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February 24, 2022

Ms. Tanowa M. Troupe, Secretary
Public Utilities Commission of Ohio
180 East Broad Street, 11th Floor
Columbus, OH 43215

Re: Kingwood Solar I LLC
Case No. Case No. 21-0117-EL-BGN
Testimony of Alex Odom

Dear Ms. Troupe:

Pursuant to the motion filed today in the above referenced case, Kingwood Solar I LLC is filing the full testimony of Alex Odom. No questions or answers have been changed in the testimony as compared to the version filed on February 23, 2022. The only change is the addition of the missing attachments already referenced in the testimony.

Thank you for your attention to this matter. If you have any questions, please call me at the above direct dial number.

Very truly yours,

/s/ Anna Sanyal

Anna Sanyal
Attorney for Kingwood Solar I LLC

AS/jaw

2/24/2022 41490013

BEFORE
THE OHIO POWER SITING BOARD

In the Matter of the Application of Kingwood Solar I LLC for a Certificate of Environmental Compatibility and Public Need	**)** **)** **)** **)**	**Case No. 21-117-EL-BGN**

DIRECT TESTIMONY OF ALEX ODOM

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

A.1. My name is Alex Odom. The address of my company's headquarters is 33 Moulton Street, Cambridge, MA 02138.

Q.2. Mr. Odom, by whom are you employed and in what capacity?

A.2. I have been employed for over four years by Acentech, as a Consultant in their Noise and Vibration Group. Acentech is a consulting firm that provides acoustics, audiovisual, information technology, security, and vibration consulting to clients across the globe. More specifically, it specializes in the acoustical design and analysis of a wide variety of spaces and facilities of all kinds, including solar energy projects. I acted as the project manager for the Kingwood Solar Project Noise Assessment.

Q.3. What is your educational and professional background?

A.3. I received my Bachelor of Mechanical Engineering from the University of Minnesota Twin Cities in 2016. I am scheduled to complete my graduate studies with a Master of Engineering in Acoustics at Penn State in May 2022. My professional background includes experience as an environmental consultant at Trinity Consultants, where I conducted environmental noise and air quality studies. My work at Acentech includes en vironmental noise measurement and modeling, mechanical systems noise

control, construction noise monitoring, and structural vibration analysis. I work on commercial, industrial, residential, higher education, transportation, and energy projects. My work in the energy sector includes solar, wind, battery storage, and traditional energy sources (i.e., gas). My resume is also attached for reference as Exhibit A.

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

A.4. I am testifying on behalf of the Applicant, Kingwood Solar I LLC, in support of its application filed in Case No. 21-117-EL-BGN.

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

A.5. The purpose of my testimony is to describe the noise assessment study included in the application as Exhibit K, the Applicant response to Staff data request dated June 1, 2021, to summarize the results of the noise assessment study, and describe the construction and operational noise from the project. I will also address certain conditions in the October 29, 2021 Staff Report of Investigation and provide recommendations for revisions.

Q.6. Please describe the noise assessment study included in the Application.

A.6. Acentech carried out a noise assessment for the Kingwood Solar Project ("Project") to assess the Project's sound emissions to the surrounding community. While the Ohio Power Siting Board does not have standards for operational noise for solar projects, it does utilize a standard of 5 dB over the average ambient Leq for wind powered electric generation projects. For this project, we used a similar procedure; that is, the design threshold is the measured ambient sound level plus 5 dB for daytime and nighttime periods. The study included both a field survey to measure the existing ambient sound levels, and acoustic modeling to predict the operational sound produced by the Project and the relative

increase over the ambient conditions. Additional calculations of construction noise estimates were completed.

Q.7. Please describe the ambient noise survey conducted for the Project.

A.7. The ambient noise survey was conducted with sound monitoring equipment placed at three different locations within the Project area to capture sound levels representative of the general area and allow for a valid comparison to the predicted sound levels from the Project's noise-producing equipment. The ambient sound level was measured continuously from January 21 to January 29, 2021, and data including Leq and other statistics (e.g., L90) were collected in 1-hour increments. The ambient noise survey took place before air travel was permitted for employees of Acentech during the Covid-19 pandemic. As such, I coordinated with a local representative of Haley & Aldrich to set up the noise monitoring systems. In addition to a detailed written instruction guide which was provided to the local representative, I coordinated the set up virtually with a video conference call in the field. The equipment was set up in our office, and shipped to the field representative. The field representative then field-calibrated the equipment with our guidance at the Project site to verify the proper operating condition of the equipment. The equipment was installed at the three sites and then locked to prevent tampering for the duration of the measurement.

Q.8. How were the three monitoring locations selected?

A.8. I selected the measurement locations in order to capture a variety of locations around the large Project area that may be expected to have different ambient sound conditions. The monitoring locations are shown in Figure 1 of Exhibit K of the Application and each monitoring location is representative of residences located in that particular area.

Location 1, located near homes in the northeast portion of the Project area, was selected due to its proximity to Clifton, Ohio, as well as the proposed location for the Project Substation. Location 2, located near homes in the southeast portion of the Project area, is located far from Clifton, OH and Cedarville, OH, to represent a more rural condition in the Project area. Location 3 was selected to represent homes in the western portion of the project.

Q.9. Do you believe the three monitoring locations are representative of the Project area?

A.9. Yes, the three monitoring locations are representative of residences located throughout the Project Area. Also, as I note above, the three monitoring locations represent a diversity of geographic areas and acoustic conditions within the Project area.

Q.10 What did the survey results indicate with respect to the sound levels that currently exist in the Project area?

A.10. The measured average ambient nighttime Leq at Locations 1, 2, and 3 were 46 dBA, 42 dBA, and 37 dBA, respectively. The measured average ambient daytime Leq at Locations 1, 2, and 3 were 51 dBA, 49 dBA, and 42 dBA, respectively. The measured average ambient nighttime L90 at Locations 1, 2, and 3 were 31 dBA, 28 dBA, and 29 dBA, respectively. The measured average ambient daytime L90 at Locations 1, 2, and 3 were 36 dBA, 33 dBA, and 33 dBA, respectively. Additional detail is provided in the Applicant's response to data requests from the Staff, dated June 1, 2021 and filed on the case docket on June 3, 2021. These results are consistent with sound levels in rural environments.

Q.11. Can you describe your analysis of the operational noise of the Project?

A.11. The acoustic model was developed using Cadna/A, a widely-accepted software

package, to estimate the contributions of various noise sources to the community sound levels. Cadna/A complies with international standard ISO 9613-2 "Attenuation of sound during propagation outdoors -- Part 2: General method of calculation." The noise producing equipment at the Project used for our modeling included inverters (qty. 52), distribution transformers (qty. 52), a substation transformer (qty. 1), and tracker motors (qty. 127). The sound power level for the equipment was based on representative Project equipment selections, as noted in the Applicant's response to data requests from the Staff, dated June 1, 2021 and filed on the case docket on June 3, 2021. Specifically, the following equipment models were used for the noise assessment:

- Distribution transformer and inverter: Sungrow SG3425/3600UD-MV
- Substation Transformer: Prolec GE
- Tracker Motor: Array Technologies HZ v3

The daytime noise modeling assumed that all tracker motors would continuously operate, when, in reality, they operate intermittently and asynchronously.

We calculated noise levels at 50 non-participating residences in the surrounding neighborhood within 250 feet of the Project. For each non-participating residence, we assigned it a representative ambient noise level based on the nearest monitoring location. We determined that the Project sound sources will not increase daytime sound levels at non-participating residences by more than 2 dB above ambient. The existing ambient level assigned to each non-participating residence and the increase to the ambient level as a result of the Project's operation is identified in Tables 4 and 5 to Exhibit K.

At night it is expected that the inverters and tracker motors will be inactive, however the transformers will likely be energized and producing sound. However, I further understand

that the Project maintains the ability to operate at up to 60 percent capacity at night to provide reactive power to the grid. The Project has the flexibility to achieve this by all inverters operating at 60% capacity or 60% of all inverters operating at 100% capacity. While this reduction in capacity will reduce the sound output, we lacked the sound data to characterize equipment sound levels at 60% capacity, so we assumed the nighttime sound characteristics of the inverters would remain unchanged from daytime performance and that all inverters would operate at night under these conditions. Based on our model, we determined that the Project sound sources will not increase nighttime sound levels at non-participating residences by more than 4 dB above ambient. However, these modeled increases assume all inverters are operating at night, at full capacity, which I understand is an atypical operation status for the inverters that does not take into account the 60% reduction described above.

Q.12. Can noise from inverters be mitigated?

A.12. Yes. Noise from an inverter can be mitigated with a noise barrier wall, an acoustic enclosure, or third party noise control, such as additional noise mitigation elements including, but not limited to, air inlet and exhaust acoustic louvers or sound attenuators.

Q.13. Are there any other potential sources of noise associated with the Project?

A.13. In addition to operational sound, a certain amount of unavoidable noise will be generated during the Project's construction. Activities such as driving in the panel rack supports could result in some temporary elevated levels of sound. Construction noise is typically mitigated through operational constraints, such as limiting the time of day for which specific construction activities are allowed. The Project application describes the construction operational constraints the Project has committed to, which limits

construction activities to between 7:00 a.m. and 7:00 p.m., or until dusk when sunset occurs after 7:00 p.m., and limits impact pile driving, hoe ram, and similar activities to between 10:00 a.m. and 5:00 p.m.

Q.14. Have you reviewed the Staff Report of Investigation issued on October 29, 2021, including the condition on pile driving?

A.14. Yes. I have reviewed the Staff Report.

Q.15. Can you describe Condition 29 of the Staff Report?

A.15. Yes. Condition 29 addresses general construction activities, including pile driving. Condition 29, as recommended by Staff, requires the Applicant to limited construction activities to the hours of 7:00 a.m. to 7:00 p.m., or until dusk when sunset occurs after 7:00 p.m. The condition also requires the Applicant to install a sound monitor at a representative location if pile driving is required between 7:00 a.m. and 9:00 a.m. and after 6:00 p.m. or until dusk (when sunset occurs after 6:00 p.m.) to catalog that the noise impact at non-participating receptors is not greater than the daytime ambient Leq plus 10 dBA. Staff also recommended that hoe ram operations be further restricted, between 10:00 a.m. and 4:00 p.m., Monday through Friday. Of note, the Applicant's commitment to limit pile driving between the hours of 10:00 a.m. – 5:00 p.m. in the Application is more stringent than Staff's recommended condition. Overall, coupled with the Applicant's commitments in the Application, this condition will provide more protections with regard to mitigation of construction noise from the Project.

Q.16. Have you reviewed the Staff Report's condition on sound modeling?

A.16. Yes, I have reviewed the Staff Report's Condition 30, which addresses pre-construction sound modeling. Condition 30 as recommended by Staff requires the

Applicant to conduct additional sound modeling if the sound power output for the transformer and inverters selected for the project are higher than the sound power levels used in our sound modeling. If sound power levels are not available, Staff recommends that an operational noise test be done at a distance equal to the minimum distance from an inverter to a non-participating residence to determine if operational sound levels are greater than the project area ambient Leq plus five dBA.

Q.17. Do you agree with Staff's recommendation in Condition 30?

A.17. I understand that alternative methods of compliance with the pre-construction modeling condition have been accepted in other projects, such as the condition approved by the OPSB in various proceedings, including the Sycamore Creek Solar Project (Case No. 20-1762-EL-BGN). The Applicant seeks approval for similar language for the Project. The proposed language below identifies the process the Applicant will follow if data for transformers or inverters is not available. If data is not available for the transformer that the Project selects, the Applicant can rely on the NEMA TR1 standard. If data is not available from the manufacturer for the inverters, once the final inverter is installed, sound level measurements can be made in close proximity to the installed inverter to determine whether modeling is necessary using the actual sound level measurements. Specifically:

- If transformer manufacturer data is not available, the model will be updated with sound emission data following the NEMA TR1 standard.
- If inverter manufacturer data is not available, a similar inverter model will be used to update the sound propagation model prior to construction.
- Once constructed, sound level measurements will be made in close proximity to an inverter to determine the sound power level of the installed inverter. If the sound

power level of the installed inverter is 2 dB or more above the sound power level used in the updated pre-construction model, then the sound propagation model will be updated to ensure project-wide compliance with the applicable sound level limit. If the sound power level is determined to be less than 2 dBA above the sound power level used in the updated pre-construction model, then the project will be deemed in-compliance.

Consequently, as noted in Mr. Stickney's testimony, Condition 30 should be revised as follows:

If the inverters or substation transformer chosen for the project have a higher sound power output than the models used in the noise model, the Applicant shall submit, 30 days prior to construction, the results from an updated noise model for the project using the expected sound power output from the models chosen for the project, to show that sound levels will not exceed the average daytime ambient level in dBA for the nearest sound monitoring location for the Project Noise Evaluation attached to the application as Exhibit K plus five dBA at any nonparticipating sensitive receptor. If transformer manufacturer data is not available, the model will be updated with sound emission data following the NEMA TR1 standard. If inverter manufacturer data is not available, a similar inverter model will be used to update the sound propagation model prior to construction. Once constructed, sound level measurements will be made in close proximity to the inverter to determine the sound power level of the installed inverter. If the sound power level of the installed inverter is 2 dBA or more above the sound power level used in the updated preconstruction model, then the sound propagation model will be updated to ensure project-wide compliance with the applicable sound level limit. If the sound power level is determined to be less than 2 dBA above the sound power level used in the updated preconstruction model, then the project will be deemed in-compliance. If the equipment chosen for the project are at the same (or lower) sound power outlet as the models used in the noise model, no further action is needed for compliance of this condition. ~~shall show that sound levels will not exceed the daytime ambient level plus five dBA at any non participating sensitive receptor and will be submitted at least 30 days prior to construction. If noise data is not available from the inverter or transformer manufacturer, an operational noise test may be performed to comply with this condition. The test must be performed on a sunny day between 10 a.m. and 2 p.m. in the months of May-August, at a distance equal to the minimum distance from an inverter to a non participating residence. If the test shows the operational noise level is greater than project area ambient Leq level plus five dBA additional noise mitigation will be required. This condition is complied with if the test shows the operational noise level is equal or less than project area ambient Leq level plus five dBA. The Applicant shall file a report on the public docket that shows either 1) for the chosen inverter and substation transformer that sound levels will not exceed the daytime ambient level plus five dBA at any non-~~

~~participating sensitive receptor or 2) results of the operational noise test showing that sound levels will not exceed the daytime ambient level plus five dBA at any non-participating sensitive receptor.~~

Q.18. What are your overall conclusions regarding the potential noise impacts of the Project?

A.18. The Project operational noise levels are predicted to not exceed 5 dB over the designated ambient levels at non-participating residences. As noted above, the modeling of both daytime and nighttime operational noise levels was conservative, for example assuming continuous operation of tracker motors during the day, and full operation of all inverters at night, when the Project is only capable of 60% capacity under specific conditions at night. Construction noise levels were conservatively estimated, and the Applicant has described operational constraints and best practices to limit the short-term exposure to construction noise. And, as I note above, mitigation to inverters can be implemented in the event an operational noise issue develops.

Q.19. Does this conclude your direct testimony?

A.19. Yes, it does.

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing was served upon the following via email on this 23rd day of February, 2022.

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/s/Michael J. Settineri
Michael J. Settineri

Exhibit A

Alex Odom

Consultant | Acoustics, Noise & Vibration

EXPERIENCE AND RESPONSIBILITIES

Alex Odom consults with Acentech's Acoustics and Noise and Vibration Groups on a wide range of projects, assisting in the certification of lab/sensitive facilities, construction monitoring, and environmental noise issues. He has been involved in environmental noise modeling, mechanical systems noise control, and psychoacoustic analysis of the audibility of police sirens. He applies these skills to projects in the environmental, transportation, energy, and commercial industries.

EDUCATION

B.M.E., Mechanical Engineering, University of Minnesota - Twin Cities, 2016

PROFESSIONAL SOCIETIES

Institute for Environmental Sciences & Technology (IEST), Member

PRESENTATIONS | PUBLICATIONS

- "Addressing Noise Concerns in Cleanroom Environments," ESTECH, 2020
- "Boston's Construction BOOM: Help Me Understand My Noise Problem, ABX, October 2018

REPRESENTATIVE PROJECTS | POWER/ENERGY

- 1690 Revere Beach Parkway, Solar, Everett, MA
- Brookhaven Battery Storage, Brookhaven, NY
- Confidential Solar Farm, Noise Evaluation, Dartmouth, MA
- Cortlandt Solar Farm Noise Evaluation, Cortlandt, NY
- Duke Energy Corporation, Rockingham Combustion Turbines, Reidsville, NC
- Fairland Farm Solar Project, Norton, MA
- Gemma Powers System, Harrison Power Project, Harrison County, WV
- Guernsey Power Station, Valley Township, OH
- Hancock County Solar Farm, Hancock County, OH
- Harvard University, Allston Energy Facility, Allston, MA
- Invenergy, Number 3 Wind Farm, Lowville and Harrisburg, NY
- Lilly del Caribe Cogeneration Project, Carolina, PR
- Norton Solar Far, Norton, MA
- Ohio State University, Combined Heat and Power Project, Columbus, OH
- Ohio State University, Smart Campus Energy Project, Columbus, OH
- Pacifico Energy Solar Farm, Attleboro, Maring Road Solar Project, Kingston, MA
- Pittsfield Generating Company, Gas Turbine Attenuator Removal, Pittsfield, MA
- South Wrentham Battery and Energy Storage Site, Wrentham, MA
- Total Peaking Liquid National Gas Facility, Vaporization Capacity Increase and BOG Compressor, Milford, CT
- Township Power Plant, Riga, MI
- Watertown Solar Project, Watertown, MA

REPRESENTATIVE PROJECTS | LABS

- 1 Winthrop Square Lab Fit-out, Boston, MA
- 20 Cambridgeside Place, Cambridge, MA
- 599 Somerville Ave Lab Core and Shell, Somerville, MA
- Harvard Maxwell Dworkin Building Vibration and EMI, Cambridge, MA
- Harvard Medical School NRB Church Lab Microscopy Suite, Boston, MA

ACENTECH
ACOUSTICS TECHNOLOGY VIBRATION | RÉSUMÉ

Alex Odom

Consultant | Acoustics, Noise & Vibration

- Harvard SEAS ESL Vibration and EMI Measurements, Cambridge, MA
- Harvard University Engineering Science Laboratory Renovations SEAS ESL, Cambridge, MA
- Harvard – Mitrano Lab – Jefferson Hall, Cambridge, MA
- Kenmore Square 11-19 Deerfield Street Core and Shell, Boston, MA
- Kenmore Square 648 Beacon street, Boston, MA
- Kenmore Square Beacon Building, Boston, MA
- McKay and LISE – EMI and Vibration Measurements, Cambridge, MA
- Philips Healthcare at Parcel JK, Cambridge, MA
- UPenn Vagelos Laboratory for Energy Science and Technology, Philadelphia, PA
- USC Michelson Center, Vibration. Noise & EMI Surveys for Cleanroom and Imaging Areas, Los Angeles, CA

REPRESENTATIVE PROJECTS | HIGHER EDUCATION

- Boston College, Campion Hall Academic Building, Chestnut Hill, MA
- Dartmouth College, Thayer Hall Construction Noise Monitoring, Hanover, NH
- Harvard University, Houghton Library Construction Vibration Mitigation, Cambridge, MA
- Harvard University, Maxwell Dworkin Vibration and EMI Survey, Cambridge, MA
- Harvard University, Paulson School of Engineering and Applied Science, EMI and Vibration Measurements, Cambridge, MA
- Ohio State University, New Combined Heat and Power Plant, Columbus, OH
- University of Connecticut, Construction Noise and Vibration Measurements, Storrs, CT
- University of Connecticut, Science One, Storrs, CT
- University of Chicago, New Science Facility Site Selection Survey, Chicago, IL
- University of Minnesota, Transit Vibration Survey, St. Paul, MN
- University of Nevada, Cleanroom Testing, Reno, NV
- University of Pennsylvania, Vagelos Institute for Energy, Science, and Technology, Philadelphia, PA

REPRESENTATIVE PROJECTS | REMOTE MONITORING

- 201 Brookline Avenue, Construction Noise Monitoring, Boston, MA
- Algonquian Club, Remote Environmental Noise Monitoring, Boston, MA
- City of Portland, Citywide Sound Monitoring, Portland, ME
- Dartmouth College, Thayer Hall Construction Noise Monitoring, Hanover, NH
- Norton Estates, Industrial Noise Measurements, Norton, MA
- Prudential Center, Mechanical Noise Monitoring, Boston, MA