

**BEFORE
THE OHIO POWER SITING BOARD**

In the Matter of the Application of Yellow)
Wood Solar Energy, LLC for a Certificate of)
Environmental Compatibility and Public Need) Case No: 20-1680-EL-BGN
to Construct a Solar-Powered Electric)
Generation Facility in Clinton County, Ohio.)

DIRECT TESTIMONY OF

**Michael Hankard
Principal Acoustical Consultant
Hankard Environmental, Inc.**

**on behalf of
Yellow Wood Solar Energy, LLC**

September 19, 2022

/s/ Christine M.T. Pirik

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1. Please state your name, current title, and business address.

My name is Michael Hankard. I own and am currently employed by Hankard Environmental, Inc. as a principal acoustical consultant. My business address is 211 East Verona Ave., Verona, Wisconsin 53593.

2. Please summarize your educational background and professional experience.

I earned and received a Bachelor of Science degree in electrical engineering with a specialization in acoustics from the University of Maine (1990). Subsequently, I have 32 years of experience conducting acoustical measurements and impact analyses, preparing environmental compliance documents, and testifying before local boards, state commissions, and courts. I have completed more than 600 noise studies for projects in the electrical generation, transmission, mining, transportation, and music production industries. My firm has worked extensively in Ohio, conducting ambient noise measurements and impact assessments for five proposed solar facilities. I have provided testimony on the following Ohio Power Siting Board ("Board") cases: Hardin Wind (Case No. 09-479-EL-BGN), Hardin Solar (Case No. 17-773-EL-BGN), Hardin Solar II (Case No. 18-1360-EL-BGN), Hardin Solar III (Case No. 20-1678-EL-BGN), Vinton Solar (Case No. 17-774-EL-BGN), Pleasant Prairie Solar (Case No. 20-1679-EL-BGN), Fountain Point Solar (Case No. 21-1231-EL-BGN), and Cadence Solar (Case No. 20-1677-EL-BGN).

A copy of my resume is attached to my testimony as Attachment MH-1.

3. On whose behalf are you offering testimony?

I am testifying on behalf of Yellow Wood Solar Energy, LLC ("Applicant" or "Yellow Wood"), which is seeking to develop the proposed Yellow Wood Solar facility ("Project") in Clinton County, Ohio.

4. What is the purpose of your testimony?

The purpose of my testimony is to provide additional context, support, and clarification regarding the information pertaining to the sound assessment of the Project as it relates to

1 Yellow Wood's Application for a Certificate of Environmental Compatibility and Public
2 Need ("Certificate") filed with the Board in Case No. 20-1680-EL-BGN on February 24,
3 2021, as supplemented on June 17, August 19, September 3, and October 8, 2021, and as
4 further supplemented by responses to data requests that were received from the Board's
5 Staff and filed in the docket ("Application"). Specifically, I support the Pre-Construction
6 Noise Analysis contained in Exhibit K to the Application filed on February 24, 2021, as
7 well as the sound assessment filed with the Third Supplement to the Application on
8 September 3, 2021. Together, these two documents are referred to as the "Sound Analysis
9 Reports" and the analysis and results that these reports describe are referred to as the
10 "Sound Analysis."
11

12 My testimony, together with the other witnesses testifying for Yellow Wood in this case,
13 supports Joint Exhibit 1 filed in the case on August 8, 2022, which is the Joint Stipulation
14 and Recommendation filed by Yellow Wood, the Board's Staff ("Staff"), and the Ohio
15 Farm Bureau Federation ("OFBF") ("Stipulation"), and approval of Yellow Wood's
16 Application for a Certificate to construct the Project.
17

18 **5. Please describe the history of your involvement with the Yellow Wood Project?**

19 My firm began work on the Yellow Wood Project in August 2020. My staff conducted an
20 ambient noise survey at the Project site in September 2020. Under my direct oversight and
21 review, my firm conducted a noise impact analysis of the Project and published our
22 findings in the Sound Analysis Reports in 2021.
23

24 **6. Have you reviewed the Stipulation that was filed in this proceeding on August 8, 2022**
25 **and the noise-related Certificate Conditions recommended in the Stipulation?**

26 Yes, I reviewed Conditions 28 and 29.
27

28 **7. Please discuss the Board's construction and operational noise requirements that**
29 **apply to the Project.**

30 There are no quantitative construction noise sound limits applicable to the Project,
31 however, an analysis of construction noise levels and construction mitigation methods was

1 conducted as required for the Application. Condition 28 of the Stipulation places limits on
2 the time of day and week that certain construction activities can occur.

3
4 As described in Condition 29 of the Stipulation and the Sound Analysis Reports, the
5 benchmark applied to most renewable energy generation projects in Ohio is that the
6 facility's daytime and nighttime noise contribution does not result in noise levels at any
7 non-participating sensitive receptor within one mile of the project boundary that exceeds
8 the ambient daytime/nighttime Leq sound levels by more than five A-weighted decibels
9 ("dBA").

10
11 The Board requires applicants to submit certain information regarding potential noise
12 impacts of proposed solar facilities. This information includes:

- 13 • Ohio Administrative Code ("O.A.C.") Rule 4906-4-08(A)(3)(a) - An analysis of
14 construction noise levels expected at the nearest property boundary;
- 15 • O.A.C. Rule 4906-4-08(A)(3)(b) - An analysis of operational noise levels expected
16 at the nearest property boundary;
- 17 • O.A.C. Rule 4906-4-08(A)(3)(c) - The location of any noise-sensitive areas within
18 one mile of the facility;
- 19 • O.A.C. Rule 4906-4-08(A)(3)(d) - A description of the equipment and procedures
20 that will be used to mitigate the effects of noise emissions during construction and
21 operation; and
- 22 • O.A.C. Rule 4906-4-08(A)(3)(e) - Preparation of a preconstruction background
23 noise study of the project area that includes measurements taken under both day
24 and nighttime conditions.

25
26 **8. Please generally describe the work that was done to prepare the Sound Analysis.**

27 The process we followed to conduct the Sound Analysis can be summarized as follows:

- 28 • Reviewed the initial design of the facility, gathered data such as equipment noise
29 emission levels, and familiarized ourselves with the location of noise sensitive
30 "receptors," such as residences.
- 31 • Assembled a list of noise-sensitive receptors located within 0.5 miles of the facility

1 and selected representative locations where existing sound levels are to be
2 measured.

- 3 • Measured existing sound levels and made observations of the sources of sound
4 present in the Project area. Existing sound levels were measured by conducting
5 attended short-term sound level measurements, as well as by deploying four
6 monitors that measured sound levels continuously for two weeks at four
7 representative locations.
- 8 • The average daytime and nighttime sound levels were determined from the monitor
9 data and used to calculate the Project noise limits.
- 10 • Noise levels from the operation of the facility were predicted at each of the noise-
11 sensitive receptor locations and at the boundary of the facility.
- 12 • Noise impact was assessed by comparing predicted noise levels to the limits
13 determined for the Project. If necessary, noise mitigation measures were applied to
14 the design, such as shifting inverters further from receptors, until full compliance
15 was achieved as documented in the Sound Analysis.
- 16 • Construction noise was assessed by predicting noise levels at noise-sensitive
17 receptors from different phases of construction.

18
19 **9. Please summarize the findings of the Pre-Construction Noise Analysis contained in**
20 **Exhibit K to the Application filed on February 24, 2021, as well as the sound**
21 **assessment filed with the Third Supplement to the Application on September 3, 2021,**
22 **with respect to construction of the Project.**

23 Construction of the facility will require the use of typical construction equipment, such as
24 bull dozers, forklifts, dump trucks, and solar pile drivers. Noise from construction
25 activities will be controlled primarily through the time-of-day restrictions outlined in
26 Condition 28 of the Stipulation. Recommendations made in the Sound Analysis include
27 the use of ambient controlled broadband backup alarms versus tonal alarms, using well-
28 maintained equipment (particularly with respect to mufflers), and maintaining
29 communication with affected residents. Noise levels from the construction of the facility
30 were predicted at each of the 264 noise-sensitive receptors identified within one-half mile
31 of the Project and also at one worst-case location along the Project boundary. The

1 construction noise levels range from 37 to 75 dBA for most activities but are as high as 82
2 dBA (instantaneous) when pile driving is taking place in the immediate area. At the Project
3 boundary, construction noise levels are predicted to be as high as 93 dBA during solar pile
4 driving. Note that these are the levels expected when construction equipment is nearby
5 and fully operational.

6
7 **10. Please summarize the findings of the Pre-Construction Noise Analysis contained in**
8 **Exhibit K to the Application filed on February 24, 2021, as well as the sound**
9 **assessment filed with the Third Supplement to the Application on September 3, 2021,**
10 **with respect to operation of the Project.**

11 The primary noise sources associated with the operation of the Project include 81 pad-
12 mounted inverters located throughout the Project area and the two 178 megavolt-amperes
13 (“MVA”) step-up transformers located at the substation. The Sound Analysis assumed that
14 all of the equipment would operate simultaneously at full acoustic output during the
15 daytime, but only the substation step-up transformers would operate at night. The range
16 of predicted daytime noise levels, including participating and non-participating residences,
17 is 22 to 44 dBA, with 97% of the residences having levels of 40 dBA or less. All of the
18 levels are less than the daytime limit of 47 dBA. The predicted nighttime noise levels at
19 non-participating residences are 35 dBA or less, all of which are below the limit of 38 dBA
20 established for the Project. Along the Project boundary, the predicted worst-case
21 operational noise levels could exceed 47 dBA, but only in areas adjacent to agricultural or
22 undeveloped land uses which are not considered noise-sensitive.

23
24 **11. Please generally summarize the requirements in Certificate Condition 29 of the**
25 **Stipulation.**

26 The Sound Analysis Reports described daytime and nighttime noise limits for the facility
27 that were calculated based on the measured existing sound levels. The basis for the limits
28 was the average of the sound levels measured by the four monitors deployed around the
29 Project area. Condition 29 of the Stipulation requires that the limits at any one receptor
30 location shall be based on the average daytime and nighttime noise levels from the nearest
31 single noise monitor, versus the average of the levels from all four monitors. As stated in

1 Condition 29, the “Applicant shall operate a facility that limits sound levels emitted to non-
2 participating receptors to no higher than the closest Long-Term Monitoring Station’s area
3 ambient Leq level plus five decibels (“dBA”) as referenced in Application Exhibit K Table
4 4-3. If the facility is found to be above these limits, the Applicant shall install additional
5 noise mitigation measures to maintain compliance with this provision.”
6

7 Condition 29 also requires the Applicant to select equipment for the Project that has noise
8 emission factors equal to or less than those assumed in the Sound Analysis. If equipment
9 has higher emission levels, the design of the Project shall be modified and compliance with
10 the noise limits demonstrated.
11

12 **12. Based upon the findings in the Sound Analysis, is it possible for the Board to**
13 **determine the nature of the probable environmental sound impact of the facility?**

14 Yes.
15

16 **13. Based upon the findings in the Sounds Analysis, together with Yellow Wood’s**
17 **commitments in the Application, along with the conditions in the Stipulation, does the**
18 **facility represent the minimum adverse environmental sound impact considering the**
19 **state of available technology and the nature and economics of the various alternatives,**
20 **and other pertinent considerations?**

21 Yes.
22

23 **14. Are your opinions and conclusions in your testimony made with a reasonable degree**
24 **of scientific certainty?**

25 Yes.
26

27 **15. Does this conclude your testimony?**

28 Yes. However, I reserve the right to update my testimony to respond to any further
29 testimony, reports, and/or evidence submitted in this case.

CERTIFICATE OF SERVICE

The Ohio Power Siting Board's e-filing system will electronically serve notice of the filing of this document on the parties referenced in the service list of the docket card who have electronically subscribed to these cases. In addition, the undersigned certifies that a copy of the foregoing document is also being served upon the persons below this 19th day of September, 2022.

/s/ Christine M.T. Pirik

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Attachment MH – 1
Michael Hankard
Resume

Professional Qualifications

Michael Hankard



Education:

B.S. Electrical Engineering
Acoustics Specialization
University of Maine, 1990

Professional Affiliations:

Institute of Noise Control Engineering
Acoustical Society of America

Agency Experience:

Public Service/Utility Commissions
(NY, WI, MN, WV, SD, OH, RI)
World Bank
Federal Highway Administration
Dozens of cities/counties in 20 states

Summary:

Mr. Hankard has been practicing in the fields of acoustics and noise control engineering for the past 32 years. In 1996 he started Hankard Environmental. The firm consults in environmental noise and has successfully completed over 600 projects relating to wind energy, solar facilities, transmissions lines and facilities, gas-fired power generation facilities, oil and gas extraction operations, mines, lawsuits, and land development projects.

Mr. Hankard has experience in all aspects of environmental noise, including field measurements, predictions, impact assessments, mitigation design, and expert testimony at local and state proceedings. He has conducted ambient and compliance noise surveys lasting from days to years, used a variety of models to predict noise from wind turbines, roadways, and industrial facilities, and designed a wide variety of mitigation measures such as walls, enclosures, baffles, and silencers.

Vibration experience includes the measurement and prediction of ground-borne and structure-borne levels from sources such as railroads and blasting; and the assessment of impact according to internationally-accepted standards.

Noise Level Compliance Measurements

Mr. Hankard has conducted dozens of extensive environmental noise measurement studies for projects involving transmission line construction and operation, electrical substations, utility-scale wind turbines, photovoltaic solar plants, and fossil-fuel fired power plants. Over the past 32 years he has conducted compliance surveys at some of the largest wind, solar, and gas-fired power plants. These surveys include near-field measurements of noise from individual pieces of equipment, attended property line measurements, and the collection and analysis of long-term monitoring. Mr. Hankard is versed in the various standards that are applicable to these measurements, including ANSI S12.9, ANSI S12.18, and ISO 1996-2.

Ambient Noise Measurements

Mr. Hankard has conducted more than 100 ambient sound surveys for the power generation, land development, mining, and other industries. His experience includes the design, execution, data analysis, and reporting of these studies. A successful study begins with a careful consideration of the project environs, the relative location of sources and residences, applicable regulations, and potential seasonal fluctuations. The selection of the measurement locations is paramount as is the need to possibly measure for weeks to months to ensure collection of sufficient data.

Modeling

Mr. Hankard has modeled (predicted) noise from hundreds of industrial sources, including HVDC stations, wind, solar, and gas-fired power plants, transmission lines, substations, construction operations, roadways, and commercial developments. Mr. Hankard has experience with different modeling methods, including ISO 9613-2:1996, Nord2000, and CONCAWE, the different settings to be used within these methods (ground type, propagation rate, directivity, low frequency considerations), and the determination of emission factors based on measurements or estimates. Most importantly, Mr. Hankard has the experience to know how to relate modeling results to each project, putting the numerical results into perspective for the benefit of the audience of the study at hand.

Expert Testimony

Mr. Hankard has represented clients at public service commission hearings as an expert on noise in New York, Wisconsin, Minnesota, West Virginia, South Dakota, and Rhode Island. He has also provided testimony in legal proceedings, including municipal courts, local and county hearings, and federal courts. In addition, he has presented noise-related information at dozens of local and county hearings and meetings, and before the general public at project information sessions.

Representative Projects

Mr. Hankard was lead consultant for the acoustical aspects of the following projects:
Southern Oak Solar Facility, Georgia: Noise emission measurements (2019)
Phish: Outdoor concert noise monitoring (2017-2019)
Freeborn Wind, MN: Ambient survey, modeling, testimony (2017-present)
Badger Hollow Solar, WI: Ambient survey, modeling, testimony (2019)
Akyem Gold Mine, Ghana: Ambient measurements and impact analysis (2010)
Lackawanna Energy Center, PA: Design and compliance measurements (2019)
Lake Winds Energy Park, MI: Compliance measurements (2016-2017)
Prairie Breeze Wind Energy Center, NE: Compliance measurements (2016)
California Ridge Wind Energy Center, IL: IPCB Compliance measurements (2013)
Willow Creek Energy Center, OR: Long-term compliance monitoring (2009-2016)
Highland Wind, WI: Ambient survey, Public Service Commission testimony (2013)
Shirley Wind, WI: Ambient survey and compliance testing (2010-2012)

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Case No(s). 20-1680-EL-BGN

Summary: Testimony - Direct Testimony of Michael Hankard electronically filed by
Christine M.T. Pirik on behalf of Yellow Wood Solar Energy, LLC