

**BEFORE
THE OHIO POWER SITING BOARD**

In the Matter of the Application of Oak Run)
Solar Project, LLC for a Certificate of)
Environmental Compatibility and Public) Case No. 22-549-EL-BGN
Need to Construct a Solar-Powered Electric)
Generation Facility in Madison County, Ohio)

Direct Testimony of Dr. John Boeckl

**On behalf of
Dr. John Boeckl**

May 10, 2023

/s/ Matthew Eisenson

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Counsel for Dr. John Boeckl

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

A-1. My Name is John Boeckl, I am the Senior International Focal Point for the Materials and Manufacturing Directorate of the US Air Force Research Laboratory located at 2179 12th Street, WPAFB, OH 45433-7718, and my residence is at 4565 State Route 38 NE, London OH, 43140.

Q-2. How long have you lived in London, Ohio?

A-2. I have lived in London at the same address for the past 23 years and have been a resident of the State of Ohio for my entire life. My residence is approximately 1,000 feet from the site of the planned Oak Run Solar Project. My wife has taught elementary school in the London area for the past 20 years and my three children attend or attended school in the Jonathan Alder School District.

Q-3. What is your occupation?

A-3. For the past 33 years I have been a Civilian Employee for the US Air Force. The past 26 years I was employed at the Materials and Manufacturing Directorate of the Air Force Research Laboratory on Wright Patterson Air Force Base. The initial 5 years of my career associated with the Materials and Manufacturing Directorate was as a graduate student in a program called Palace Knight that the US Air Force sponsored to develop employees to obtain their Ph.D. My graduate studies and eventual Doctoral Thesis were conducted at the Ohio State University and related to advanced solar cell materials research. For the next 18 years of my career, I was a Research Scientist performing electronic materials research on a number of solid-state, two dimensional, and

1 nanomaterials again for the Materials and Manufacturing Directorate. In January of 2020
2 I took on a new role in the Directorate and became the Senior International Focal Point in
3 which I engage with foreign countries to develop collaborative research projects with the
4 Materials and Manufacturing Directorate. I am attaching my C.V. as Attachment JB-1.

5
6 **Q-4. What has been your involvement in the community?**

7 **A-4.** For the past 18 years I have been a volunteer coach with numerous sports teams
8 connected with my children's school and local city teams. I attend the St. Patrick Catholic
9 Church which was also connected to the school my wife taught at for 15 years and have
10 been a volunteer at many of their social and fundraising events. I am also an avid
11 beekeeper and have given demonstrations at local schools and mentor a number of local
12 beekeepers.

13
14 **Q-5. What is the purpose of your testimony?**

15 **A-5.** I am testifying in support of the Oak Run Solar Project because I believe it will bring
16 benefits to my family and the local community.

17
18 **Q-6. In your opinion, what are those benefits?**

19 **A-6.** First, as a signatory of a Good Neighbor Agreement and a corollary rooftop solar
20 agreement, I will receive a direct benefit from the project. Upon completion of the
21 project, I will receive a residential solar energy system to offset my usage and reduce my
22 monthly bill.

1 Second, as a scientist who understands the cause and impacts of climate change,
2 as well as conventional air and water pollution, I understand that projects such as the Oak
3 Run Solar project will have significant environmental benefits. In particular, I understand
4 that replacing conventional fossil fuel power plants, such as coal-fired power plants, with
5 renewable energy sources, such as solar energy projects, will help to mitigate global
6 climate change while improving local air quality and reducing the risk of water pollution.

7 Third, as someone who lives close to the project site, I also believe that the
8 construction and operation of a solar farm at the site would be far less disruptive to my
9 lifestyle than other possible uses of the land. For example, I would greatly prefer living
10 next to a solar farm than a large-scale dairy farm (i.e., mega-dairy), housing development,
11 manufacturing facility, or landfill. This is not just a hypothetical. In 2007, the previous
12 owner of the site, Orleton Farms, LLC, submitted a permit application to the Ohio
13 Department of Agriculture for a dairy facility that would have housed 5,428 dairy cows at
14 the site. I live approximately 1,000 feet downwind of the site and was deeply concerned
15 about the odors that would have wafted onto my property. I was also concerned about the
16 vast quantities of manure that would have been generated at the site, which could leaked
17 into the water and harmed the fragile ecosystems of the Little Darby Creek and Spring
18 Fork. I would be thrilled to live near a relatively quiet, non-polluting, low-traffic solar
19 farm instead.

20 Fourth, I believe the surrounding region has a serious opportunity to benefit from
21 the boost of economic activity and tax revenue that the Project will deliver. In addition to
22 creating jobs, the Project will deliver hundreds of millions of dollars in revenue to the
23 local school districts and tens of millions of dollars to the fire department, ambulance,

1 and other services through a payment-in-lieu-of-taxes (PILOT) agreement. As a local
2 resident and taxpayer, I believe this revenue will increase the quality of services in the
3 town or help to offset my own tax burden or both.

4 Fifth, as a professional who develops international research partnerships, I have
5 observed that a major shift to renewable energy sources is underway across the globe. I
6 see this project as an opportunity for Ohio to become a focal point as the U.S. leader in
7 the global transition to renewables. I believe this project is at the cutting edge on at least
8 three dimensions, including total generation capacity, total battery storage capacity, and
9 commitment to agrivoltaics. The Applicant's witness Sarah Moser has testified in this
10 proceeding that the largest agrivoltaic project in the United States is only 4 acres. I
11 understand that Oak Run Solar is prepared to commit to employing agrivoltaics on at
12 least 2,000 acres. I strongly support the concept of agrivoltaics, which allows farming and
13 energy production to occur side-by-side, and I believe this project would truly distinguish
14 Ohio as a leader. To help the Board visualize what these projects look like, I am
15 including a diagram and two photographs from the National Renewable Energy
16 Laboratory website as Attachment JB-2.

17
18 **Q-7. Does this conclude your testimony?**

19 **A-7.** Yes. However, I reserve the right to update this testimony to respond to any further
20 testimony in this case.

CERTIFICATE OF SERVICE

I certify that The Ohio Power Siting Board's e-filing system will electronically serve notice of the filing of this document on the parties referenced on the service list of the docket card who have electronically subscribed to the case on this 10th day of May 2023.

/s/ Matthew Eisenson

Matthew Eisenson

Attachment JB-1

Curriculum Vitae of Dr. John Boeckl

John J. Boeckl

Materials & Manufacturing Directorate, Air Force Research Laboratory

AFRL/RXOP, WPAFB, OH 45433

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Education

2003 Ph.D. Electrical and Computer Engineering, Ohio State University, Columbus, OH

1997 M.S. Electrical Engineering, Ohio State University, Columbus, OH

1989 B.S. Electrical Engineering, Cleveland State University, Cleveland, OH

Experience

2020-Present Senior International Focal Point, Air Force Research Lab, WPAFB, OH

2001-2020 Research Scientist, Air Force Research Lab, WPAFB, OH

1996-2001 Senior Palace Knight, Air Force Research Lab, WPAFB, OH

1989-1996 Electronics Engineer, Aerospace Guidance/Metrology Center, Newark Air Force Base, OH

Professional Service

Adjunct Professor: University of Dayton, Department of Materials Science

Air Force Institute of Technology, Physics Department

Wright State University, Department of Physics

Fisk University, Department of Physics

Merits

Materials and Manufacturing Directorate International Award (2016, 2011, 2009)

Affiliate Societies Council Outstanding Scientists & Engineers Award (2013)

Exemplary Civilian Service Award (1996)

Areas of Technical Expertise

General research interest has been in the characterization of graphene and carbon nanotubes formed on silicon carbide materials. His work in the Nanoelectronic Materials Branch is concentrated in two technical areas of interest to the Air Force: Agile RF Electronic Materials and Integrated Opto-electronics. In pursuit of material solutions in these areas, he is a lead researcher for low-dimensional carbon material growth on SiC. In addition to managing the synthesis efforts, he is also well versed in various characterization tools that are used to evaluate the resulting material both electronically and structurally.

Selected Recent Publications

1. "Towards high-mobility heteroepitaxial beta-Ga₂O₃ on sapphire - dependence of the substrate off-axis angle," by Subrina Rafique, Lu Han, Adam T. Neal, Shin Mou, John Boeckl, Hongping Zhao, Phys. Status Solidi A 2018, 215, 1700467.
2. "Graphene quantum dots direct electrochemistry and development of sensitive electrocatalytical glucose biosensor," S. Gupta, T. Smith, A. Banaszak, and J. Boeckl, 2017 Sep 29;7(10). pii: E301. doi: 10.3390/nano7100301.
3. "Highly-Conductive Homoepitaxial Si-doped Ga₂O₃ Films on (010) β-Ga₂O₃ by Pulsed Laser Deposition," Kevin D. Leedy, Kelson D. Chabak, Vladimir Vasilyev, David C. Look,

- John J. Boeckl, Jeff L. Brown, Stephen E. Tetlak, Andrew J. Green, Neil A. Moser, Antonio Crespo, Darren B. Thomson, Robert C. Fitch, Jonathan P. McCandless, and Gregg H. Jessen, *Appl. Phys. Lett.* 111, 012103, 2017.
4. "Work Function Characterization of the Directionally Solidified LaB₆–VB₂ Eutectic," T. Back, S. Fairchild, J. Boeckl, M. Cahay, F. Derkink, G. Chen, A. Schmid, A. Sayir, Submitted to *Ultramicroscopy*.
 5. "Al₂O₃–BaTiO₃ nanolaminates fabricated by multistationary target pulsed laser deposition with in situ ellipsometry," John G. Jones ; John J. Boeckl ; Steven R. Smith ; Gerald R. Landis ; Neil R. Murphy ; Zhongqiang Hu ; Cynthia T. Bowers ; Charles E. Stutz, *J. Nanophotonics*, 11(4), 043506, 2017.
 6. "Filament Formation in Lithium Niobate Memristors Supports Neuromorphic Programming Capability," C. Yakopcic, S. Wang, W. Wang, E. Shin, J. Boeckl, G. Subramanyam, T. Taha, *Neural Computing and Applications* 2017. Doi 10.1007/s00521-017-2958-z.
 7. "Solid source growth of graphene with Ni–Cu catalysts: towards high quality in situ graphene on silicon," N. Mishra, J.J. Boeckl, A. Tadich, R.T. Jones, P.J. Pigram, M. Edmonds, M.S. Fuhrer, B.M. Nichols, F. Iacopi, *Journal of Physics D: Applied Physics*, 50, 9, 2017.
 8. "On-Silicon Supercapacitors with Enhanced Storage Performance," M. Ahmed, B. Wang, B. Gupta, J.J. Boeckl, N. Motta, F. Iacopi, *Journal of the Electrochemical Society*, 164, 4, 2017.
 9. "Direct graphene growth on transitional metal with solid carbon source and its converting into graphene/transitional metal oxide heterostructure," J. Park, T. Back, S.B. Fairchild, W.C. Mitchel, S. Elhamri, J. Boeckl, D. Martinotti, L. Douillard, P. Soukiassian, *Carbon*, 116, 303-09, 2017.
 10. "Local investigation of the emissive properties of LaB₆–ZrB₂ eutectics," M.-H. Berger, T. C. Back, P. Soukiassian, D. Martinotti, L. Douillard, S. B. Fairchild, J. J. Boeckl, V. Filipov, and A. Sayir, *J Mater Sci*, DOI 10.1007/s10853-017-0816-0, 2017
 11. "Modeling Graphene with Nanoholes: Structure and Characterization by Raman Spectroscopy with Consideration for Electron Transport," Jie Jiang, Ruth Pachter, Teresa Demeritte, Paresh Chandra Ray, Ahmad E. Islam, Benji Maruyama, and John J Boeckl, *J. Phys. Chem. C*, Just Accepted Manuscript, DOI: 10.1021/acs.jpcc.5b10225, Publication Date (Web): 21 Jan 2016.
 12. "A Raman spectroscopy signature for characterizing defective single-layer graphene: Defect-induced I(D)/I(D₀) intensity ratio by theoretical analysis," Jie Jiang, Ruth Pachter *, Faisal Mehmood, Ahmad E. Islam, Benji Maruyama, John J. Boeckl, *Carbon* 90, 53-62, 2015.
 13. "A thin film approach for SiC–derived graphene as an on-chip electrode for supercapacitors", M.Ahmed, M.Khawaja, M.Notarianni, B.Wang, D.Goding, B.Gupta, J.J. Boeckl, A.Takshi, N.Motta, S.E.Saddow, and F.Iacopi, *Nanotechnology* 26 (43), 434005, 2015.
 14. "Morphology dependent field emission of acid-spun carbon nanotube fibers," S B Fairchild, J Boeckl, T C Back, J B Ferguson, H Koerner, P T Murray, B Maruyama, M A Lange, M M Cahay, N Behabtu, C C Young, M Pasquali, N P Lockwood, K L Averett, G Gruen and D E Tsentalovich, *Nanotechnology* 26, 2015.
 15. "A catalytic alloy approach for graphene on epitaxial SiC on silicon wafers," F. Iacopi, N. Mishra, B.V. Cuning, D. Goding, S. Dimitrijevic, R. Brock, R.H. Dauskardt, B. Wood, J.J. Boeckl, *JMR*, 30, 05, 2015.
 16. "Morphology dependent field emission of acid-spun carbon nanotube fibers," S B Fairchild, J Boeckl, T C Back, J B Ferguson, H Koerner, P T Murray, B Maruyama, M A Lange, M M

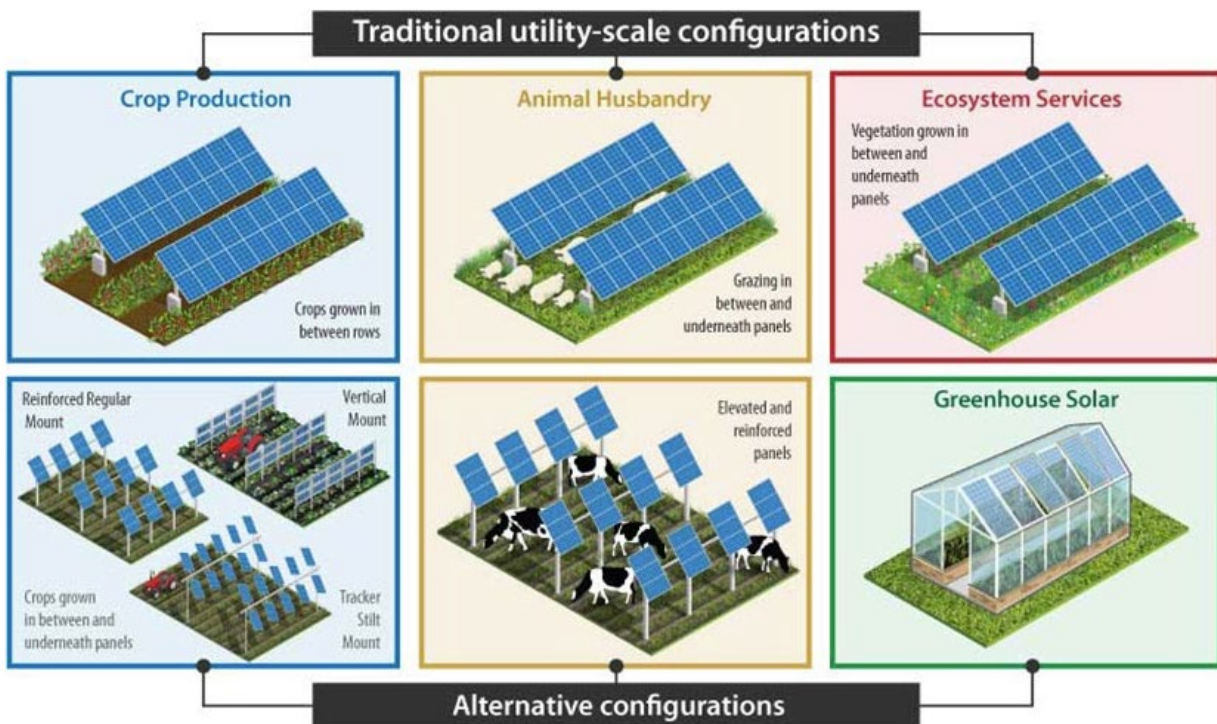
Cahay, N Behabtu, C C Young, M Pasquali, N P Lockwood, K L Averett, G Gruen and D E Tsentalovich, *Nanotechnology* 26 (2015).

17. "Vertical Graphene Growth from Amorphous Carbon Films using Oxidizing Gases," *The Journal of Physical Chemistry*, Bachmatiuk, Alicja; Boeckl, John; Smith, Howard; Ibrahim, Imad; Gemming, Thomas; Oswald, S.; Kazmierczak, Wojciech; Makarov, Denys; Schmidt, Oliver; Eckert, J.; Fu, Lei; Rummeli, Mark, Manuscript ID: jp-2015-05167v.R1

Attachment JB-2

National Renewable Energy Laboratory Images of Agrivoltaics Projects¹

Image #1



Agrivoltaics includes many different uses. Agrivoltaics systems can be installed in the same basic row layout as a traditional large-scale solar plant—or they can be modified to provide extra space for light, animals, or farm equipment to move under and between them.

¹ All images in Attachment JB-2, including captions, are screenshots from Harrison Dreves, *Growing Plants, Power, and Partnerships Through Agrivoltaics: Solar and Agriculture Pair Well Together; Thanks to Planning and Cooperation*, NREL, Aug. 18, 2022, <https://www.nrel.gov/news/program/2022/growing-plants-power-and-partnerships.html>.

Image #2



[Jack's Solar Garden](#) is a partner organization on the InSPIRE project and the largest commercially active agrivoltaics system in the United States. The 1.2-megawatt array generates enough power for more than 300 homes. Local nonprofits also use the space as pollinator habitat and to train young farmers, such as Brittany Staie, pictured here. Brittany was the farm manager at Jack's Solar Garden before joining NREL as a research intern. *Photo by Werner Slocum, NREL*

Image #3



Solar arrays can make a great home for grazing livestock, with the panels offering shade and shelter to the animals, who in turn keep the vegetation under the panels trimmed. *Photo from Lexie Hain, Lightsource bp*

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Summary: Testimony Direct Testimony of Dr. John Boeckl electronically filed by Mr.
Matthew B Eisenson on behalf of Boeckl, John Dr..