

**Michael T. Craig**  
Assistant Professor  
School for Environment and Sustainability  
Department of Industrial and Operations Engineering, College of Engineering  
University of Michigan  
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## **EDUCATION**

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**Carnegie Mellon University** Pittsburgh, PA  
Doctor of Philosophy in Engineering and Public Policy December 2017  
Thesis: Economic and Environmental Costs, Benefits, and Trade-offs of Low-carbon Technologies in the Electric Power Sector

**Massachusetts Institute of Technology** Cambridge, MA  
Master of Science in Technology and Policy May 2014  
Thesis: An Assessment of Time-Differentiated Pricing of Nitrogen Oxide Emissions from the Power Sector

**Washington University in St. Louis** St. Louis, MO  
Bachelor of Arts in Environmental Studies, *Summa cum Laude* December 2010

## **APPOINTMENTS**

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Assistant Professor. School for Environment and Sustainability, University of Michigan. 2019-present.  
Assistant Professor. Department of Industrial and Operations Engineering, College of Engineering, University of Michigan. 2019-present.  
Associate Director. Institute for Energy Solutions, College of Engineering, University of Michigan. 2024-present.  
Faculty Affiliate. Science, Technology, and Public Policy Certificate Program, University of Michigan. 2019-present.  
Research Engineer III. Power System Design and Planning Group, National Renewable Energy Laboratory. 2018-2019.

## **PEER-REVIEWED PUBLICATIONS**

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*Google Scholar metrics*

Citations: 968; h-index: 19; i10-index: 27 (as of November 2024).

*Italics* indicates co-author is a student.

*In review*

*Owusu-Obeng, P.Y., S.B. Mills, and M.T. Craig.* Implications of zoning ordinances for rural utility-scale photovoltaic deployment and power system decarbonization in the Great Lakes region. Nature Communications.

*Wu, H., Q. Kong, M. Huber, M. Sun, and M.T. Craig.* Climate change will increase high temperature risks, degradation, and costs of rooftop photovoltaics globally. Joule.

- Chen, J., M.T. Craig, J. Michalek, M. Bruchon, and P. Vaishnav.* Negative electric vehicle emissions: vehicle-to-grid incentivizes enough wind and solar investment to reverse EV charging emissions. Joule.
- Nawawi, S., M. Yi, M.T. Craig, T. Detjeen, and P. Vaishnav.* Cross-sectoral tradeoffs in a changing climate: surrogate models to balance home energy bills, occupant comfort, and power system externalities. Joule.
- Garrouste, M., B. Kochunas, M. Vanatta, and M.T. Craig.* A Small Modular Reactors deployment roadmap for the decarbonization of the U.S. power and industrial sectors. One Earth.
- Pham, A., B. Kinzer, R. Jain, R.B. Chandran, and M.T. Craig.* Assessing the value of coupling thermal energy storage with air-source heat pumps for residential space heating in U.S. cities. Cell Reports: Sustainability.
- Garrouste, M., M.T. Craig, D. Wendt, M.H. Diaz, W. Jenson, Q. Zhang, and B. Kochunas.* Techno-economic analysis of synthetic fuel production from existing nuclear power plants across the United States. Environmental Research: Energy.

2024

- Shi, M., X. Lu, and M.T. Craig.* Climate change impacts on the evolving value and technoeconomically optimal adoption of residential rooftop solar photovoltaics. Nature Climate Change **14**: 482-489.
- Vanatta, M., W. Stewart, and M.T. Craig.* The role of policy and module manufacturing learning in industrial decarbonization by small modular reactors. Nature Energy. (In press.)
- Sundar, S., F. Lehner, N. Voisin, and M.T. Craig.* Identifying robust decarbonization pathways for the western u.s. electric power system under deep climate uncertainty. Earth's Future **12**.

2023

- Koleva, M., Y. Shi, K. McKenna, M.T. Craig, and A. Nagarajan.* Optimal strategies for hybrid battery-storage systems design. Energy Technology **11**: 2300115.
- Pham, A., and M.T. Craig.* Advanced planning for negative emissions U.S. power systems yields little cost savings. Applied Energy **350**: 121649.
- Sundar, S., M.T. Craig, A. Payne, D.J. Brayshaw, and F. Lehner.* Meteorological drivers of resource adequacy failures in current and high renewable Western U.S. power systems. Nature Communications **14**: 6379.
- Vanatta, M., D. Patel, T. Allen, D. Cooper, and M.T. Craig.* Technoeconomic analysis of small modular reactors decarbonizing industrial process heat. Joule **7**: 713-737.
- Wildstein, P., M.T. Craig, and P. Vaishnav.* Participant overrides can halve the reliability value of direct load control programs. Energy and Buildings **299**: 113606.

2022

- Craig, M.T., J. Wohland, L.P. Stoop, A. Kies, B. Pickering, H.C. Bloomfield, J. Browell, M. de Felice, C.J. Dent, A. Deroubaix, F. Frischmuth, P.L.M. Gonzalez, A. Grochowicz, K. Gruber, P. Hartel, M. Kittel, L. Kotzur, I. Labuhn, J.K. Lundquist, N. Pflugradt, K. van der Wiel, M. Zeyringer, and D.J. Brayshaw.* Overcoming the disconnect between energy system and climate modelling. Joule **6**: 1405-1417.
- Mays, J., M.T. Craig, L. Kiesling, J. Macey, B. Shaffer, and H. Shu.* Private risk and social resilience in liberalized electricity markets. Joule **6**: 369-380.

- Pham, A., L. Lovdal, T. Zhang, and **M.T. Craig**. A techno-economic analysis of distributed energy resources versus wholesale electricity purchases for fueling decarbonized heavy duty vehicle. Applied Energy **322**: 119460.
- Vanatta, M., **M.T. Craig**, B. Rathod, J. Florez, I. Bromley-Dulfano, and D. Smith. The costs of replacing coal plant jobs with local instead of distant wind and solar jobs across the United States. iScience **25**: 104817.
- Vanatta, M., B. Rathod, J. Calzavara, T. Courtright, T. Sims, É. Saint-Sernin, H. Clack, P. Jagger, and **M.T. Craig**. Emissions impacts of electrifying motorcycle taxis in Kampala, Uganda. Transportation Research: Part D **104**: 103193.
- Woody, M., P. Vaishnav, **M.T. Craig**, G. Keoleian. Life cycle greenhouse gas emissions of the USPS next generation delivery vehicle fleet. Environmental Science & Technology **56**: 13391-13397.
- Woody, M., **M.T. Craig**, P. Vaishnav, G. Lewis, and G. Keoleian. Optimizing future cost and emissions of electrified delivery vehicles. Journal of Industrial Ecology **26**: 1108-1122.

2021

- Wang, M., and **M.T. Craig**. The value of vehicle-to-grid in a decarbonizing California grid. Journal of Power Sources **513**: 230472.
- Bromley-Dulfano, I., J. Florez, and **M.T. Craig**. Reliability benefits of wide-area renewable energy planning across the Western United States. Renewable Energy **179**: 1487-1499.
- Fonseca, F.R., **M.T. Craig**, M. Berges, E. Severnini, A. Loew, H. Zhai, Y. Cheng, B. Nijssen, N. Voisin, J. Yearsley, and P. Jaramillo. Climate-induced tradeoffs in planning and operating costs of a regional electricity system. Environmental Science & Technology **55**: 11204-11215.
- Woody, M., P. Vaishnav, **M.T. Craig**, G. Lewis, and G. Keoleian. Charging strategies to minimize greenhouse gas emissions of electrified delivery vehicles. Environmental Science & Technology **55**: 10108-10120.
- Farthing, A., **M.T. Craig**, and T. Reames. Optimizing solar plus storage deployment on public buildings for climate, health, resilience, and energy bill benefits. Environmental Science & Technology **55**: 12528-12538
- Fonseca, F.R., **M.T. Craig**, P. Jaramillo, M. Berges, E. Severnini, A. Loew, H. Zhai, Y. Cheng, B. Nijssen, N. Voisin, and J. Yearsley. Effects of climate change on capacity expansion decisions of an electricity generation fleet in the Southeast U.S. Environmental Science & Technology **55**: 2522-2531.
- Guerra, O.J., B. Sergi, **M.T. Craig**, K.A. Pambour, C. Brancucci, and B.-M. Hodge. Coordinated operation of electricity and natural gas systems from day-ahead to real-time markets. Journal of Cleaner Production **281**: 124759.
- DeCarolis, J.F., P. Jaramillo, J.X. Johnson, D.L. McCollum, E. Trutnevyte, D.C. Daniels, G. Akin-Olcum, J. Bergerson, S. Cho, J.-H. Choi, **M.T. Craig**, A. R. de Queiroz, H. Eshraghi, C.S. Galik, T.G. Gutowski, K.R. Haapala, B.-M. Hodge, S. Hoque, J.D. Jenkins, A. Jenn, D.J.A. Johansson, N. Kaufman, J. Kiviluoma, Z. Lin, H.L. MacLean, E. Masanet, M.S. Masnadi, C.A. McMillan, D.S. Nock, N. Patankar, D. Patino-Echeverri, G. Schivley, S. Siddiqui, A.D. Smith, A. Venkatesh, G. Wagner, S. Yeh, and Y. Zhou. Leveraging open-source tools for collaborative macro-energy system modeling efforts. Joule **4**: 2523-2526.

2020

- Carreño, I.L., **M.T. Craig**, M. Rossol, M. Ashfaq, F. Batibeniz, S.E. Haupt, C. Draxl, B.-M. Hodge, C. Brancucci. Potential impacts of climate change on wind and solar electricity generation in Texas. Climatic Change **163**: 745-766.
- Craig, M.T.**, O.J. Guerra, C. Brancucci, K.A. Pambour, and B.-M. Hodge. Valuing intra-day coordination of electric power and natural gas system operations. Energy Policy **141**: 111470.
- Craig, M.T.**, P. Jaramillo, B.-M. Hodge, B. Nijssen, and C. Brancucci. Compounding climate change impacts during high stress periods for a high wind and solar power system in Texas. Environmental Research Letters **15**: 024002.

2019

- Craig, M.T.**, J. Zhao, G. Schneider, A. Schneider, W. Sterling, and G. Stark. Net revenue and downstream flow impact trade-offs for a network of small-scale hydropower facilities in California. Environmental Research Communications **1**: 011001.
- Craig, M.T.**, I.L. Carreño, M. Rossol, B.-M. Hodge, and C. Brancucci. Effects on power system operations of potential changes in wind and solar generation potential under climate change. Environmental Research Letters **14**: 034014.
- Kumler, A., I.L. Carreño, **M.T. Craig**, B.-M. Hodge, and C. Brancucci. Inter-annual variability of wind and solar electricity generation and capacity values in Texas. Environmental Research Letters **14**: 044032.

2018

- Craig, M.T.**, S. Cohen, J. Macknick, C. Draxl, O.J. Guerra, M. Sengupta, S.E. Haupt, B.-M. Hodge, and C. Brancucci. A review of the potential impacts of climate change on bulk power system planning and operations in the United States. Renewable and Sustainable Energy Reviews **98**: 255-267.
- Craig, M.T.**, P. Jaramillo, B.-M. Hodge, N.J. Williams, and E. Severnini. A retrospective analysis of the market price response to distributed photovoltaic generation in California. Energy Policy **121**: 394-403.
- Craig, M.T.**, P. Jaramillo, and B.-M. Hodge. Carbon dioxide emissions effects of grid-scale electricity storage in a decarbonizing power system. Environmental Research Letters **13**: 014004.
- Craig, M.T.**, and W.B. Jacobs. Legal pathways to widespread carbon capture and sequestration. Environmental Law Reporter **47**: 11022-11047.

2017

- Craig, M.T.**, P. Jaramillo, H. Zhai, and K. Klima. The economic merits of flexible carbon capture and sequestration as a compliance strategy with the Clean Power Plan. Environmental Science & Technology **51**: 1102-1109.
- Craig, M.T.**, H. Zhai, P. Jaramillo, and K. Klima. Trade-offs in cost and emission reductions between flexible and normal carbon capture and sequestration under carbon dioxide emission constraints. International Journal of Greenhouse Gas Control **66**: 25-34.

2016

- Craig, M.T.**, E. McDonald-Buller, and M.D. Webster. Technology adoption under time-differentiated market-based instruments for pollution control. Energy Economics **60**: 23-34.

McDonald-Buller, E., Y. Kimura, **M.T. Craig**, G. McGaughey, D. Allen, and M.D. Webster. Dynamic management of NO<sub>x</sub> and SO<sub>2</sub> emissions in the Texas and Mid-Atlantic electric power systems and implications for air quality. Environmental Science & Technology 50: 1611-1619.

2011

**Craig, M.T.**, J.L. Orrock, and L.A. Brudvig. Edge mediated patterns of seed removal in experimentally connected and fragmented landscapes. Landscape Ecology 26: 1373-1381.

## **OTHER PUBLICATIONS**

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2023

Energy Systems Integration Group. Weather dataset needs for planning and analyzing modern power systems. A Report of the Weather Datasets Project Team. Reston, VA. [Main project team contributor.]

2022

Jaramillo, P., S. Kahn Ribeiro, P. Newman, S. Dhar, O.E. Diemuodeke, T. Kajino, D.S. Lee, S.B. Nugroho, X. Ou, A. Hammer Strømman, and J. Whitehead. Transport. In IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK and New York, NY, USA. [Contributing author]

Dubash, N.K., C. Mitchell, E.L. Boasson, M.J. Borbor-Cordova, S. Fifita, E. Haites, M. Jaccard, F. Jotzo, S. Naidoo, P. Romero-Lankao, M. Shlapak, W. Shen, and L. Wu. National and sub-national policies and institutions. In IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK and New York, NY, USA. [Contributing author.]

Reiter, H. (moderator), R. Nateghi, J. Bruzgul, H. Payne, and **M.T. Craig**. Past the tipping point: How regulators and utilities are and will be looking at ways to mitigate the inevitable impacts of climate change. *Energy Law Journal* 43: 191-222.

2021

**M.T. Craig** and C. Brancucci. Impact of variable renewable energy sources on bulk power system planning and operations. In A. Rubino, A. Sapio, M.L. Scala, and M. Hallack (Eds.), Handbook of Energy Economics and Policy, Elsevier.

Koritarov, V., P. Balducci, T. Levin, M. Christian, J. Kwon, C. Milostan, Q. Ploussard, M.P.Y. Tian, T. Mosier, S.M.S. Alam, R. Bhattarai, M. Mohanpurkar, G. Stark, D. Bain, **M.T. Craig**, B. Hadjerioua, P. O'Connor, S. Mukherjee, K. Stewart, X. Ke, and M. Weimar. Pumped Storage Hydropower Valuation Guidebook: A Cost-Benefit and Decision Analysis Valuation Framework. Argonne National Laboratory Technical Report ANL-21/10.

2020

Guerra, O.J., B. Sergi, B.-M. Hodge, **M.T. Craig**, K.A. Pambour, R.T. Sogwi, and C. Brancucci. Electric Power Grid and Natural Gas Network Operations and Coordination. National Renewable Energy Laboratory Technical Report NREL/TP-6A50-77096.

2018

Jacobs, W., and **M.T. Craig**. Carbon capture and sequestration. In M. Gerrard and J. Dernbach (Eds.), Legal Pathways to Deep Decarbonization in the United States, Environmental Law Institute.

2011

Bernard, M., **M.T. Craig**, and I. Sened. The role of institutions in the implementation of wind energy. In A. Marcus, P. Shrivastava, S. Sharma and S. Pogutz (Eds.), Cross-Sector Leadership for the Green Economy, Palgrave Macmillan.

## **RESEARCH FUNDING**

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2024

University of Michigan Office of the Vice President for Research: Bold Challenges BOOST Program. *Decarbonized, Equitable, and Climate Adapted Directions for Energy Systems*. \$75,000 (PI).

2023

University of Michigan Graham Sustainability Institute. *Advancing Successful and Equitable Decarbonization of the U.S. Electric Power and Residential Sectors Given Sectoral Interactions, Climate Change Impacts, and Energy Burdens*. \$159,178 (PI).

2022

U.S. National Science Foundation: Environmental Sustainability. *CAREER: Making Decarbonization of the Electric Power Sector Robust to Climate Change*. \$507,983 (PI).

2021

U.S. National Science Foundation: Environmental Sustainability. *Coupling Decarbonization of the Power System with Advance Planning for Integrating Negative Emission Technologies*. \$287,495 (PI).

U.S. Department of Energy: Solar Energy Technologies Office. *Mapping and Bridging Barriers in Knowledge Flows of How Solar Photovoltaics Affect Rural Community Economies*. \$1,289,000 (PI).

University of Michigan: Graham Institute for Sustainability. *Evaluation of Thermal Energy Storage Materials, Mechanisms, and Deep Decarbonization*. \$300,000 (co-PI, \$97,000).

2020

U.S. Department of Energy: Nuclear Energy University Program. *Optimal Nationwide Deployment Pathways of Small Modular Reactors in Electric Power, Industrial, and Other Niche Markets to Achieve Widespread Use and Cost Reductions*. \$691,657 (PI).

University of Michigan: Energy Institute. *Estimating Future Emissions of a Decarbonizing DTE System Through Grid-Scale and Marginal Emissions Modeling*. \$15,000 (PI).

University of Michigan: Graham Institute for Sustainability. *Current and Future Emission, Air Quality, Economic and Health Benefits of Electrifying the Motorcycle Taxi Fleet (Boda bodas) in Kampala, Uganda, in Partnership with Zembo*. \$10,000 (PI).

U.S. Idaho National Laboratory. *Emerging Energy Market Analysis (EMA), Geographically Remote Energy Center (GREC) Case Study*. \$42,000 (PI).

University of Michigan: Office of Research. *Integrating Direct Air Capture into Electric Power Systems*. \$13,890 (PI).

## ADVISING

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### Current PhD Students

#### *Primary advisor*

Pam Wildstein - PhD candidate, School for Environment and Sustainability and School for Urban and Regional Planning. (2020-present.)

*Subject:* Orienting the roles of consumers and communities in a more distributed grid. *NSF GRFP recipient.*

Max Vanatta - PhD candidate, School for Environment and Sustainability. (2021-present.)

*Subject:* Decarbonization of industrial heat via nuclear small modular reactors.

Papa Yaw Owusu-Obeng - PhD candidate, School for Environment and Sustainability. (2021-present.)

*Subject:* Capturing local zoning and economic impacts in utility-scale solar deployment in rural communities.

Haochi Wu - visiting PhD candidate, School of Control Science and Engineering, Zhejiang University. (2023-present.)

*Subject:* Updating technology performance and standards under climate change.

Camilo Toruno-Taylor - PhD candidate, Department of Industrial and Operations Engineering. (2023-present.)

*Subject:* Quantifying household energy burdens under climate change.

Martha Christino - PhD student, School for Environment and Sustainability and Department of Climate and Space Sciences and Engineering. (2023-present.)

*Subject:* Identifying and understanding the impact of climate-driven weather extremes on the bulk power system. *NSF GRFP recipient.*

Megan Jones - PhD student, School for Environment and Sustainability. (2024-present.)

*Subject:* Quantifying and eliminating barriers to equitable access to EV charging infrastructure.

Wei Ai - PhD student, School for Environment and Sustainability. (2024-present.)

*Subject:* Quantifying the value of long-duration storage technologies under infrastructure constraints.

#### *Co-advisor*

Jill Moraski - PhD Candidate, Energy and Resources Group, UC Berkeley. (2024-present.)

*Subject:* Integrating building and power system planning under climate extremes.

### PhD Thesis Committee Service

Marisol Garrouste – PhD in Nuclear Engineering and Radiological Sciences, University of Michigan. (2024.) *Techno-economic Analyses for Non-electric Applications of Nuclear Power*. Committee: **M.T. Craig** (co-chair), B. Kochunas (co-chair, UM NERS), T. Allen (UM NERS), J. Mathieu (UM EECS), P. Talbot (INL).

Srihari Sundar – PhD in Aerospace Engineering and Scientific Computing, University of Michigan. (2023.) *Enhancing Power System Planning by Exploiting Energy and Meteorology Linkages*. Committee: **M.T. Craig** (chair), A. Payne (UM CLASP), K. Powell (UM AE), M. Wooldridge (UM AE).

Chongxing Fan – PhD in Climate and Space Engineering and Sciences, University of Michigan. (2024.) *The Importance of Accurate Physical Parameterization for Radiative Transfer in Global Climate Simulations and Remote Sensing: Examples of Cloud Longwave Scattering and Solar Farm Modeling*. Committee: X. Huang (chair, UM CLASP), **M.T. Craig**, M.G. Flanner (UM CLASP), N.O. Renno (UM CLASP).

Alireza Ramyar – PhD in Electrical and Computer Engineering, University of Michigan. (2023.) *Power Processing Architectures for Sustainable Power and Energy*. Committee: A.-T. Avestruz (chair, UM ECE), **M.T. Craig**, H. Hofmann (UM EECS), J.B. Siegel (UM ME).

Reshmi Ghosh – PhD in Civil and Environmental Engineering, Carnegie Mellon University. (2021.) *Data-driven stochastic reliability assessment of the US electricity grid under large penetration of variable renewable energy resources*. Committee: H. Scott Matthews (chair, CMU CEE), **M.T. Craig**, C. Samaras (CMU CEE), M. Small (CMU EPP), M. Pozzi (CMU CEE).

### **Post-Doctoral Fellows**

Aviad Navon – PhD in Electrical and Computer Engineering, Technion-Israel Institute of Technology. (2024-present.)

*Subject:* Adapting electricity distribution networks to climate change.

An Pham – PhD in Energy Engineering, Pennsylvania State University. (2021-2023.)

*Subject:* Analyzing technoeconomic potential of negative emission and thermal energy storage technologies.

Franklyn Kanyako – PhD in Industrial Engineering and Operations Research, University of Massachusetts Amherst. (2024-present.)

*Subject:* Quantifying the effect of R&D on learning and deployment of direct air capture.

### **AWARDS AND NOMINATIONS**

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#### **Awards**

Editors' Choice. *Joule*. 2023.

CAREER Award. *U.S. National Science Foundation*. 2022.

Outstanding Young Investigator Award. *Institute of Industrial & Systems Engineers, Energy Systems Division*. 2022.

1<sup>st</sup> Place, Energy Week Three Minute Thesis Competition. *Carnegie Mellon University*. 2016.

2<sup>nd</sup> Place, Three Minute Thesis Competition. *Carnegie Mellon University*. 2015.

1<sup>st</sup> Place, Case Competition. *U.S. Association of Energy Economics North American Conference*. Anchorage, AK. 2013.

#### **Nominations**

Outstanding Teaching Nomination. *University of Michigan*. 2020.

Outstanding Research Mentor Nomination. University of Michigan Undergraduate Research Opportunities Program. 2020.

### **PROFESSIONAL ACTIVITIES**

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Technical review committee member. *Power Planning for Alignment of Climate and Energy Systems Project, U.S. National Renewable Energy Laboratory*. 2024-present.

Technical advisory committee member. *Climate Resilient Electricity System, Energy and Environmental Economics, Inc*. 2023-present.



Editorial board member. *Environmental Research: Energy*. IOP Publishing. 2023-present.

Steering committee member. *Macro-Energy Systems Community*. 2023-present.

Steering committee member. *Next Generation Challenges in Energy Climate Modelling*. 2021-present.

Steering committee member. *Electric Power Research Institute Climate READi Initiative*. 2022-present.

Steering committee member. *University of Michigan College of Engineering Institute for Energy Solutions*. Ann Arbor, MI. 2022-2024.

Steering committee member. *University of Michigan College of Engineering Integrative Systems and Design Division*. Ann Arbor, MI. 2022-present.

Program faculty. *Institute of Public Utilities, Michigan State University*. 2019-2023.

Participant. *Working Group on Multisector Impacts of Energy Transitions*. Virtual. 2020-present.

Participant. *Electric Sector Team, Open Energy Outlook*. Virtual. 2019-present.

Contributing Author. *Chapter 10 of 6<sup>th</sup> Annual Review, Intergovernmental Panel on Climate Change*. Virtual. 2019-2022.

Science and Engineering Ambassador. *National Academy of Sciences and National Academy of Engineering*. Pittsburgh, PA. 2015-2017.

Co-leader. *Summer Center for Climate, Energy, and Environmental Decisionmaking, Carnegie Mellon University*. Pittsburgh, PA. 2016.

## INVITED TALKS

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Emerging analytical techniques, opportunities, and challenges in transmission planning. Panelist. *Probabilistic planning symposium: Transmission planning for tomorrow's uncertainty*. Midcontinent Independent System Operator. November 19-20, 2024.

Risk informed decision-making for operational reliability and resiliency. Panelist. *Department of Energy Office of Electricity's Grid Controls and Communications Division Program Review*. Washington, DC. October 30-31, 2024.

Increased value and reduced reliability of rooftop solar in a warming world. *University of British Columbia Clean Energy Research Centre Seminar*. Vancouver, BC. July 23, 2024.

Identifying robust electricity decarbonization pathways in the Western United States. *University of Michigan Applied Physics Departmental Seminar*. Ann Arbor, MI. September 27, 2023

Making power systems robust to climate change and meteorological extremes. *U.S. National Renewable Energy Laboratory*. Golden, CO. June 12 2023.

Overcoming the disconnect between energy system and climate modeling. *Electric Power Research Institute Climate READi Workshop*. Washington, DC. May 11, 2023

The value of nuclear small modular reactors for decarbonizing industrial heat processes. *International Federation of Operational Research Societies Global Webinar*. Virtual. April 27, 2023.

Advancing climate adaptation in a decarbonizing electric power sector. *University of Toronto Centre for Climate Science and Engineering Lecture Series*. Virtual. December 8, 2022.

Advancing climate adaptation in a decarbonizing electric power sector. *Pennsylvania State University Department of Energy and Mineral Engineering Departmental Seminar*. State College, PA. October 7, 2022.

Furthering a just transition through quantitative modeling of *boda boda* electrification and U.S. coal to renewable workforce transition. *University of Toronto CivMin Distinguished Lecture*. Toronto, ON, Canada. July 25, 2022.

Power system planning under a changing climate: recent advances and future directions. *Next Generation Challenges in Energy Climate Modelling*. Virtual. September 16-17, 2021.

Climate induced tradeoffs in planning and operating of a regional electricity system. *U.S. Department of Energy Solar Energy Technologies Office Solar Colloquium*. Virtual. September 7, 2021.

Making power system investment decisions under a changing climate. *Virtual Conference on Decision Making for Emerging Risks, INFORMS Decision Analysis Society*. Virtual. June 15, 2021.

Climate-induced tradeoffs in planning and operating of the southeast united states power system. *Chinese Society for Industrial Ecology Environmental and Ecological Systems Engineering Forum*. Virtual. November 11, 2021.

Electricity systems in a changing climate: Investment and equity implications. *Michigan Technology University Mechanical Engineering – Engineering Mechanics Graduate Student Seminar*. Virtual. January 14, 2021.

Electricity systems in a changing climate: investment and equity implications. *University of Maryland Center for Global Sustainability Forum*. Virtual. September 23, 2020.

Electricity systems in a changing climate. *Dartmouth University Arthur L. Irving Institute for Energy & Society, New Energy: Conversations*. Virtual. July 29, 2020.

Planning electric power systems for changing technologies and climate. *University of Michigan Conference on Transportation, Economics, Energy, and the Environment*. Virtual. October 9, 2020.

Decarbonizing electric power systems under economic, regulatory, and system constraints. *University of Michigan Climate and Space Sciences and Engineering Departmental Seminar*. Ann Arbor, MI. February 27, 2020.

Planning the electricity system for a changing climate. *University of Alberta Mechanical Engineering Departmental Seminar*. Edmonton, AB, Canada. November 7, 2019.

Electricity systems in a changing climate. *University of Alberta Future of Alberta’s Electricity System*. Edmonton, AB, Canada. November 6, 2019.

## **CONFERENCE LEADERSHIP**

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Session chair. MultiSector Dynamics: Adapting energy systems to climate change. *American Geophysical Union Fall Meeting*. Washington, DC. 2024.

Cluster chair. *INFORMS Annual Meeting Section on Energy, Natural Resources, and the Environment*. Seattle, WA. 2024.

Organizing committee member. *Next Generation Challenges in Energy Climate Modelling Workshop*. Virtual. 2024.

Session chair. Multi-sector dynamics: Adapting energy systems to a changing climate by overcoming disconnects between energy system and climate modeling. *American Geophysical Union Fall Meeting*. San Francisco, CA. 2023.

Session co-chair. Energy consumption in a changing climate. *American Geophysical Union Fall Meeting*. San Francisco, CA. 2023.

Cluster chair. *INFORMS Annual Meeting Section on Energy, Natural Resources, and the Environment*. Phoenix, AZ. 2023.

Session co-chair. Multi-sector dynamics: Multisector impacts of energy transitions. *American Geophysical Union Fall Meeting*. Chicago, IL. 2022.

Session chair. Multi-sector dynamics: Adapting energy systems to a changing climate by overcoming disconnects between energy system and climate modeling. *American Geophysical Union Fall Meeting*. Chicago, IL. 2022.

Session chair. Challenges and opportunities for the U.S. fossil fuel workforce during the energy transition. *U.S. Association of Energy Economics North American Conference*. Houston, TX. 2022.

Session chair. Competing objectives in the energy transition. *INFORMS Annual Meeting*. Indianapolis, IN. 2022.

Session chair. Sector coupling and electrification. *INFORMS Annual Meeting*. Indianapolis, IN. 2022.

Organizing committee member. *Next Generation Challenges in Energy Climate Modelling*. Virtual. 2022.

Session co-chair. Challenges and opportunities for hydropower generation under climate change. *American Geophysical Union Fall Meeting*. New Orleans, LA. 2021.

Session co-chair. Multi-sector dynamics: Multi-sector impacts of energy transitions. *American Geophysical Union Fall Meeting*. New Orleans, LA. 2021.

Organizing committee member. *Next Generation Challenges in Energy Climate Modelling*. Virtual. 2021.

## **PUBLIC ENGAGEMENT**

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### **Advisory Committees, Workshops, and Public Lectures**

Invited panelist. “Advancing Climate Transition Action Plans (CTAPs) in the power sector.” *CERES*. Virtual. October 16, 2024.

Invited lecture. “Increased value and reduced reliability of rooftop solar in a warming world.” *Green Angel Ventures*. Virtual. September 6, 2024

Invited participant. “SIAM convening on climate science and clean energy.” *Society for Industrial and Applied Mathematics*. Washington, DC. October 10-12, 2022.

Invited participant. “Synthesis workshop on physical climate-related financial risk assessments.” *CarbonPlan, Environmental Defense Fund, and Initiative on Climate Risk and Resilience Law*. Virtual. December 8, 2022.

Invited expert advisor. “Utility-scale energy storage expert meeting.” *U.S. Government Accountability Office*. Virtual. September 2-5, 2022.

Co-organizer. “Advances in AI for sustainability.” *Michigan Institute of Data Science*. Virtual. October 6, 2022.

Co-Organizer. “Designing a decarbonized energy system under a changing climate.” *Clean Air Task Force, Electric Power Research Institute, World Resources Institute, National Association of Regulatory Utility Commissioners, University of Michigan, and Carnegie Mellon University*. November 16-17, 2021.

Panelist. “Electric grids and resiliency.” *Princeton Energy Conference*. Princeton, NJ. November 6, 2021.

Invited speaker. “Better planning electric power systems for a changing climate.” *Technical Conference on Emergency Preparedness, Distribution Reliability, and Storm Response*, Michigan Public Service Commission. November 5, 2021.

Panelist. “Resilient power: Storage in our energy future.” *Michigan Energy Providers Conference*. July 30, 2021.

Moderator. “Defining a distributed energy future.” *Ross Energy Conference*. Ann Arbor, MI. September 27, 2019.

Co-Organizer. “Implications of future climate states for an increasingly decarbonized electricity system.” *Clean Air Task Force, University of Michigan, and Carnegie Mellon University*. May 4, 2021.

### **Selected Media Engagement**

Epp, H. “To put more renewable power to use, utilities are doubling down on battery storage.” *Marketplace*. January 16, 2024.

Plautz, J. “4 takeaways from the grid’s record-breaking summer.” *EnergyWire*. August 25, 2023.

Stevens, H. “America needs clean electricity. These states show how to do it.” *The Washington Post*. April 12, 2023.

ANS Nuclear Café. “Study favors SMRs for use at future electric truck charging stations.” *Nuclear Newswire*. January 23, 2023.

Dyer, J. “Small modular reactors could hold key to electrifying heavy transport: Michigan study.” *SightlineU3O8*. January 19, 2023.

Buckley, C. “Facing budget shortfalls, these schools are turning to the sun.” *The New York Times*. September 15, 2022.

Gaskell, A. “Research shows that renewable jobs can replace those from coal.” *Forbes*. September 13, 2022.

Resources Radio. “Bridging the divide between energy and climate models, with michael craig.” *Resources for the Future*. June 28, 2022.

Root, T. “Renewable energy in the U.S. nearly quadrupled in the past decade, report finds.” *Washington Post*. November 9, 2021.

Rao, R. “Tomorrow’s hydropower begins with retrofitting today’s dams.” *IEEE Spectrum*. July 19, 2021.

Ben-Achour, S. “U.S. electrical grids are not prepared for climate change.” *Marketplace*. July 1, 2021.

Barber, G. “When the grid goes down, can a fleet of batteries replace it?” *WIRED*. February 24, 2021.

Russell, P.M., and C. Grinapol. “In Texas power outages, clear problems and no easy answers.” *Engineering News Record*. February 24, 2021.

Storrow, B. “Will Texas blackout offer coal a lifeline?” *E&E News*. February 23, 2021.

Pelley, J. “Climate change will force boost in electrical grid capacity, mostly from renewables.” *Chemical and Engineering News*. February 22, 2021.

Johnson, J. “The Week with Joshua Johnson.” *MSNBC*. February 20, 2021.

Flavelle, C., B. Plumer, and H. Tabuchi. “Texas blackouts point to coast to coast crises waiting to happen.” *The New York Times*. February 20, 2021.

Liederman, J. “How one Texas storm exposed an electric grid unprepared for climate change.” *NBC Nightly News*. February 16, 2021.

Plumer, B. “A glimpse of america’s future: climate change means trouble for power grids.” *The New York Times*. February 16, 2021.

Daly, M., and E. Knickmeyer. “US needs to brace itself for more deadly storms.” *Associated Press*. February 16, 2021.

Morehouse, C. “Power experts cite gas constraint as main cause of ERCOT outages.” *Utility Dive*. February 16, 2021.

Allen, T., and M.T. Craig. “An affordable zero-emissions grid needs new nuclear.” *The Hill*. May 28, 2020.

Larsen, L. “Apartment dwellers at new complex benefit from rooftop solar panels.” *NPR Morning Edition*. March 12, 2020.

### **Congressional Briefings**

Panelist. “The Gulf of Mexico: 2 years later. recovery, restoration, and regulatory reform.” *Oceana*. Washington, D.C. April 19, 2012.

Panelist. “Offshore drilling safety.” *Oceana, Sierra Club*. Mott House, Washington, D.C. February 29, 2012.

### **TEACHING**

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EAS615: Renewable Electricity and the Grid. 2019-present.

Provides SEAS graduate students with an introduction to renewable energy technologies, economics, and policies, and their integration into system operations and planning.

IOE491.023: Computational Modeling for Decarbonizing Energy Systems. 2023-present.

Provides IOE undergraduate and SEAS graduate students an in-depth understanding of and hands-on experience with computational models that we use to operate and plan energy systems.

EAS625: Technologies and Policies for Deep Decarbonization. 2019-2022.

Explores technologies and policies for deep decarbonization of the economy consistent with aggressive climate change mitigation through group discussions. Topics include climate change science and impacts, emission reduction trajectories, sectoral decarbonization strategies, global climate policies, and crosscutting issues like equity.

EAS501.023: Computational Modeling for Decarbonized Electric Power Systems. 2022.

Provides SEAS graduate students an in-depth understanding of and hands-on experience with computational models that we use to operate and plan energy systems.

EAS501.023: Modeling and Uncertainty Analysis for Sustainability and Policy. 2020.

Provides SEAS graduate students understanding and experience with computational models and methods for uncertainty analysis that are essential to sustainability analysis. Topics include introduction to Python; data characterization, manipulation, and visualization; computational modeling concepts and tools; and decision-making under uncertainty.