BEFORE THE OHIO POWER SITING BOARD

In the Matter of the Application of Hardin Wind LLC, for a Certificate to Construct a Wind-Powered Electric Generating Facility in Hardin and Logan Counties, Ohio	)	**Case No. 13-1177-EL-BGN**
In the Matter of the Application of Hardin Wind LLC for a Certificate of Environmental Compatibility and Public Need for a Substation Project in Hardin County	)	**Case No. 13-1767-EL-BSB**
In the Matter of the Application of Hardin Wind LLC for a Certificate of Environmental Compatibility and Public Need for a 345kV Transmission Line in Hardin County	)	**Case No. 13-1768-EL-BTX**

MOTION FOR LEAVE TO FILE *INSTANTER* AMENDED TESTIMONY OF KENNETH KALISKI

Hardin Wind LLC, the Applicant, respectfully moves for leave to file *Instanter* the attached Amended Testimony of Kenneth Kaliski. Mr. Kaliski's direct testimony was filed on January 9, 2014 in this proceeding, however, in the process of finalizing his testimony, portions of Michael Speerschneider's testimony were inadvertently inserted into Mr. Kaliski's direct testimony in place of a question and answer in Mr. Kaliski's testimony. Given the inadvertent error, and the immediate filing of this motion, Hardin Wind LLC requests leave be granted and that the attached Amended Testimony of Kenneth Kaliski be accepted for filing on the docket in

this proceeding, replacing the testimony filed on January 9, 2014. A Memorandum in Support of this Motion is attached.

Respectfully submitted,

s/ Michael J. Settineri
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Attorneys for Hardin Wind LLC

MEMORANDUM IN SUPPORT OF MOTION FOR LEAVE TO FILE *INSTANTER* AMENDED TESTIMONY OF KENNETH KALISKI

Hardin Wind LLC, the Applicant, respectfully moves for leave to file *Instanter* the attached Amended Testimony of Kenneth Kaliski. In support of this Motion, Hardin Wind states as follows:

1. On January 9, 2014, Hardin Wind LLC filed the Direct Testimony of Kenneth Kaliski in this matter.

2. During the process of finalizing Mr. Kaliski's testimony, portions of Mr. Speerschneider's testimony were inadvertently included in Mr. Kaliski's testimony in place of a question and answer in Mr. Kaliski's testimony.

3. Hardin Wind now moves to file the attached Amended Direct Testimony of Kenneth Kaliski which replaces Q.9/A.9 and Q.10/A.10 that pertain to Mr. Speerschneider's testimony with the correct Q.9/A.9. No other portion of Mr. Kaliski's testimony is being amended through this filing.

4. This amendment is for the purpose of ensuring that the record is accurate; it would be preferable for Hardin Wind to be permitted to correct the error and amend Mr. Kaliski's testimony now rather than awaiting the hearing, at which Mr Kaliski would make the same correction.

5. No party will be unduly prejudiced by the granting of this Motion given the immediate correction after the day testimony was filed. Moreover, copies of this Motion and the Amended Testimony will be sent to all parties via email, including Mr. Grant who will also receive a copy via U.S. Mail.

WHEREFORE, Hardin Wind LLC respectfully requests that the Board grant its Motion for Leave to File *Instanter* the attached Amended Direct Testimony of Kenneth Kaliski.

Respectfully submitted,

s/ Michael J. Settineri
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CERTIFICATE OF SERVICE

I certify that a copy of the foregoing document was served by electronically or by U.S. Mail (as indicated) upon the following this 10th day of January 2014:

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BEFORE THE OHIO POWER SITING BOARD

In the Matter of the Application of Hardin Wind LLC, for a Certificate to Construct a Wind-Powered Electric Generating Facility in Hardin and Logan Counties, Ohio	)	**Case No. 13-1177-EL-BGN**
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In the Matter of the Application of Hardin Wind LLC for a Certificate of Environmental Compatibility and Public Need for a 345kV Transmission Line in Hardin County	)	**Case No. 13-1768-EL-BTX**

AMENDED DIRECT TESTIMONY OF KENNETH KALISKI

Q.1 Please state your name and business address?

A.1 My name is Kenneth Kaliski and I am employed at Resource Systems Group, Inc. (RSG), located at 55 Railroad Row, White River Junction, VT 05001.

Q.2 What is your educational background?

A.2 I have a Bachelor of Arts in Biology and Environmental Studies from Dartmouth College and a Bachelor of Engineering from the Thayer School of Engineering at Dartmouth College. My educational experience includes coursework in sound level monitoring, noise control engineering, active noise control, indoor and outdoor acoustical modeling, vibration control, sound level meter design, and the physics and

mathematics involving sound and its propagation. I am the co-holder of a patent for an environmental noise monitoring system.

Q.3 **What is your professional background?**

A.3 I have worked with RSG since its founding in 1986, and served on its Board of Directors for fifteen years. At RSG, I am a Senior Director, responsible for noise and acoustics.

I am a professional engineer, with licenses in Vermont, New Hampshire, Massachusetts, and Michigan. I am Board Certified through Institute of Noise Control Engineering (INCE), and within INCE, I formally served as its Vice President for Board Certification and on its Board of Directors. I am a member of the Acoustical Society of America and RSG is a member of the National Council of Acoustical Consultants. I am a Qualified Environmental Professional as certified through the Institute of Professional Environmental Practice.

I have been involved with wind projects since 1993, when RSG was asked by the Maine Land Use Regulatory Commission to review a large wind farm in the western part of that state. Subsequently, we have done analyses and reviews of many projects throughout the U.S., including Ohio, Kansas, Michigan, Arizona, Massachusetts, Pennsylvania, Illinois, and Vermont. I am the author or co-author of a dozen publications and presentations on wind turbine noise, with invitations to speak on wind turbine noise issues to the American Wind Energy Association, National Wind Coordinating Collaborative, and New England Wind Energy Education Project. I have chaired or co-chaired conference sessions on wind turbine noise, including those at Internoise 2009 in Ottawa, the Acoustical Society of America (ASA)/NoiseCon 2010

conference in Baltimore, the ASA 2011 conference in Seattle, and the INCE 2011 Portland conference. A copy of my resume is attached as Exhibit A.

Q.4 On whose behalf are you offering testimony?

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

Q.5 What is the purpose of your testimony?

A.5 The purpose of my testimony is to describe the studies my firm undertook on behalf of the Applicant, to briefly summarize the results of those studies, and to discuss operational noise and Staff's recommended conditions regarding operational sound.

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

A.6 RSG has been involved in the noise analysis of the project since 2012. In July and November of 2012, we set up sound level meters at 13 sites within the project area to record background sound levels over a two-week period. Subsequently, we modeled sound levels from construction and operation of the project wind turbines and prepared a noise impact study, attached as Exhibit P to the Application. In addition, we modeled sound levels from the substation and transmission line proposed as part of this project.

Q.7 Please explain your studies and findings regarding sound pressure levels resulting from turbine operation?

A.7 Our first step was to establish a design standard for the project. Previous projects that have gone before the OPSB, Timber Road II, Horizon, Black Fork, and Blue Creek, established a precedent standard of 5 dB over the facility-wide

background equivalent continuous sound level (Leq). To determine this background level for Scioto Ridge, sound monitoring was conducted at 13 locations within the project area. Daytime and nighttime sound levels were calculated. While there was variation hour to hour and between the monitoring locations, the overall average nighttime Leq was 42 dBA. At two sites (B and C), the data was filtered to exclude excessive bird and insect sound. The average daytime sound level was 47 dBA. Using the nighttime Leq as the basis for the standard, "Leq plus five" for the Scioto Ridge project would make the design standard a maximum of 47 dBA.

We then modeled the project using a computer implementation of the ISO 9613-2 standard. While the final turbine model has not yet been selected, we modeled the worst-case scenario of 176 Gamesa G97 wind turbines, which have a sound power of 105.8 ± 2 dBA for wind speeds of 7 m/s and greater (10-meter anemometer height).

The model results show sound levels exceeding 47 dBA at three residences.

The project was then modeled with the same worst case scenario with the exception that 120 turbines were modeled with Noise Reduced Operation (NRO) applied, with reduced sound power levels ranging from 102 to 105 dBA. As a result, all non-participating receivers were modeled at 45 dBA or below, with standard deviations ranging from 1.1 to 3.9 dB.

Q.8 Did your study on turbine operational noise address low frequency noise as well?

A.8 Yes. To address low frequency noise, we calculated sound levels at the 63 Hz octave bands where sound power data is available from the turbine manufacturer. We then compared those levels to Table 6 of the ANSI S12.2-2008

standard, which is for moderately perceptible noise-induced building vibration. We found that the Gamesa G97 turbine was 14 dB lower than the 70 dB standard at 63 Hz for the worst-case home.

Q.9 In your opinion, will the project meet the design standard adopted for the project?

A.9 Yes, according to the modeling, the highest average sound levels under maximum turbine output, 45 dBA, will be within the design standard. However, as with any project, the turbine sound levels can be slightly higher or lower than modeled. As a result, there could be a short amount of time where those sound levels may exceed the standard during certain operating and weather conditions. The design standard for the project was based on a background sound level at 42 dBA which results in a nighttime Leq plus 5 dB of 47 dBA. A project designed with the Gamesa G97 turbine, or a turbine with similar or lower sound power, should meet this standard at all non-participating residences with NRO implemented at selected turbines. Alternatively, if the project is designed with quieter turbines, then fewer turbines would likely operate in NRO.

Q.10 How have you addressed cumulative noise from the adjacent InvEnergy Hardin Wind Facility?

A.10. A separate modeling run was conducted that included the InvEnergy Hardin Wind Farm with 132 GE 1.6-100 wind turbines operating at full sound power. In this case, the worst-case receiver is 46 dB with a standard deviation of 1.8 dB. Most of the noise at this receiver is from the InvEnergy project. As a result,

mitigation here is primarily dependent on NRO implemented at the InvEnergy facility.

Q.11 If there are excessive levels of wind turbine noise after the project is in operation, what steps can be made to reduce the impact?

A.11 The most common method of noise mitigation is putting select turbines into a noise-reduced operating mode (NRO). In NRO, the turbine tips speed is reduced by controlling the turbine torque and/or changing blade pitch. The side effect of NRO is that it reduces the electric output from the turbine, which reduces the amount of renewable energy generated by the project. Automatic curtailment during specific wind or meteorological conditions can also be implemented.

Q.12. Can these methods be applied to this project?

A.12 Yes. NRO and curtailment controllers are offered by most turbine manufactures. They can be applied to individual turbines, as needed, before or after construction of the project. It is expected that once turbines are selected and a final layout is prepared, noise modeling will be redone, if the layout and turbine type are materially different than provided in the application. At that time, if necessary to meet standards, a final mitigation plan can be prepared.

Q.13 Have you reviewed the Staff Report issued in Case No. 13-1177-EL-BGN?

A.13 Yes.

Q.14 The Staff Report recommended that the certificate be conditioned upon the requirement that the Applicant adhere to the OPSB precedent goal of 47 dBA, which is nighttime LEQ plus 5 dBA, except when, during daytime operation, the Applicant can demonstrate that slightly higher noise levels do not exceed validly measured LEQ at the

receptor by more than 5 dBA. Is this consistent with the assumptions used in your report?

A.14 Yes.

Q.15. The Staff recommends at page 40 of the Staff Report in Case No. 13-1177-EL-BGN that the above standard be applied to the cumulative impact of the adjacent InvEnergy and Scioto Ridge projects. Do you foresee any issues with this recommendation?

A.15 The noise standard for the InvEnergy project, which I understand has not been constructed, is different from the proposed standard for Scioto Ridge. Therefore, the only negative issue I foresee, is if the Scioto Ridge noise standard is not met at a residence that is primarily affected by InvEnergy turbines. In this case, the residence may meet either the InvEnergy standard or the Scioto Ridge standard, but not both if the projects are operating and running at the same time. If InvEnergy is not agreeable to implement NRO to accommodate the Scioto Ridge noise standard, then that residence may not be able to meet the Scioto Ridge noise standard with just mitigation from Scioto Ridge. In the event of any noise complaint requiring mitigation at a receiver that is subject to cumulative impacts from the two projects, I would suggest that Scioto Ridge be only responsible for mitigating exceedances of its noise standard where Scioto Ridge's contribution to that receiver is 44 dBA or greater and that NRO by Scioto Ridge, alone, can mitigate noise to an acceptable level.

Q.16. The Staff recommends in Condition 13 of the Staff Report in Case No. 13-1177-EL-BGN that the Applicant establish a complaint resolution process through which complaints related to facility noise can be resolved. Do you foresee any issues with this condition?

A.16 No. I believe that a fair and efficient complaint resolution process leads to greater community acceptance of the project and provides a way to protect neighboring residences from any potential unexpected noise issues from the project.

Q.17 Please explain your studies and findings regarding sound pressure levels resulting from the proposed Scioto Ridge transmission line and the point-of-interconnect substation?

A.17 RSG studied both the alternative and preferred transmission line and interconnect substations. We performed two types of sound modeling. The first predicts the worst-case noise at a single receiver. The modeling found that under foul weather conditions (rain, fog, snow), the transmission line corona sound level immediately under the power line could reach 39 dBA, and at the nearest residence, 33 dBA. Under fair weather conditions (all other weather), this is reduced to 14 dBA under the line. The second method modeled sound over a grid of receivers covering the entire project area. These results compared well with the first method, show the maximum foul weather sound level at a residence to be 32 dBA along the preferred route and 34 dBA along the alternative route.

Q.18 In your opinion, will the project meet the design standard adopted for the transmission line and point-of-interconnect substation?

A.18 Yes. Because transmission lines and associated facilities can generate tonal sound by their nature, it is appropriate to have a more stringent noise standard than is applied to the wind turbines. RSG recommended to Hardin Wind a project design goal for the transmission line and substation of no more than 40 dBA averaged over the night and 45 dBA averaged over the day. This is based, in part, on the World

Health Organization and ANSI guidelines, discussed in the report included in the application.

Q.19 Did you make any recommendations to limit transmission line and interconnect noise?

A.19 To reduce corona noise at the interconnect substation, we recommend installing low corona components where available.

Q.20. Does this conclude your testimony?

A.20 Yes, it does.

CERTIFICATE OF SERVICE

I certify that a copy of the foregoing document was served by electronically or by U.S. Mail (as indicated) upon the following this 10th day of January 2014:

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/s/ Michael J. Settineri
Michael J. Settineri

RSG
the science of insight

KENNETH KALISKI, PE

Senior Director, Environment, Energy, and Acoustics

In over 25 years with RSG, Ken has worked in all of RSG's market areas with a focus on engineering and advanced analytics. His technical specialty is in noise control engineering, where he works on projects such as community noise monitoring and modeling, architectural acoustics, transportation noise, and industrial noise control. He also works on complex modeling projects in the fields of market and energy research. Ken is the co-holder of Patent 7,092,853 for an Environmental Noise Monitoring System.

EXPERIENCE

28 years

EDUCATION

B. E. Engineering, Dartmouth College, NH (2002)

A.B. Biological Sciences and Environmental Studies, Dartmouth College, NH (1985)

SELECTED PROJECT EXPERIENCE

Wind Farm Noise Analysis, MA – Conducted a study of the noise impacts of the Brodie Mountain Wind Project specifically with respect to a nearby condominium development. Sound levels were monitored continuously over several days and these monitored levels were then correlated against ridgeline wind speed.

Deerfield Wind Farm, VT – Prepared a noise study for Vermont's Section 248 filing on a 34 MW wind power project proposed for southern Vermont. The project included background sound monitoring, sound propagation modeling of the wind turbines and substation, and preparation of reports and exhibits. Sound modeling included analyses of 8760 hours of meteorology. A report was prepared and testimony was presented to the Section 248 Board

Noise Forecasting for a Wind Turbine Demonstration Project, VT – conducted noise measurements and modeling for a proposed 12-tower wind turbine project by the Green Mountain Power Company in Searsburg, Vermont. Used the NTerrain model to quantify the effects of atmospheric loss, vegetation, wind, and terrain features on octave-band noise levels in the area.

Black Fork Wind – Conducted a noise assessment of this 100.5 MW wind project in Richland and Crawford Counties in Ohio. Monitored background sound levels over a two-week period for eight locations over an eight-day period. Correlated wind speed measured at project met towers with background wind speeds and assessed the average background sound level over all sites for use in comparing modeled wind turbine sound levels to Ohio's relative sound standard. Presented testimony to Ohio Power Siting Board.

Kenneth.Kaliski@rsginc.com

Kingdom Community Wind – Prepared a noise assessment of a 63 MW wind project in Lowell, Vermont. The project included background sound monitoring at six locations, detailed sound modeling to assessment annualized impacts, testimony before the Public Service Board, and ongoing post-construction sound monitoring.

Spruce Mountain Wind – Conducted assessment of turbulence intensity and potential impacts to amplitude modulation during permitting. During post-construction, ongoing management of continuous 24/7/365 compliance monitoring system. Developed software for processing combining 50 ms sound monitoring data with turbine SCADA and met tower instrumentation to assess sound pressure level, amplitude modulation, and tonal sound over 10-minute compliance periods.

Kansas Wind Farm Study – Conducted sound propagation modeling for a proposed 100 MW wind farm in Kansas. Measured background sound levels at several locations around the proposed site. Calibrated the sound model using measurements at an operating wind farm in Kansas. Prepared a report comparing the impacts to a noise standard and suggested mitigation necessary to meet the standard

SELECTED PUBLICATIONS

- Kaliski, K., Wilson, D.K., Vecherin, S., Duncan, E., "Improving Predications of Wind Turbine Noise Using PE Modeling," *Proceedings of the 2011 Institute of Noise Control Engineers NOISECON 2011*
- Kaliski, K., and Duncan, E. "Calculating Annualized Sound Levels for a Wind Farm," *Acoustical Society of America, Proceedings of Meetings on Acoustics*, Vol. 9, 2010.
- Kaliski, K. and Duncan, E. "Propagation modeling Parameters for Wind Power Projects," *Sound & Vibration Magazine*, Vol. 24 no. 12, December 2008.
- Duncan, E. and Kaliski, K. "Improving Sound Propagation Modeling for Wind Turbines," *Acoustics 08*, Paris 2008.
- Kaliski, K. "Sound Advice: Evaluating Noise Impacts in a Changing Landscape," American Wind Energy Association Fall Symposium, November 2008.
- Hathaway, K, and Kaliski, K. "Assessing Wind Turbines using Relative Noise Standards," *Proceedings of the 2006 Institute of Noise Control Engineers INTERNOISE* 2006.
- Kaliski, K. H., Mills-Tettey, A., Seitaridou, E., Collier, R. "Low-Complexity Continuous Noise Monitoring System for Communities, Small Airports, and Remote Areas," *Proceedings of the 2001 Institute of Noise Control Engineers NOISECON 2001.*

LICENSES, CERTIFICATIONS, MEMBERSHIPS, AND AFFILIATIONS

- Qualified Environmental Professional, Institute of Professional Environmental Practice
- Licensed Professional Engineer (PE), States of Vermont, New Hampshire, Massachusetts, and Michigan
- Board Certified, Institute of Noise Control Engineering
- Acoustical Society of America
- Air and Waste Management Association
- Institute of Professional Environmental Practice
- Institute of Noise Control Engineering, Former Board of Directors and Vice President for Board Certification
- Tau Beta Pi Engineering Society

Summary: Motion for Leave to File Instanter Amended Testimony of Kenneth Kaliski electronically filed by Mr. Michael J. Settineri on behalf of Hardin Wind LLC