

# Jonathan D. Ogland-Hand, PhD

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## Research Interests

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Energy decarbonization, integrated modelling, electric power systems, energy storage valuation, developing CO<sub>2</sub>-based approaches to energy storage, CO<sub>2</sub>-geothermal power plants, sedimentary basin geothermal resources, reservoir simulation, capacity expansion modelling, renewable energy integration, unit commitment and economic dispatch modelling, techno-economic assessment, dynamic programming.

## Experience Prior to Current Position

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### The Ohio State University

*Doctoral Student*

Columbus, OH

August 2014 – May 2019

- Developed and valued approaches for using geologically stored CO<sub>2</sub> and geothermal resources for energy storage by building and integrating process level models of a subsurface CO<sub>2</sub> based energy storage system, cost models, and systems-level optimization models of the electricity system. Found approaches to energy storage that use geologically stored CO<sub>2</sub> and geothermal resources can (1) store energy for long durations; (2) have high efficiencies (i.e., >100%) because of the energy input from the geothermal heat flux; (3) have value to reducing system-wide CO<sub>2</sub> emissions and water requirements from the electricity system; and (4) have value in transmission constrained electricity systems.

- Created a natural resource economic model for geothermal energy resources. Modeled the physical processes of geothermal heat extraction with the NUFT reservoir simulator and used those results to characterize a dynamic optimization model that I developed. Found that using CO<sub>2</sub> to extract geothermal energy can be more sustainable than using conventional geofluid.

- Mentored undergraduates: (a) taught optimization basics, IBM ILOG CPLEX Optimization Studio, and MATLAB, and created a research plan for a student during the 2017 Summer Research Opportunities Program and (b) taught three students how to use the NUFT reservoir simulator and created a research plan for them during the 2016 to 2017 Academic Year.

### Lawrence Livermore National Laboratory

*Academic Cooperation Participant*

Livermore, CA

Summer 2015

- Worked under the guidance of Dr. Thomas Buscheck and became proficient with the Non-isothermal Unsaturated Flow and Transport (NUFT) reservoir simulator.

### Valparaiso University

*College of Engineering Undergraduate Research Intern*

Valparaiso, IN

May 2013 – July 2014

- Worked with electrical engineers, mechanical engineers, and chemists on concentrating solar power projects: (1) funded by the US NSF to produce hydrogen using metal oxides; (2) funded by the US DOE to produce magnesium from magnesium-oxide.

## Education

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### The Ohio State University

*Doctor of Philosophy in Environmental Science*

Columbus, OH

May 2019

Advisor: Jeffrey M. Bielicki

Committee Members: Ramteen Sioshansi, Brent L. Sohngen, and Gil Bohrer

### The Ohio State University

*Master of Science in Environmental Science*

Columbus, OH

August 2017

### Valparaiso University

*Bachelor of Science in Mechanical Engineering*

Valparaiso, IN

May 2014

Minor: Mathematics

## Peer-Reviewed Journal Articles

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**J. Ogland-Hand**, J. Bielicki, Y. Wang, B. Adams, T. Buscheck, M. Saar. (2019). "The Value of Bulk Energy Storage for Reducing CO<sub>2</sub> Emissions and Water Requirements from Regional Electricity Systems," *Energy Conversion and Management*, 181, 674-685.

J. Bielicki, B. Adams, H. Choi, B. Jamiyurason, S. Taff, T. Buscheck, **J. Ogland-Hand**, J. Randolph, M. Saar. "Engineering Cost-Competitive Geothermal Electricity from Geologic CO<sub>2</sub> Storage," *Energy Conversion and Management*. In Revision.

**J. Ogland-Hand**, J. Bielicki, B. Adams, E. Nelson, T. Buscheck, M. Saar, R. Sioshansi. "The Value of CO<sub>2</sub>-Bulk Energy Storage with Wind in Transmission Constrained Electric Power Systems," *Energy*. In Prep.

**J. Ogland-Hand**, J. Bielicki, M. Miranda, I. Patel, B. Adams, T. Buscheck, K. Mansoor, M. Saar. "Optimal Heat Mining of Geothermal Reservoirs," *Renewable Energy*. In Prep.

## Funded Research Grants

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- The Ohio State University Sustainable and Resilient Economy Program** \$21,450 | Summer 2018  
*Developing Capacity for Seasonal Energy Storage Capacity*
- The Ohio State University Center for Energy Research, Training, and Innovation** \$16,000 | Spring 2018  
*Engineering the Subsurface to Seasonally Store Energy While Sequestering CO<sub>2</sub>*
- The Ohio State University Environmental Policy Initiative Student Grant Competition** \$4,500 | Spring 2016  
*The Value of Bulk Energy Storage for Reducing Water Stress While Meeting the Goal of a Policy that Limits CO<sub>2</sub> Emissions*

## Conference Papers and Proceedings

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- S. Maldonado, J. Bielicki, M. Miranda, **J. Ogland-Hand**, C. Howard, B. Adams, T. Buscheck, M. Saar, (2020). "Geospatial Estimation of the Electric Power Potential in Sedimentary Basin Geothermal Resources Using Geologically Stored Carbon Dioxide," *Proceedings World Geothermal Congress 2020*, Reykjavik, Iceland, April 26-May 2, 2020.
- J. Ogland-Hand**, M. Miranda, J. Bielicki, B. Adams, T. Buscheck, M. Saar, (2018). "Operational Characteristics of a Geologic CO<sub>2</sub> Storage Bulk Energy Storage Technology," *14<sup>th</sup> International Conference on Greenhouse Gas Technologies*, Melbourne, Australia, October 21-25, 2018.
- J. Ogland-Hand**, J. Bielicki, E. Nelson, B. Adams, T. Buscheck, M. Saar, R. Sioshansi, (2018). "Effects of Bulk Energy Storage in Sedimentary Basin Geothermal Resources on Transmission Constrained Electricity Systems," *Proceedings of the 43<sup>rd</sup> Workshop on Geothermal Reservoir Engineering*, Stanford CA, February 12-14, 2018.
- M. Fleming, M. Saar, B. Adams, **J. Ogland-Hand**, T. Kuehn, T. Buscheck, J. Bielicki, J. Randolph (2018). "High Efficiency and Large-Scale Subsurface Energy Storage with CO<sub>2</sub>," *Proceedings of the 43<sup>rd</sup> Workshop on Geothermal Reservoir Engineering*, Stanford CA, February 12-14, 2018.
- J. Ogland-Hand**, J. Bielicki, T. Buscheck, (2017). "The Value of CO<sub>2</sub>-Bulk Energy Storage to Reducing CO<sub>2</sub> Emissions," *Energy Procedia*, 114, 6886-6892.
- J. Ogland-Hand**, J. Bielicki, T. Buscheck, (2016). "The Value of Bulk Energy Storage in Sedimentary Basin Geothermal Resources for Reducing CO<sub>2</sub> Emissions," *Proceedings of the 41<sup>st</sup> Workshop on Geothermal Reservoir Engineering*, Stanford University, Stanford CA, February 22-24, 2016. SGP-TR-209.
- J. Bielicki, B. Adams, H. Choi, B. Jamiyansuren, M. Saar, S. Taff, T. Buscheck, **J. Ogland-Hand**, (2016). "Sedimentary Basin Geothermal Resource for Cost-Effective Generation of Renewable Electricity from Sequestered Carbon Dioxide," *Proceedings of the 41<sup>st</sup> Workshop on Geothermal Reservoir Engineering*, Stanford CA, February 22-24, 2016.

## Teaching Experience

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- The Ohio State University** Columbus, OH  
*Instructor of Record: ENR 3900 (Sustainability Metrics)* Spring 2017  
- Facilitated discussion and taught methods pertaining to life cycle thinking, risk assessment, and sustainability indicators to a class of 43 students enrolled in the Environment, Economy, Development and Sustainability program. Average rating: 4.3/5.  
- Introduced a memo template into the laboratory curriculum and revised the laboratory assignment grading rubrics.
- The Ohio State University** Columbus, OH  
*Graduate Teaching Assistant: ENR 3900 | CIVILEN 5130 | PUBAFRS 5600* Fall 2016 | Fall 2017 | Spring 2018  
- Taught 40 undergraduate students the basics of Microsoft Excel for ENR 3900 (Sustainability Metrics).  
- Created exam and homework rubrics and graded exams and homework for CIVILEN 5130 (Applied Hydrology).  
- Graded homework and created a midterm exam for PUBAFRS 5600 (Science, Engineering, and Public Policy).

## Oral Presentations and Guest Lectures

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- Using Geologically Stored CO<sub>2</sub> and Geothermal Energy to Decarbonize the Electricity System** October 2019  
2019 INFORMS Annual Meeting Seattle, WA
- Optimally Mining Heat for Geothermal Energy Production** October 2019  
2019 INFORMS Annual Meeting Seattle, WA
- Optimizing the Use of CO<sub>2</sub>-Bulk Energy Storage for Transmission Deferral** November 2018  
2018 INFORMS Annual Meeting Phoenix, AZ
- Using Integrated Models to Value the Use of Bulk Energy Storage for Reducing CO<sub>2</sub> Emissions from Regional Electricity Systems** November 2018  
2018 INFORMS Annual Meeting Phoenix, AZ

**Using CO<sub>2</sub>-BES to Address Environmental Challenges Facing the Electricity System**  
Otterbein University Physics Coffee Hour

February 2018  
Westerville, OH

**Effects of Bulk Energy Storage in Sedimentary Basin Geothermal Resources on Transmission Constrained Electricity Systems**

Stanford Geothermal Workshop

February 2018  
Palo Alto, CA

**The Value of CO<sub>2</sub>-Geothermal Bulk Energy Storage to CO<sub>2</sub>**  
CO<sub>2</sub> Summit II: Technologies and Opportunities

April 2016  
Santa Ana Pueblo, NM

**Prepared Lecture on Energy Storage**  
Valparaiso University College of Engineering

April 2015  
Valparaiso, IN

## Poster Presentations

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**Using Geothermal Resources to Increase Utilization of Wind Energy Technologies and Transmission Infrastructure**

2018 Geothermal Resource Council Annual Meeting

October 2018  
Reno, NV

**The Value of CO<sub>2</sub>-Geothermal Bulk Energy Storage to Reducing CO<sub>2</sub> Emissions**  
2016 American Geophysical Union Fall Meeting

December 2016  
San Francisco, CA

**Optimal Geothermal Heat Extraction Using CO<sub>2</sub>**  
CO<sub>2</sub> Summit II: Technologies and Opportunities

April 2016  
Santa Ana Pueblo, NM

**Using CO<sub>2</sub> for Renewable Energy Production from Geothermal, Wind, and Solar Resources**  
1<sup>st</sup> Annual Ohio Conference on the Sustainable Use of Greenhouse Gases

August 2014  
Columbus, OH

**Storing Sunlight in Rust**  
121<sup>st</sup> ASEE Annual Conference and Exposition

June 2014  
Indianapolis, IN

**Solar Thermal Decoupled Electrolysis: A Study of the Conversion of Fe<sub>3</sub>O<sub>4</sub> to Fe<sub>2</sub>O<sub>3</sub>**  
246<sup>th</sup> American Chemical Society National Meeting & Exposition

September 2013  
Indianapolis, IN

## Leadership Experience

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### The Ohio State University

Environmental Science Graduate Program (ESGP) Student Association | President  
ESGP Graduate Studies Committee | Student Representative

Columbus, OH  
2017 to 2018 Academic Year  
2017 to 2018 Academic Year

### Valparaiso University

Tau Beta Pi Engineering Honors Society Student Chapter | President  
Valparaiso University Men's Club Soccer | President  
American Society of Mechanical Engineers Student Chapter | Treasurer  
Sigma Phi Epsilon National Fraternity IN Zeta Chapter | VP of Membership Development

Valparaiso, IN  
2013 to 2014 Academic Year  
2013 to 2014 Academic Year  
2011 to 2012 Academic Year  
2011 to 2012 Academic Year

## Global Humanitarian Volunteer Experience

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### Sustainable and Resilient Tanzanian Community, The Ohio State University

*Service Trip Group Leader*

- Mentored a group of eight Ohio State University undergraduates during a two-week service trip in Tanzania, Africa

August 2015

### Engineers Without Borders, Valparaiso University Student Chapter

*Finance Team Leader and Grant Writing Chair*

- Traveled to La Palma, Nicaragua for Initial Assessment Trip in November 2013 and raised \$9,500 through grant writing

September 2010 – December 2013

## Honors and Awards

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2018 Geothermal Resource Council Graduate Scholarship Award (1 of 5 students in USA)

August 2018

2018 Research Experience in Carbon Sequestration (RECS) Workshop Attendee

July 2018

2018 Catalyzing Advocacy for Science and Engineering AAAS Workshop Attendee (1 of 4 OSU students)

March 2018

2017 to 2018 OSU Preparing Future Faculty Fellow

May 2017

2016 National Science Foundation Graduate Research Fellowship Honorable Mention

March 2016

2016 ARP Ae Innovation Summit Student Program Participant (1 of 100 students in USA)

February 2016

2015 National Science Foundation Graduate Research Fellowship Honorable Mention

March 2015

2014 Ohio State University Graduate School Fellowship

March 2014

Valparaiso University College of Engineering Outstanding Senior Award

February 2014

Scholarship Award Presented by the St. Joseph Valley Section of American Society of Mechanical Engineers

April 2012