

Jeremiah Johnson, Ph.D.

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RESEARCH AND TEACHING INTERESTS

Sustainable infrastructure, life cycle assessment, industrial ecology, macro-energy systems, energy system optimization, grid-interactive buildings

ACADEMIC POSITIONS

- 2017- Associate Professor, Department of Civil, Construction & Environmental Engineering, North Carolina State University
Senior Faculty Fellow, KIETS Climate Leaders Program
Chancellor's Faculty Excellence Cluster: Sustainable Energy Systems & Policy
Academy of Outstanding Teachers (2023)
RED Inclusive Teaching Certification (2022)
- 2014-2017 Assistant Professor, School of Natural Resources & Environment, University of Michigan
Core Faculty: Center for Sustainable Systems
- 2012-2014 Assistant Research Scientist, School of Natural Resources & Environment, University of Michigan
Professional Affiliations: Association of Environmental Engineering and Science Professors (AEESP), International Society for Industrial Ecology (ISIE), Institute for Operations Research and the Management Sciences (INFORMS), American Geophysical Union (AGU)

EDUCATION

- 2007 **Ph.D.**, Yale University, Chemical and Environmental Engineering
Dissertation: "Material flows and energy use in anthropogenic metal cycles," *distinguished rating*
Chair: Thomas Graedel
Outstanding Doctoral Dissertation Award from the Association of Environmental Engineering and Science Professors (AEESP) & CH2MHill
- 2004 **M.S.**, Yale University, Chemical and Environmental Engineering
- 2001 **B.S.**, Clarkson University, Department of Chemical Engineering, Environmental Engineering Concentration; University Honors

OTHER PROFESSIONAL EXPERIENCE

- 2007-2012 Principal Consultant, PA Consulting Group, Global Energy Practice, Cambridge, MA
- 2006-2007 Project Manager, Hawaii Island Sustainable Energy Initiative, The Kohala Center, Kamuela, HI
- 2002 Environmental Health & Safety Co-op, Cargill Corn Milling Operations, Cedar Rapids, IA

REFEREED PUBLICATIONS

56. Liu, L., Barlaz, M.A., **Johnson, J.X.**, *Economic and environmental comparison of emerging plastic waste management technologies*, in review, 2023.
55. Liu, L., Miranda, M.M., Bielicki, J.M., Ellis, B.R., **Johnson, J.X.**, *Life cycle greenhouse gas emissions of CO₂-enabled sedimentary basin geothermal*, Environmental Science & Technology, accepted, 2023.
54. de Chalendar, J.A., Keskar, A., **Johnson, J.X.**, Mathieu, J., *Living laboratories can and should play a greater role to unlock flexibility in U.S. commercial buildings*, Joule, accepted, 2023.

53. Sinha, A., Venkatesh, A., Jordan, K., Eshraghi, H., Jaramillo, P., **Johnson, J.X.**, *Diverse decarbonization pathways under near cost-optimal futures*, in review, 2023.
52. Mignone, B.K., Clarke, L., Edmonds, J., Gurgel, A., Herzog, H.J., Johnson, J.X., Mallapragada, D., McJeon, H., Morris, J., O'Rourke, P.R., Paltsev, S., Rose, S.K., Steinberg, D.C., Venkatesh, A., *Beyond electrification: Drivers and implications of alternative routes to fuels decarbonization in net-zero energy systems*, in review, 2023.
51. Lin, A.J., Lei, S., Keskar, A., Hiskens, I., **Johnson, J.X.**, Mathieu, J.L., *The Sub-metered HVAC Implemented for Demand Response (SHIFDR) Dataset*, ASME Journal of Dynamic Systems, Measurement and Control, accepted, 2023.
50. Yang, H., Luo, Q., He, G., Lin, J., **Johnson, J.X.**, Garcia-Menendez, F., Deschenes, O., Mileva, A., Deshmukh, R., *Decarbonizing China's electricity sector brings significant health benefits but may widen regional disparities in employment*, in review, 2023.
49. Keskar, A., Soni, V., Jain, S., Patel, R., Ghosh, S., Shukla, J., Jain, S., **Johnson, J.X.**, *Tapping the Unused Energy Potential of Solar Water Pumps in India*, Environmental Science & Technology, 57 (38), 14173–14181, 2023.
48. Luo, Q., Garcia-Menendez, F., Lin, J., He, G., **Johnson, J.X.**, *Accelerating China's power sector decarbonization can save lives: integrating public health goals into power sector investment decisions*, Environmental Research Letters, 18 (10), 104023, 2023.
47. Luo, Q., Garcia-Menendez, F., Yang, H., Deshmukh, R., He, G., Lin, J., **Johnson, J.X.**, *The health and climate benefits of economic dispatch in China's power system*, Environmental Science & Technology, 57(7), 2898-2906, 2023.
46. Keskar, A., Galik, C., **Johnson, J.X.**, *Planning for winter peaking power systems in the United States*, Energy Policy, 173, 113376, 2023.
45. Jain, S., Phani Kumar, Sonti, V., Keskar, A., **Johnson, J.X.**, Ghosh, S., Patel, RN, *High-Performance Hybrid MPPT Algorithm based Single-Stage Solar PV fed Induction Motor Drive for Standalone Pump Application*, IEEE Transactions on Industry Applications, in press, 2023.
44. Luo, Q., Copeland, B., Garcia-Menendez, F., **Johnson, J.X.**, *Diverse pathways for power sector decarbonization yield health co-benefits, but fail to alleviate air pollution exposure inequities*, Environmental Science & Technology, 56(18), 13274-13283, 2022.
43. Ssengonzi, J., **Johnson, J.X.**, DeCarolis, D., *An efficient method to estimate renewable energy capacity credit at increasing regional grid penetration levels*, Renewable and Sustainable Energy Transition, 2, 100033, 2022.
42. Keskar, A., Lei, S., Webb, T., Nagy, S., Lee, H., Hiskens, I., Mathieu, J., **Johnson, J.X.**, *Assessing the performance of global thermostat adjustment in commercial buildings for load shifting demand response*, Environmental Research: Infrastructure and Sustainability, 2(1), 015003, 2022.
41. Biliecki, J.M., Leveni, M., **Johnson, J.X.**, Ellis, B.R., *The promise of coupling geologic CO₂ storage with sedimentary basin geothermal power generation*, iScience, 26(2), 2023.
40. Sioshansi, S., Demholm, P., Arteaga, J., Bhattacharjee, S., Awara, S., Botterud, A., Cole, W., de Queiroz, A., DeCarolis, J., Ding, Z., DiOrio, N., Dvorkin, Y., Helman, U., **Johnson, J.X.**, Konstantelos, I., Mai, T., Pandžić, H., Sodano, D., *Energy-Storage Modeling: State-of-the-Art and Future Research Directions*, IEEE Transactions on Power Systems, 37(2), 860-875, 2021. [Won 2023 PES Prize Paper Award and 2023 IEEE Power & Energy Society, Power System Operation, Planning and Economics Technical Committee Prize Paper Award]
39. Sodano, D., DeCarolis J., de Queiroz, A.R., **Johnson, J.X.**, *The Symbiotic Relationship of Solar Power and Energy Storage in Providing Capacity Value*, Renewable Energy, 177, 823-832, 2021.
38. Fell, H., **Johnson, J.X.**, *Regional Disparities in Emissions Reduction and Net Trade from Renewables*, Nature Sustainability, 4(4), 358-365, 2021.

37. Luo, Q., Garcia Menendez, F., **Johnson, J.X.**, *Reducing human health impacts from power sector emissions with redispatch and energy storage*, Environmental Research: Infrastructure and Sustainability, 1(2), 025009, 2021.
36. Mueller, K.E., Thomas, J.T., **Johnson, J.X.**, DeCarolis, J.F., Call, D. F., *An Environmental Life Cycle Assessment of Salinity Gradient Energy Recovery Using Reverse Electrodialysis*, Journal of Industrial Ecology, 25(5), 1194-1206, 2021.
35. DeCarolis J., Jaramillo, P., **Johnson J.X.**, McCollum, D., Trutnevyte, E., Daniels, D., et al., *Leveraging open source tools for collaborative macro-energy system modeling efforts*, Joule, 4(12), 2523-2526, 2020.
34. Hollingsworth, J., Copeland, B., **Johnson J.X.**, *Are E-Scooters Polluters? The Environmental Impacts of Shared Electric Scooters*, Environmental Research Letters, 14 (8), 084031, 2019.
33. Arbabzadeh, M., Sioshansi, R., **Johnson, J.X.**, Keoleian, G., *The role of energy storage in deep decarbonization of electricity production*, Nature Communications, 10 (1), 3413, 2019.
32. Hollingsworth, J., Ravishankar, E., O'Connor, B., **Johnson, J.X.**, DeCarolis, J., *Environmental and Economic Impacts of Greenhouse-Integrated Solar Photovoltaics*, Journal of Industrial Ecology, 24(1), 234-247, 2020.
31. Keskar, A., Anderson, D., **Johnson, J. X.**, Hiskens, I. A., & Mathieu, J. L. *Do commercial buildings become less efficient when they provide grid ancillary services?* Energy Efficiency, 1-15, 2019.
30. Liang, S., Qu, S., Zhao, Q., Zhang, X., Daigger, G., Newell, J., Miller, S., **Johnson, J.X.**, Love, N., Zhang, L., Yang, Z., Xu, M., *Quantifying the Urban Food-Energy-Water (FEW) Nexus: The Case of the Detroit Metropolitan Area*, Environmental Science & Technology, 53 (2), 779-788, 2018.
29. Ryan, N.A., Lin, Y., Mitchell-Ward, N., Mathieu, J., **Johnson, J.X.**, *Use-Phase Drives Lithium-Ion Battery Life Cycle Environmental Impacts When Used for Frequency Regulation*, Environmental Science & Technology, 52 (17), 10163-10174, 2018.
28. Ryan, N.A., **Johnson, J.X.**, Keoleian, G.A., Lewis, G., *Decision Support Algorithm to Guide Method Selection for Quantifying Emissions from Electricity Consumption*, Journal of Industrial Ecology 22 (6), 1318-1330, 2018.
27. Lin, Y., Mathieu, J., **Johnson, J.X.**, Hiskens, I.A., Backhaus, S., *Explaining Inefficiencies in Commercial Buildings Providing Power System Ancillary Services*, Energy and Buildings, 152: 216-226, 2017.
26. **Johnson, J.X.**, *Location or Insolation: the Importance of Siting in Emissions Mitigation from Solar Photovoltaics*, WIREs Energy and Environment, 6: 1-11, 2017.
25. Forrester, S., Zaman, A. Mathieu, J., **Johnson, J.X.**, *Policy Barriers for Multiple Services from Energy Storage*, Electricity Journal, 30: 50-56, 2017. (Editorial review)
24. Arbabzadeh, M., Keoleian, G.A., **Johnson, J.X.**, *Parameters Driving Environmental Performance of Energy Storage Systems Across Grid Applications*, Journal of Energy Storage, 12: 11-28, 2017.
23. Novacheck, J., **Johnson, J.X.**, *Diversifying Wind in Real Power Systems*, Renewable Energy, 106: 177-185, 2017.
22. Alfaro, J.F., Miller, S.A., **Johnson, J.X.**, Riolo, R.R., *Agent Based Modeling for Stakeholder Engagement and Decision Making in Electricity System Planning*, Energy Policy, 101: 317–331, 2017.
21. Ryan, N., Keoleian, G.A., **Johnson, J.X.**, *Comparative Assessment of Models and Methods to Calculate Grid Electricity Emissions*, Environmental Science & Technology, 50(17): 8937–8953, 2016.
20. Chiang, A., Keoleian, G., Moore, M.R., **Johnson, J.X.**, *Emission Abatement Costs and Benefits of Siting an Offshore Wind Farm: A Spatial Analysis of Lake Michigan*, Ecological Economics, 130: 263-276, 2016.
19. Good, J., **Johnson, J.X.**, *Impact of Inverter Loading Ratio on Solar Photovoltaic System Performance*, Applied Energy, 177: 475–486, 2016.

18. Lin, Y., **Johnson, J.X.**, Mathieu, J., *Emissions Impacts of Using Distributed Energy Storage for Power System Reserves*, Applied Energy, 168: 444-456, 2016.
17. Arbabzadeh, M., **Johnson, J.X.**, Keoleian, G.A., Rasmussen, P., Thompson, L., *Twelve Principles for Green Energy Storage in Grid Applications*, Environmental Science & Technology, 50(2): 1046-1055, 2016.
16. **Johnson, J.X.**, Novacheck, J., *The Impact of Coal Plant Retirements on Emissions Mitigation from Renewable Portfolio Standards*, The Electricity Journal, 28 (8): 59–68, 2015. (Editorial review)
15. Novacheck, J., **Johnson, J.X.**, *The Environmental and Cost Implications of Solar Energy Preferences in Renewable Portfolio Standards*, Energy Policy, 86: 250-261, 2015.
14. **Johnson, J.X.**, Novacheck, J., *Emissions Reductions from Expanding State-Level Renewable Portfolio Standards*, Environmental Science & Technology, 49(9): 5318-5325, 2015.
13. Arbabzadeh, M., **Johnson, J.X.**, De Kleine R., Keoleian, G.A., *Vanadium redox flow batteries to reach greenhouse gas emissions targets in an off-grid configuration*, Applied Energy, 146: 397-408, 2015.
12. **Johnson, J.X.**, De Kleine R., Keoleian, G.A., *Assessment of Energy Storage for Transmission-Constrained Wind*, Applied Energy, 124: 377–388, 2014.
11. **Johnson, J.X.**, McMillan, C.A., Keoleian, G.A., *Evaluation of Life Cycle Assessment Recycling Allocation Methods: The Case Study of Aluminum*, Journal of Industrial Ecology, 17 (5): 700–711, 2013.
10. **Johnson, J.**, Chertow, M., *Climate Stabilization Wedges in Action: A Systems Approach to Energy Sustainability for Hawaii Island*, Environmental Science & Technology, 43(7): 2234-2240, 2009.
9. **Johnson, J.**, Reck, B., Wang, T., Graedel, T.E., *The Energy Benefit of Stainless Steel Recycling*, Energy Policy, 36 (1): 181-192, 2008.
8. **Johnson, J.**, Graedel, T.E., *The “Hidden” Trade of Metals in the United States*, Journal of Industrial Ecology, 12 (5/6): 739-751, 2008.
7. Wang, T., Mao, J., **Johnson, J.**, Reck, B., Graedel, T.E., *Anthropogenic Metal Cycles in China*, Journal of Material Cycles and Waste Management, 10 (2): 188-197, 2008.
6. **Johnson, J.**, Harper, E.M., Lifset, R., Graedel, T.E., *Dining at the Periodic Table: Metals Concentrations as They Relate to Recycling*, Environmental Science & Technology, 41(5): 1759-1765, 2007.
5. **Johnson, J.**, Schewel, L., Graedel, T.E., *The Contemporary Anthropogenic Chromium Cycle*, Environmental Science & Technology, 40 (22): 7060-7069, 2006.
4. Harper, E.M., **Johnson, J.**, Graedel, T.E., *Making Metals Count: Applications for Material Flow Analysis*, Environmental Engineering Science, 23 (3): 493-506, 2006.
3. **Johnson, J.**, Gordon, R.B., Graedel, T.E., *Silver Cycles: The Stocks and Flows Project, Part 3*, JOM: Journal of the Minerals, Metals, and Materials Society, 58 (2): 34-38, 2006.
2. **Johnson, J.**, Jirikowic, J., Bertram, M., van Beers, D., Gordon, R.B., Henderson, K., Klee, R.J., Lanzano, T., Oetjen, L., Graedel, T.E., *Contemporary Anthropogenic Silver Cycle: A Multilevel Analysis*, Environmental Science & Technology, 39 (12): 4655-4665, 2005. [Featured on cover]
1. **Johnson, J.**, Bertram, M., Henderson, K., Jirikowic, J., Graedel, T.E., *The Contemporary Asian Silver Cycle: One-Year Stocks and Flows*, Journal of Material Cycles and Waste Management, 7 (2): 93-103, 2005.

CONFERENCE PROCEEDINGS

9. Jain, S. Phani Kumar, SVS, Keskar, A., **Johnson, JX**, Ghosh, S., Patel, RN, A Hybrid MPPT Algorithm for Solar PV Water Pumping Systems, 2021 IEEE 2nd International Conference on Smart Technologies for Power, Energy and Control (STPEC), November, 2021.

8. Curri, D., Aziz, T., Baugh, J., **Johnson, J.X.**, *Industrial Symbiosis Waste Exchange Identification and Optimization*, Proceedings of the Hawaii International Conference on Systems Science (HICSS). HI, January, 2021.
7. Keskar, A., Lei, S., Webb, T., Nagy, S., Lee, H., Hiskens, I., Mathieu, J., Johnson, J.X., Stay cool and be flexible: energy-efficient grid services using commercial buildings HVAC systems, 2020 ACEEE Summer Study on Energy Efficiency in Buildings, Pacific Grove, CA, 2020.
6. Kern, A., Mège, O., **Johnson, J.X.**, Mathieu, J., *Environmental Impacts of Using Energy Storage Aggregations to Provide Multiple Services*, Proceedings of the Hawaii International Conference on Systems Science (HICSS). Wailea, Maui, HI, January, 2019.
5. Keskar, A., Anderson, D., **Johnson, J.X.**, Hiskens, I., Mathieu, J. Experimental investigation of the additional energy consumed by building HVAC providing grid ancillary services, 2018 ACEEE Summer Study on Energy Efficiency in Buildings, Pacific Grove, CA, August 13, 2018.
4. Afshari, S., Wolfe, J., Nazir, M. Hiskens, I.A., **Johnson, J.X.**, Mathieu, J.L., Lin, Y., Barnes, A.K., Geller, D.A., Backhaus, S.N., *An Experimental Study of Energy Consumption in Buildings Providing Ancillary Services*, IEEE Integrated Smart Grid Technologies Conference (IGST), 2017.
3. Lin, Y., Mathieu, J., **Johnson, J.X.**, *Stochastic optimal power flow formulation for environmental dispatch strategy with energy storage*, IEEE 19th Power Systems Computation Conference (PSCC), 2016.
2. Lin, Y., Hiskens, I., Backhaus, S., **Johnson, J.X.**, Mathieu, J. *Explaining inefficiencies in buildings providing ancillary services*, 2016 ACEEE Summer Study on Energy Efficiency in Buildings, August 2016.
1. **Johnson, J.**, Chertow, M., *A Systems Approach to Energy Sustainability in Hawai'i County*, IEEE Proceedings of the 42nd Hawaii International Conference on System Sciences, Waikoloa, Hawaii, 2009.

NON-REFEREED PUBLICATIONS

- **Johnson, J.** and DeCarolis J., The Texas power system failed in extreme weather. The same could happen in N.C., News & Observer and Charlotte Observer, February 21, 2021.
- **Johnson, J.**, Are shared e-scooters good for the planet? Only if they replace car trips, The Conversation, August 2, 2019.
- DeCarolis, J., **Johnson, J.**, Utilities are starting to invest in big batteries instead of building power plants, The Conversation, February 22, 2019.
- DeCarolis, J., Dulaney, K., Fell, H., Galik, C., **Johnson, J.**, Kalland, S., Lu, N., Lubkeman, D., Panzarella, I., Proudlove, A., Rodrigo de Queiroz, A., Tang, W., Alrushoud, A., Gambino, C., Meng, Y., Liang, M., Liu, S., Mulcahy, D., Sodano, D., Soutendijk, D., Sun, L., Energy Storage Options for North Carolina, prepared for the NC Policy Collaboratory, Energy Policy Council, and the Joint Legislative Commission on Energy Policy, December 2018.
- **Johnson, J.**, Novacheck, J., Barteau, M., Lyon, T., Expanding the Renewable Portfolio Standard for Michigan: A Study, University of Michigan Energy Institute, January 2015.
- **Johnson, J.**, Chertow, M., Davies, M., Gagne, C., Hausfather, Z., Lippert, D., Analysis and Recommendations for the Hawaii County Energy Sustainability Plan, The Kohala Center, 2007.
- **Johnson, J.**, book review for “Transforming Sustainability Strategy into Action: The Chemical Industry”, Ecological Economics, 61: 194-195, 2007.
- **Johnson, J.**, Leistra, D., Opton-Himmel, J., Smith, M., Baseline Energy Analysis for Hawaii Island, sponsored and distributed by the Kohala Center, Kamuela, Hawaii, 2006.

TEACHING

North Carolina State University

- CE250: Sustainable Infrastructure (Fall 2017, 2018, 2019, 2020, 2021, 2023; Spring 2021)
- CE478/CE578: Energy & Climate (Fall 2022, 2023)
- CE497/CE596: Renewable Energy & the Grid (Spring 2019, 2020, 2022, 2023)
- CE796: Environmental Life Cycle Assessment (Spring 2018, 2023)

University of Michigan

- NRE615: Renewable Electricity & the Grid (Winter 2015, 2016, 2017)
- NRE550/STRAT566: Systems Thinking for Sustainable Development & Enterprise (Winter 2016, 2017)
- Dow Sustainability Academy – Executive Education at Ross School of Business (2017)
- Guest lectures: ESE501 (Fall 2014, Fall 2015, Fall 2016); CEE567 (Winter 2015); ENG100 (Fall 2013); UROP (Summer 2015)

Yale University

- FES500: Greening the Industrial Facility, Teaching Fellow, two semesters
- FES300: Technology and Environment, Teaching Fellow, one semester
- CENG120: Introduction to Environmental Engineering, Teaching Fellow, one semester

PUBLISHED TEACHING CASES

5. Kraus, A., Mashburn, B., **Johnson, J.X.**, *Green Mountain Power & Tesla Powerwall: Innovation within a Conservative Industry*, Michigan Sustainability Case, 2016.
4. Szczepanik, B., Cole, D., Neema, B., Taddei Arriola, P.D., **Johnson, J.X.**, *A Radioactive Decision: Should DTE Energy Build Fermi III?*, Michigan Sustainability Case, 2016.
3. Golrokian, M., Ilayian, R., **Johnson, J.X.**, *Ohio Renewable Energy Portfolio Standard Freeze*, Michigan Sustainability Case, 2016.
2. Miranda-Blackney, T., Cui, Y., Santiago, A., Talbot, J., **Johnson, J.X.**, *Renewable Energy at the National Aquarium*. WDI Publishing, case 1-430-451, 2016.
1. Ryan, D., Bednar, D., Cecco, L., MV Reddy, P., **Johnson, J.X.**, *Evading the Death Spiral: Minnesota's Value of Solar Tariff*. WDI Publishing, case 1-430-450, 2015.

FUNDING AND AWARDS

- The Sloan Foundation, (co-PI, with P. Jaramillo), Open Energy Outlook Phase II, 2023-2025, **\$409,175**.
- ARPA-E, Lowering CO₂: Models to Optimize Train Infrastructure, Vehicles, and Energy Storage (LOCOMOTIVES), Co-PI and Project Manager, (PI: G. List), Multi-decadal Decarbonization Pathways for U.S. Freight Rail, 2021-2023, **\$1,892,333**.
- The Sloan Foundation, PI (with P. Jaramillo), Proposal for an Open Energy Outlook, 2020-2023, **\$400,000**.
- Environmental Research and Education Foundation, PI, Economic and Environmental Comparison of Emerging Plastic Waste Management Technologies, 2021-2024, **\$61,431**.
- The Sloan Foundation, (PI: B. Ellis), CO₂ Utilization for Geothermal Energy Production and Renewable Energy Storage, 2020-2024, **\$613,144**.
- National Science Foundation: Environmental Sustainability, PI (Co-PIs: F. Garcia Menendez and H. Fell), Optimal Use of Grid-Connected Energy Storage to Reduce Human Health Impacts, 2019-2024, **\$300,000**.

- North Carolina State University Research and Innovation Seed Funding, (PI: W. Yang), Data-driven planning and operation of integrated energy-water systems, 2021-2022, **\$25,000**.
- Center for Strategic and International Studies - Partnership 2020, PI (Co-PIs: A. Keskar, S. Jain, S. Ghosh, R. Patel), Ensuring optimal utilization of solar water pumps in rural Chhattisgarh, 2020-2022, **\$75,000**.
- North Carolina State University Research and Innovation Seed Funding, PI (CoPIs: F. Garcia Menendez, H. Fell, M. Morrill), Optimal Use of Grid-Connected Energy Storage to Reduce Human Health Impacts, 2019-2020, **\$35,000**.
- Department of Energy, (PI: S. Kiliccote), IDREEM: Impact of Demand Response on short and long term building Energy Efficiency Metrics, 2018-2021, **\$1,700,000**.
- North Carolina Policy Collaboratory, Co-PI (PI: J DeCarolis), North Carolina Energy Storage Study, 2017-2018, **\$195,000**.
- Eco-Industrial Park Planning: Identifying Partner Industries, Co-PI (with T. Aziz and A. Fox), 2018, **\$10,000**.
- University of Michigan Office of Research and Rackham Graduate School: Distinguished Faculty & Grad Student Seminars Program, Co-PI (PI: J. Mathieu), Emerging Topics in Sustainable Electric Power Systems, 2016-2017, **\$15,000**.
- National Science Foundation: Environmental Sustainability, Co-PI (PI: M. Xu), UNS: U.S.-China: Integrated Systems Modeling of Food-Energy-Water (FEW) Nexus for Urban Sustainability, 2016-2020, **\$499,990**.
- National Science Foundation: Environmental Sustainability, PI (Co-PI: J. Mathieu), Environmental Impacts of Using Distributed Energy Storage for Power System Reserves, 2015-2018, **\$310,000**.
- University of Michigan, Transforming Learning for a Third Century Program, Co-PI (with 18 others), Transforming Sustainability Education and Case-Based Teaching, 2015-2018, **\$1,595,749**.
- University of Michigan Energy Institute, with J. Mathieu, Assessing the Environmental Impacts of Providing Power System Reserves with Demand Response and Distributed Energy Storage – Grant Renewal, 2015, **\$40,000**.
- University of Michigan, M-Cubed, Co-PI (with J. Mathieu, I. Hiskens), Improving the Energy Efficiency of Buildings Participating in Power System Ancillary Services, 2015-2016, **\$60,000**.
- U.S.-China Clean Energy Research Center, Co-PI (with G. Keoleian), Electricity and Material Sourcing Scenario Analysis to Guide Vehicle Technology Strategies Implementation Proposal, 2015, **\$68,000**.
- 5 Lakes Energy, PI, A Dynamic Tool for Evaluating Carbon Mitigation Options from Existing Power Plants in Michigan, Phase II, 2015, **\$54,251**.
- University of Michigan Energy Institute, with J. Mathieu, Assessing the Environmental Impacts of Providing Power System Reserves with Demand Response and Distributed Energy Storage, 2014, **\$40,000**.
- The Energy Foundation and 5 Lakes Energy, PI, A Dynamic Tool for Evaluating Carbon Mitigation Options from Existing Power Plants in Michigan, 2014, **\$45,622**.
- University of Michigan Energy Institute, PI, Evaluation of Alternative Design Considerations for Renewable Portfolio Standards, 2014, **\$45,200**.
- National Science Foundation: Sustainable Energy Pathways Program, Co-PI (by invitation; PI: L. Thompson), Non-Aqueous Redox Flow Battery Chemistries for Sustainable Energy Storage, 2012-2016, **\$1,750,000**.

- University of Michigan: Rackham Centennial Fellowship, Student Support – Josh Novacheck, Environmental Impacts of Various Renewable Grid Integration, 2013, **\$6,000**.
- Association of Environmental Engineering and Science Professors (AEESP) & CH2MHill Outstanding Doctoral Dissertation Award, 2007, **\$1,000**.
- International Precious Metals Institute: Student Award, 2004, **\$1,500**.
- Intel Award for Environmental Innovation, 2002.

PRESENTATIONS [* = INVITED; # = KEYNOTE]

- 2023: American Geophysical Union (x3), AEESP (x5), Snowmass Workshop, INFORMS, MIT*, USAEE
- 2022: University of North Carolina – Clean Tech Summit*, Macro-Energy Systems Workshop# (x3), Global Clean Energy Technology Summit, Association of Environmental Engineering and Science Professors (x3), INFORMS, Air & Waste Management Association, Hydrail Conference, NCSU Climate Fellow Symposium (moderator), Macro-Energy Systems seminar series (moderator), NCSU Benjamin Franklin Scholars Interdisciplinary Lecture*
- 2021: National Institute of Environmental Health Sciences#, United States Association for Energy Economics, International Symposium for Sustainable Systems and Technology, INFORMS, American Geophysical Union (x3), Environmental and Ecological Systems Engineering Forum*
- 2020: ACEEE Summer Study on Energy Efficiency in Buildings, American Geophysical Union, Hawaii International Conference on System Sciences, American Center for Life Cycle Assessment
- 2019: Hawaii International Conference on System Sciences, Engineering Sustainability (x2), State Energy Conference of North Carolina*, Our Clean Energy Future*, Association of Environmental Engineering and Science Professors (x3), International Symposium for Sustainable Systems and Technology (x5), International Society for Industrial Ecology (x2), INFORMS, Energy and Society in Transition, Kimley-Horn*, Air & Waste Management Association*, 18th Annual CMAS Conference
- 2018: State Energy Conference of North Carolina*, International Symposium for Sustainable Systems and Technology (x3); ACEEE Summer Study on Energy Efficiency in Buildings; INFORMS Conference; Center for Energy Education*, NC State EWC Seminar*
- 2017: ASME Power and Energy Conference; University of Michigan Emerging Topics in Sustainable Electric Power Systems Seminar Series; INFORMS; International Society for Industrial Ecology/International Symposium for Sustainable Systems and Technology (x4); Association of Environmental Engineering and Science Professors (x3)
- 2016: INFORMS; ACEEE Summer Study on Energy Efficiency in Buildings; IEEE 19th Power Systems Computation Conference; EPRI ENV-Vision*; International Symposium for Sustainable Systems and Technology (x4)
- 2015: Golisano Institute of Sustainability, Rochester Institute of Technology*; Electrochemical Society (ECS) Meeting; Energy Policy Research Conference; International Society for Industrial Ecology (x3); Association of Environmental Engineering and Science Professors; International Symposium for Sustainable Systems and Technology (x2); Engineering Sustainability
- 2014: IEEE Power & Energy Society General Meeting; EPA Carbon Standards Technical Meeting*; International Symposium for Sustainable Systems and Technology (x2); University of Michigan – SNRE*; University of Michigan – Env Eng*; Purdue University*
- 2013: Yale University*; Midland American Chemical Society Fall Scientific Meeting #
- 2012: University of Michigan – SNRE

- 2009: Columbia University*; Massachusetts Institute of Technology*; University of California Santa Barbara*; Hawaii International Conference on System Sciences
- 2007: National Research Council of the National Academies*
- 2006: Gordon Research Conference on Industrial Ecology; International Stainless Steel Forum; CHROMIUM*
- 2005: International Society for Industrial Ecology; National Science Foundation Conference on Biocomplexity in the Environment
- 2004: Gordon Research Conference on Industrial Ecology
- 2001: International Waste Education and Research Consortium

STUDENT ADVISEES

Doctoral students

- (Co-chair) Bianca Meotti, Environmental Engineering, North Carolina State University, September 2023 to present
- Lily Liu, Environmental Engineering, North Carolina State University, August 2020 to present
- Jethro Ssengonzi, Civil Engineering, North Carolina State University, August 2020 to present
- (Co-chair) Kerem Akdemir, Civil Engineering, North Carolina State University, August 2020 to present
- (Co-chair) Ghazal Kamyabjou, Design, North Carolina State University, August 2020 to 2023
- Aditya Keskar, Environmental Engineering, North Carolina State University, September 2018 to 2023, currently at North Carolina Utilities Commission
- (Co-chair) Qian Luo, Environmental Engineering, North Carolina State University, September 2018 to 2023; currently a post doc at Princeton
- (Co-chair) Nicole Ryan, School of Natural Resources & Environment, University of Michigan, September 2016 to 2020; currently IEEE Fellow
- (Co-chair) Maryam Arbabzadeh, School of Natural Resources & Environment, University of Michigan, September 2013 to 2018; recipient of Dow Doctoral Fellowship, Barbour Scholarship (declined), and Rackham Pre-doctoral Fellowship; post doctoral fellow at MIT

Doctoral student committees

- Shiyue Yao, North Carolina State University, 2023 to present
- Ashley Bittner, North Carolina State University, 2022 to 2023
- Leah Weaver, North Carolina State University, 2022 to present
- Hanpyo Lee, North Carolina State University, 2022 to present
- Ece Ackdemir, North Carolina State University, 2022 to present
- Ashwin Shirsat, North Carolina State University, 2021 to 2022
- Amir Zeighami, North Carolina State University, 2021 to present
- Luis Miguel Prieto Miranda, North Carolina State University, 2021 to present
- Stephanie Parsons, North Carolina State University, 2021 to present
- Jacob Monroe, North Carolina State University, 2019 to 2020
- Hadi Esraghi, North Carolina State University, 2018 to 2020
- Morteza Taiebat, University of Michigan, September 2016 to 2018
- Vineet Raichur, Design Science Program, University of Michigan, August 2015

Post-doctoral fellows

- Tongchuan Wei, 2022-2023, currently: NC State faculty
- Aditya Sinha, 2021-2023, currently: NC State faculty
- Sina Afshari, 2016-2017, currently: Ecosense Lighting
- Yashen Lin, 2014-2016, currently: National Renewable Energy Laboratory

Master's theses

- Gavin Mouat, North Carolina State University, 2022 to present
- Kerem Akdemir, North Carolina State University, 2020 to 2021
- Zachary Lucy, North Carolina State University, 2020 to 2021
- (Co-Chair) Danny Sodano, Civil, Construction, & Environmental Engineering, 2018-2020
- (Co-Chair) Sydney Forrester, School for Environment and Sustainability, September 2016-2019
- (Co-Chair) Joseph Hollingsworth, Civil, Construction, & Environmental Engineering, 2017-2019, currently in solar development
- (Co-Chair) Kate Mueller, Civil, Construction, & Environmental Engineering, 2017-2018, currently a consultant at Camus Group
- (Chair) Bhuvan Neema, School for Environment and Sustainability, November 2015-2017, currently energy analyst at NextEra
- (Chair) Xinwei Li, School of Natural Resources & Environment, December 2015-2017, currently: doctoral student at UC Davis
- (Chair) Dan Ryan, School of Natural Resources & Environment and Ross School of Business, January 2015-2017, currently: Associate at EDF Renewable Energy
- (Co-Chair) Nicole Ryan, School of Natural Resources & Environment and Mechanical Engineering, 2015-2016, currently: doctoral student at University of Michigan
- (Chair) Shreyas Vangala, School of Natural Resources & Environment, 2015-2016, currently: Strategy Analyst at New York Power Authority
- (Chair) Joshua Novacheck, Mechanical Engineering and School of Natural Resources & Environment, University of Michigan, January 2013 to December 2014; recipient of the Dow Masters Fellowship; currently: Electricity System Research Engineer at the National Renewable Energy Laboratory

Master's projects

- Southeast Michigan Regional Energy Office, Municipal Street Lighting Consortium: Deshpande, Durand, Liang, Liu, McGinnis, 2015-2016
- SunEdison Solar Strategies: Heidenreich, Serron, Kletter, Underwood, Azgaldov, Dahagama, Wolff, 2014-2015
- Transportation Solutions to Reduce Fossil Fuel Dependence on Hawaii Island: Madrazo, Epstein, McManamon, Medina, Wen, 2013-2014

SELECTED SERVICE

- Senior Faculty Fellow, KIETS Climate Leaders Program (2022-present)
- Environmental Research: Energy, IOP Publishing, Editorial Board (2023-present)
- Gov. Cooper's Technical Advisory Committee, Pathways Analysis on Executive Order 246 on Climate and Equity, (2022-2023)

- Association of Environmental Engineering and Science Professors (AEESP) Student Services Committee, supporting the Academic Job Application Review (AJAR) program, (2021-present)
- North Carolina State University Energy Collaborative, Organizing Committee (2017-present)
- International Symposium on Sustainable Systems and Technology (ISSST) Organizing Committee (2017-2021), Program Co-Chair (2016-2021), and Leadership Committee (2014-2021)
- Civil, Construction & Environmental Engineering (CCEE) Environmental, Water Resources & Coastal Engineering Symposium Committee: Faculty Member (2017-2022)
- CCEE Publicity Committee: Faculty Member (2017-present)
- Committee member: President Schlissel's Committee on Greenhouse Gas Reduction, 2014-2017.
- Committee member: UM Central Power Plant Expansion Committee, 2016-2017.
- Judge in Renewable Energy Case Competition, Ross School of Business, University of Michigan, 2012, 2014-2016
- Advisor for University of Michigan Social Venture Fund, 2014-2017.
- Committee member: Scholarship (SNRE, Dow Sustainability Fellows), 2016-present
- Committee member: School for Environment and Sustainability Transition Team - Administrative Structures, 2016-present
- Erb Institute Teaching Case Judge, 2014.
- Dow Sustainability Project Advisor, Value of Solar in Michigan, 2014.
- Reviewer: National Science Foundation, Environmental Science & Technology, Nature Energy, Energy Policy, Journal of Industrial Ecology, Applied Energy, Landscape and Urban Planning, PLOS One

SELECTED PRESS COVERAGE

- Borunda, A., Solar panels and batteries on your home could help prevent the next grid disaster, *National Geographic*, Feb 25, 2021
- Rosen, J., Electric scooters are good for the environment, right? Here's why it's not so simple, *Los Angeles Times*, Aug 2, 2019.
- Ho, V., Electric scooters aren't as eco-friendly as they seem, study finds, *The Guardian*, Aug 3, 2019.
- Temple, J., Sorry, scooters aren't so climate-friendly after all, *MIT Tech Review*, Aug 2, 2019.
- Ivanova, I., E-Scooters are worse for the environment than many claim, study indicates, *CBS News*, Aug 6, 2019.
- CBC Radio, E-scooters are coming to Canada — but they're not as eco-friendly as you might think: study, *As It Happens*, rebroadcast on ~100 US PRI stations, Aug 8, 2019.
- Lee, S. Ex-EPA, Climate Czar Browner Shifts to Scooter Sustainability, *Bloomberg*, Aug 26, 2019.
- Ouzts, E., Study: Electric scooters increase carbon emissions in most cases, *Energy News Network*, Aug 2, 2019.
- Harder, A., Electric scooters aren't as green as they seem, *Axios*, Aug 2, 2019.
- Hawkins, A., Electric scooters aren't quite as climate-friendly as we thought, *The Verge*, Aug 2, 2019.
- Trendy e-scooters might not be as green as they seem, *Nature*, Aug 12, 2019.
- Sigal, S., We regret to inform you that scooters aren't actually good for the environment, *Vox*, Aug 8, 2019.
- Keating, D., Shared Electric Scooters Worse For Climate Than Riding A Moped – Study, *Forbes*, Aug 8 2019.
- Are Electric Scooters Actually Good For The Environment?, *Science Friday*, Aug 16, 2019.
- Lowrey, A., The Case Against Paper Straws, *The Atlantic*, Aug 20, 2019.

- Tucker, A., Why e-scooters might not be as environmentally friendly as they seem, *Star Calgary*, Aug 19, 2019.
- Charlton, A., Use an e-scooter to save the environment? You might be better on the bus, *Salon*, Aug 8, 2019.
- Abend, L., Cyclists and E-Scooters Are Clashing in the Battle for Europe's Streets, *Time*, Aug 27, 2019.
- Harder, A., Conservative group projects big price tags for Green New Deal *Axios*, May 8, 2019.
- Ouzts, E., Study: Batteries are coming to N.C., but how many, how soon depends on policy *Energy News Network*, January 8, 2019.
- Anderson, H. North Carolina panel bullish on energy storage, *Daily Energy Insider*, December 10, 2018.
- Shipman, M., Report spells out options for energy storage in North Carolina *WRAL TechWire*, December 5, 2018.
- Boraks, D., Duke Energy Making \$500 Million Bet On Battery Storage, *WFAE*, Oct 31, 2018.
- Magill, B., Fluence, Battery Makers to Gain as Arizona Considers Storage Goal *Bloomberg Environment*, Feb 8, 2018.
- Maloney, P., First do no harm: Michigan researchers publish storage sustainability guidelines *Utility Dive*, Feb 22, 2016.
- Balaskovitz, A., Michigan researchers issue guidelines for sustainable energy storage *Midwest Energy News*, Feb 19, 2016.
- Allington, A., States wavering on standards for renewable energy *National Public Radio, Marketplace*, July 24, 2015.
- Balaskovitz, A., Natural gas or renewables? New model helps states decide *Midwest Energy News*, Mar 23, 2015.
- Balaskovitz, A., Energy policy takes center stage in state Legislature this year *MiBiz*, Mar 1, 2015.
- Ignaczak, N., Can we power the Mitten with energy freedom? *Concentrate*, Feb 11, 2015.
- WEMU News, interview on Michigan Renewable Portfolio Standard, Jan 20, 2015.
- Tsao, S., Study: Higher Michigan RPS would boost wind, solar, *Argus Media*, Jan 14, 2015.
- WKAR Public Media, interview on Michigan Renewable Portfolio Standard, *Current State*, Jan 13, 2015.
- Balaskovitz, A., Michigan study shows ‘modest’ costs to expand renewables *Midwest Energy News*, Jan 13, 2015.
- Balaskovitz, A., ‘A tale of two peninsulas’: Can Michigan’s grid be unified? *Midwest Energy News*, Nov 20, 2014.
- Balaskovitz, A., Biomass key to Upper Peninsula’s future renewable portfolio *Midwest Energy News*, Oct 28, 2014.
- WKAR Public Media, interview on Presque Isle Power Plant retirement, *Current State*, Oct 21, 2014.
- Balaskovitz, A., Will EPA carbon rules push Michigan harder on clean energy? *Midwest Energy News*, July 1, 2014.
- Johnson, J., Greener energy for Michigan: study examines impact, cost of increased RPS targets, University of Michigan, Planet Blue, *The Conversation*, June 20, 2014.
- Reed, E., Will The EPA Take Your Job? *Main Street*, June 23, 2014.
- Matheny, K., New coal rules: Good news on Michigan jobs, or bad news on electricity rates? *Detroit Free Press*, June 2, 2014.
- Neuhauser, A., State of the Union Preview: Energy and the Environment - Experts weigh in on what Obama may say on energy and environmental policy *U.S. News & World Report*, Jan 28, 2014.