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October 29, 2012

Ms. Barcy F. McNeal, Secretary
Public Utilities Commission of Ohio
180 E. Broad St., 11th Floor
Columbus, OH 43215-3793

Re: Case No. 12-0160-EL-BGN
Champaign Wind LLC
Direct Testimony of David M. Hessler

Dear Ms. McNeal:

Please find attached the Direct Testimony of David M. Hessler in the above case. Champaign Wind LLC reserves the right to amend this testimony given that Mr. Hessler resides in Virginia and he is unavailable today due to the impending storm that is approaching the East Coast.

Thank you for your consideration.

Very truly yours,

Michael J. Settineri

MJS/jaw
cc: All Counsel of Record

BEFORE
THE OHIO POWER SITING BOARD

In the Matter of the Application of Champaign Wind LLC, for a Certificate to Construct a Wind-Powered Electric Generating Facility in Champaign County, Ohio	)))))	**Case No. 12-0160-EL-BGN**

DIRECT TESTIMONY OF DAVID M. HESSLER

Q.1. Please state your name and business address?

A.1. My name is David Hessler. I am a principal consultant and vice president of Hessler Associates, Inc., an acoustical engineering firm located at 3862 Clifton Manor Place, Haymarket, Virginia.

Q.2. What is your educational background?

A.2. I have a Bachelor of Arts Degree from the University of Hartford in Hartford, CT where I graduated in 1982, and a Bachelor of Science degree in Mechanical Engineering from the University of Maryland, College Park where I graduated *summa cum laude* in 1997.

Q.3. What is your professional background?

A.3. I have been employed as an acoustical engineer with Hessler Associates, Inc. for over 21 years. I am a licensed Professional Engineer and a member of the Institute of Noise Control Engineering (INCE). The firm is a member of the National Council of Acoustical Consultants (NCAC). Since its founding in 1976, the company has specialized almost exclusively in the prediction and measurement of noise from power generation facilities. Consequently, I have been the principal acoustical designer of hundreds of power stations all over the world; most commonly combustion turbine combined cycle plants along with coal, gas fired and diesel facilities. Typical projects

involve field surveys to establish baseline background sound level conditions - usually for the purpose of determining appropriate project design goals, computer modeling and the development acoustical design specifications. Follow-up surveys of completed projects are commonly carried out so the validity of the modeling and design can be verified. Over roughly the last 7 years, wind energy projects have emerged as one of the more dominant types of new power generation and throughout that period about 75% of my work load has involved performing noise assessments and operational surveys for wind farms. At this point I have worked on approximately 70 (usually large) wind projects all over North America. Based largely on my field experience measuring numerous operational projects, I have contributed to the professional literature with a number of articles and technical papers on the subject and have authored the chapter on measuring and analyzing wind turbine sound emissions in the recently published book *Wind Turbine Noise*[i]. I have attended all of the bi-annual Wind Turbine Noise conferences since the series began as a small gathering in Berlin in 2005. These important conferences bring together all of the top experts in the field, who are mostly from Europe, and essentially summarize the current state of knowledge on the subject.

Q.4. On whose behalf are you offering testimony?

A.4. I am testifying on behalf of the Applicant, Champaign Wind, LLC.

Q.5. What is the purpose of your testimony?

A.5. The purpose of my testimony is to summarize the results of the noise impact assessment I carried out with respect to the Champaign Wind (or Buckeye II) Wind Project.

Q.6. Please describe the history of your involvement with the Buckeye II Wind project and the studies that you and your firm undertook on behalf of the Applicant.

A.6. A field survey was carried out in November of 2011 to establish what the existing environmental sound levels were within the Buckeye II project area. The potential impact of any project is generally related to how much, if at all, its sound level exceeds the background level.

A pre-construction background survey for a wind project is unique in the sense that the noise source that the study is concerned with fundamentally requires moderate to strong winds in order to operate and begin to produce any sound emissions. When the winds are light at hub height the project is completely inert and silent. Consequently, the background sound levels that are of relevance to wind turbine projects are not the absolute quietest levels that occur during calm conditions but rather the sound levels that exist under the wind conditions associated with normal project operation. An apples-to-apples comparison is required. At the present time, no ANSI or ISO standard exists for this specific type of field survey for the simple reason that these test protocols were written with conventional, non-wind dependent noise sources, such as fossil fueled power stations or industrial facilities, in mind. Existing standards correctly limit measurements to low wind conditions because the operation of a "conventional" source is utterly unrelated to the wind conditions and, in fact, such sources are most apt to be prominent during calm and quiet conditions. In a wind turbine analysis, however, it is essential, almost by definition, to measure during moderately windy conditions. Therefore, standards, such as ANSI S12.9-1992/Part 2[ii], were followed to extent that they were relevant in the field survey but additional techniques and analyses, such as a correlation

between the measured sound levels and the concurrent high elevation wind speed, were required to obtain a sensible and meaningful result.

In brief, the survey measured a variety of statistical sound levels on a continuous basis day and night for 18 days at 10 positions distributed over the project area. These positions were selected to:

- be located at or near residences with the maximum proximity to proposed Buckeye II turbine locations
- cover the project area in a more or less uniform manner
- be located in open areas remote from any significant sources of man-made noise
- be located away from any reflective vertical surfaces

Over 2500 measurements were made in 10 minute increments at each position, resulting in over 25,000 measurements collected in a wide variety of wind and weather conditions. These sound measurements were then compared to the concurrent wind speed over each 10 minute period as measured by the highest anemometers, ranging from 58 m to 80 m (190 ft. to 260 ft.), on all 6 met towers then operational across the site area. Thus, the high elevation wind speeds that the turbines would see were directly related to the sound levels measured at the same time near ground level (where the local wind speed is often negligible) at typical residences and farms throughout the project area.

Q.7. Please explain why you used an evaluation threshold of 44 dBA as a relative design goal for operational noise levels at non-participating residences?

A.7. The wind speed and average (Leq) sound levels measured exclusively at night (10 p.m. to 7 a.m.) were compared to find the conditions when the project would theoretically be most audible relative to the background level. Substantially higher daytime sound levels were neglected. This critical wind analysis indicated that the nighttime

background level would be lowest relative to the project sound level at a wind speed of 6 m/s (at a standard reference elevation of 10 m). The mean nighttime Leq sound level measured under those wind conditions was 39 dBA. Moreover, a simple average of all the nighttime Leq sound levels measured throughout the survey at all positions *irrespective* of wind speed was also 39 dBA. Consequently, a 5 dBA relative increase due to the project would put the nominal noise impact threshold at 44 dBA. This design approach has been used since it is my understanding that the OPSB has approved a metric of Leq + 5 dBA for other projects in Ohio.

Q.8. Setting aside for the moment a relative increase of Leq + 5 dBA as a design basis, do you think a project design goal of 44 dBA is appropriate for a wind project in a rural area?

A.8. Yes. My experience conducting the field surveys of similar newly completed wind projects in very comparable settings indicates that the likelihood of complaints is quite small whenever the average project sound level is below 45 dBA, regardless of the actual background sound level, and we recommend a mean, long-term project sound level of 45 dBA as a regulatory limit for any new wind project in a rural environment. The relative limit of 44 dBA derived from the site-specific field survey performed for this project is consistent with, and even a slight improvement on, this recommendation.

Q.9. Has this recommendation been publicized in any way that is unrelated to a specific project?

A.9. Yes. Our suggestion of 45 dBA as a regulatory limit that fairly balances the interests of all parties first appeared in a peer-reviewed article[iii] in the January 2011 issue of the *Noise Control Engineering Journal* and was subsequently included in a set of best practices guidelines[iv] for siting new wind projects prepared under a federal grant for the

National Association of Regulatory Utility Commissioners (NARUC) on behalf of the Minnesota Public Utilities Commission.

Q.10. Please explain why you used an evaluation threshold of 50 dBA as a design goal for operational noise levels at non-participating property boundaries?

A.10. At the boundaries of the project, or, more specifically, at the property lines of adjoining non-participating land parcels, a relatively low project sound level is generally unnecessary because no one is usually permanently present at the fringe of a land parcel, particularly at night, to be potentially affected by noise. Consequently, an evaluation criterion of 50 dBA has been used as a reasonable impact threshold at property lines. In the rare instances where property line noise limits have been imposed on wind turbine developments (based on our experience with dozens of other wind projects), nothing lower than an absolute noise limit of 50 dBA has typically been used.

Q.11. What were the results of your modeling as to non-participating residences and non-participating boundaries considering only the Buckeye II project?

A.11. Initial modeling, with all of the units operating normally, showed that there were a number of non-participating residences with predicted levels slightly above the 44 dBA design goal. However, subsequent iterative modeling indicates that if certain units (16 out of the 56 total) are set up to operate in low noise mode (5 dBA lower than normal) at night, then a mean sound level of 44 dBA can be met at all non-participating residences. My understanding is that Champaign Wind intends to operate the 16 units identified as requiring low noise operating mode in the modeling study in low noise mode. Consequently, I expect that the mean project sound level will meet the design goal with respect to non-participating residences.

With this same restriction (16 of 56 units operating in low noise mode) it is anticipated that the assumed 50 dBA property line design goal will also be met in the vast

majority of cases, although in rare instances the predicted level in odd corners of various land tracts may exceed the goal by 1 or 2 dBA. Such a small overage has no tangible meaning in terms of audibility (i.e. 52 dBA sounds essentially the same as 50 dBA) and would not affect the probability of an adverse reaction due to noise.

Q.12. What were the results of your modeling as to non-participating residences and non-participating boundaries considering the cumulative impacts of both the Buckeye II and Buckeye Wind projects?

A.12. In general, the combined sound emissions from both projects would have an ostensible effect on the community that is similar to that of the Buckeye II project operating by itself in the sense that all non-participating residences remain outside of the 44 dBA sound contour (the nominal design limit) and the assumed design goal of 50 dBA is met at nearly all adjoining property lines. As with the case of the Buckeye II project operating alone, 16 of the turbines would need to be operated in low noise mode to achieve this result. In this or any scenario, low noise operation is not required from any of the Buckeye I turbines to meet the 44 dBA design goal.

Q.13. Do you believe that the Buckeye II project as designed will result in acceptable operational noise levels at non-participating properties?

A.13. Yes, for the reasons alluded to above where I describe our recommendation that a mean sound level of 45 dBA is a fair and reasonable regulatory noise limit for wind projects in rural areas. Our study of operating projects[iii] suggests that the rate of complaints for a project sound level between 40 and 45 dBA is about 2% of the total population (i.e. those within 2000 ft. of a turbine), meaning, inversely, that the apparent acceptance rate is on the order of 98%.

Q.14. Does this opinion remain the same if both the Buckeye II and Buckeye Wind projects are constructed?

A.14. Yes.

Q.15. Have you reviewed the Staff Report of Investigation issued in this proceeding?

A.15. Yes.

Q.16. On Page 59 of the Report, Staff recommends a condition (Condition 49) that in effect limits the project sound level to 44 dBA at night at non-participating receptors. Do you believe that the Applicant can comply with this condition?

A.16. Yes. As our modeling indicates, the mean project sound level is predicted to be less than 44 dBA at all non-participating residences. Consequently, when measured over a period of days or weeks, as wind project sound levels typically are during compliance tests, I would expect the mean level to agree with the predictions. It should be noted, however, that the actual project sound level will vary above and below the predicted mean due to naturally unsteady wind and weather conditions with the result that there may be intermittent short-term excursions that exceed 44 dBA by some, usually small, amount. In general, it is impractical for any wind project to maintain a sound level below a given threshold all of the time under all conditions. However, I anticipate compliance here the overwhelming majority of the time.

Q.17. Does this conclude your direct testimony?

A.17. Yes.

References

[i] Bowdler, R. & Leventhall, G. Editors, "Wind Turbine Noise", Multi-Science Press, Essex, UK, 2011, Chapter 7 *Measuring and Analyzing Wind Turbine Noise.*

[ii] *American Nation Standard Quantities and Procedures for Description and Measurement of Environmental Sound – Part 2: Measurement of Long-term, Wide-Area Sound*, ANSI S12.9-1992/Part 2 (R2008), Acoustical Society of America, New York, NY, 2008.

[iii] Hessler, D. M., Hessler, G. F., "Recommended noise level design goals and limits at residential receptors for wind turbine developments in the United States", *Noise Control Engineering Journal*, J. **59** (1), Jan-Feb 2011.

[iv] National Association of Regulatory Utility Commissioners (NARUC), *Best Practices Guidelines for Assessing Sound Emissions from Proposed Wind Farms & Measuring the Performance of Completed Projects*, Oct. 2011 (http://www.naruc.org/Grants/default.cfm?page=10).

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing document was served upon the following parties of record via e-mail on this 29th day of October, 2012.

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s/ Michael J. Settineri
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Summary: Testimony of David M. Hessler electronically filed by Mr. Michael J. Settineri on behalf of Champaign Wind LLC