
14 selection of six individuals who had previously complained about  
15 wind turbine operations would have added the effects of recall bias  
16 into the study, meaning that the study individuals had already  
17 formed an opinion, which would have a direct effect on their  
18 reporting of subjective sensations. More simply, individuals who  
19 have already reported complaints are more likely to continue to do  
20 so.
- 21 • The evaluation includes no reference group (or, “control group”) to  
22 compare the results of the six individuals’ subjective reports. A  
23 reference group is the hallmark of an epidemiological study. A  
24 researcher cannot reliably evaluate a complaint about turbine  
25 operations, or any other stimuli, without having both a group that is  
26 exposed to the operations and one that is not to determine if there  
27 is a difference in effects that could be attributed to the stimuli.
- 28 • In addition, in an appropriately designed epidemiological study, the  
29 subjects would be “blinded” to the status of the turbines, meaning  
30 that they would not know whether the turbines were operational.  
31 This did not occur in the Cape Bridgewater Study.

- As pointed out by the author of the Cape Bridgewater Study, their sample was limited to six individuals who had previously complained – that is the study was assessing the subjective “sensations” reported by six individuals who feel they have been adversely affected in one way or the other as a result of the wind turbine farm. (Cape Bridgewater Study at p. 212.)
- Notably, the correlations reported by the author have not been repeated using a valid epidemiological study design.

**Q. Do you agree with Mr. Hessler that some people may be sensitive to low frequency sound?**

A. No. I am not aware of any reliable scientific research that has objectively reached such a conclusion. The work done by Mr. Cooper is not reliable and is not accepted in the medical community. Further, the term “sensitivity” as used by Mr. Cooper and Mr. Hessler is not a recognized specific health condition in the medical literature. It is neither an illness nor a disease but more likely a conditioned response. In lay terms this might be described as a state of mind. If a person does not like something, he or she is likely to have a negative response to any situation reflective of the stimulating event.

**Q. Are there recent peer-reviewed studies that have examined the potential health effects related specifically to infrasound from wind turbines?**

A. Yes. Researchers in the United States (Massachusetts) (2012) (Direct Testimony, Exhibit 7), Germany (2016),<sup>1</sup> Japan (2017),<sup>2</sup> Switzerland (2017),<sup>3</sup> and Australia (2015) (Direct Testimony, Exhibit 2b) have measured infrasound from wind turbines.

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<sup>1</sup> Ministry for the Environment, Climate and Energy of the Federal State of Baden-Wuerttemberg, Germany (2016). *Low-frequency Noise Incl. Infrasound from Wind Turbines and Other Sources*. LUBW Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Wuerttemberg.

<sup>2</sup> Hitomi Kimura, Yoshinori Momose, Hiroya Deguchi, and Nameki, Mimi (2016). *Investigation, Prediction, and Evaluation of Wind Turbine Noise in Japan*. Ministry of the Environment of Japan.

<sup>3</sup> Frits van den Berg, Public Health Service Amsterdam, and Irene van Kamp, National Institute for Public Health and the Environment (2017). *Health effects related to wind turbine sound*. Swiss Federal Office for the Environment.

1 Each study concluded that infrasound levels are multiple orders of magnitude below  
2 the threshold of human hearing. For example, the 2016 German study at page 12  
3 concluded that “[t]he infrasound levels generated by [wind turbines] lie clearly below  
4 the limits of human perception. There is no scientifically proven evidence of adverse  
5 effects in this level range.” Similarly, the Ministry of the Environment of Japan’s  
6 2016 study *Investigation, Prediction, and Evaluation of Wind Turbine Noise in Japan*  
7 states on page 5760 that, “Super-low (below 20 Hz) frequency range components of  
8 wind turbine noise are at imperceptible levels. Therefore, wind turbine noise is not  
9 an issue caused by super-low frequency range.”

10  
11 Most recently, in 2017, the French National Agency for Food Safety, Environment  
12 and Labor carried out measurement campaigns near three wind farms, concluding  
13 that, “the results of these campaigns confirm that wind turbines are sources of  
14 infrasound and low sound frequencies, but no exceedance of the audibility  
15 thresholds in the areas of infrasound and low frequencies up to 50 Hz has been  
16 found.”<sup>4</sup> A summary of this study is attached as Exhibit 3 to my Direct Testimony  
17 (the original study is in French). The summary notes that the study concluded that  
18 “all the experimental and epidemiological data available today do not show any  
19 health effects related to exposure to noise from wind turbines, other than noise-  
20 related annoyance.”

21  
22 **III. RESPONSE TO KRISTI MOGEN**

23  
24 **Q. In her testimony, Ms. Mogen expresses concern about the relationship**  
25 **between shadow flicker from the Project and epilepsy. Do you have a**  
26 **response?**

27 A. Yes. While Ms. Mogen’s concerns for her daughter are understandable, as I  
28 discussed in my Direct Testimony, the Epilepsy Foundation has not identified any

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<sup>4</sup> French Agency for Food, Environmental and Occupational Health & Safety, *Exposure to low-frequency sound and infrasounds from wind farms: improving information for local residents and monitoring noise exposure* (Mar. 30, 2017), <https://www.anses.fr/en/content/exposure-low-frequency-sound-and-infrasounds-wind-farms-improving-information-local>; see also Exhibit 3.

1 risk with proximity to wind turbines and epilepsy. As I noted, the Epilepsy  
2 Foundation has stated that light flashing frequencies greater than five (300 RPM)  
3 and 30 (1,800 RPM) are most likely to trigger epileptic seizures.<sup>5</sup> This level is well  
4 below the usual wind turbine operation blade passage frequency of 0.5 to 1 Hz (30  
5 to 60 RPM).

6

7 **IV. CONCLUSION**

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

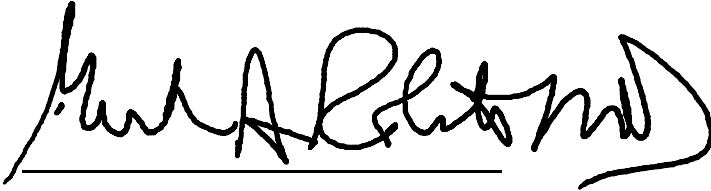
10 A. Yes.

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<sup>5</sup> <https://www.epilepsy.com/article/2014/3/shedding-light-photosensitivity-one-epilepsys-most-complex-conditions-0>.

1 Dated this 21st day of May, 2018.

2  
3 A handwritten signature in black ink, appearing to read "Mark A. Roberts", is written over a horizontal line. The signature is cursive and includes a large, sweeping flourish at the end.

4  
5 Dr. Mark Roberts

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