

Michael T. Craig
Assistant Professor of Energy Systems
School for Environment and Sustainability • University of Michigan
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EDUCATION

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

RESEARCH INTERESTS

Low- and negative-emission technologies and systems; power system markets and regulation; technoeconomic and optimization models; grid-scale energy storage; multi-sector integration and decarbonization; climate change impacts on power systems.

OTHER APPOINTMENTS

Faculty Affiliate of Science, Technology, and Public Policy Certificate, *University of Michigan*, Ann Arbor, MI (2019-present)
Research Engineer III, *National Renewable Energy Laboratory*, Denver, CO (2018-2019)

PUBLICATIONS

In review

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. Capacity expansion of an electricity generation fleet under climate change. *Joule*.

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. *Joule*.

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*.

2020

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**.

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**.

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**.

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**.

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**.

Craig, M.T., and W.B. Jacobs. Legal pathways to widespread carbon capture and sequestration. Environmental Law Reporter **47**: 11022-11047.

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.

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.

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_x and SO₂ 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

In press

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.

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

2020

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

2018

National Renewable Energy Laboratory, *Integrated Electricity Market Toolkit*, \$800,000 (co-PI)

HONORS, AWARDS, AND ACTIVITIES

Nominations

UROP Outstanding Research Mentor Nomination (2020)

Outstanding Teaching Nomination (2020)

Scholarships

Bertucci Fellowship (2016-2017)

Steinbrenner Institute Doctoral Fellow (2015-2016)

Dean's Fellowship from the Carnegie Mellon College of Engineering (2015-Present)

Achievement Rewards for College Scientists (ARCS) Scholar (2014-Present)

Competitions

1st Place, Energy Week Three Minute Thesis Competition, CMU (2016)

2nd Place, Three Minute Thesis Competition, CMU (2015)

1st Place, U.S. Association of Energy Economics Case Competition, Anchorage, AK (2013)

Outreach and Engagement

Contributing Author, Chapter 10 of 6th Annual Review, Intergovernmental Panel on Climate Change (2019-2020)
Program Faculty, Power Grid School, Institute for Public Utilities (2019-2020)
Participant, Electric Sector Team, Open Energy Outlook (2019-2020)
Co-leader, Summer Center for Climate, Energy, and Environmental Decisionmaking, Carnegie Mellon University, PA (2016)
Science and Engineering Ambassador, National Academy of Sciences and National Academy of Engineering, Pittsburgh, PA (2015-2017)

INVITED PRESENTATIONS

Departmental Seminar, “Decarbonizing Electric Power Systems under Economic, Regulatory, and System Constraints,” *Climate and Space Sciences and Engineering*, University of Michigan (2020)
Moderator, “Clean Energy Panel,” *Detroit Impact Conference*, Detroit (2020)
Departmental Seminar, “Planning the Electricity System for a Changing Climate,” *Mechanical Engineering*, University of Alberta (2019)
Future Energy Systems Research Spotlight, “Electricity Systems in a Changing Climate,” *The Future of Alberta’s Electricity System*, University of Alberta (2019)
Moderator, “Defining a Distributed Energy Future,” *Ross Energy Conference*, University of Michigan (2019)

SELECTED CONGRESSIONAL AND CONFERENCE PRESENTATIONS

Congressional Briefings

Invited panelist on offshore drilling regulatory reform post-Macondo well blowout. “The Gulf of Mexico: 2 years later. Recovery, restoration, and regulatory reform.” Briefing for Congressional staffers hosted by Oceana. Senate Russell Office Building; Commerce, Science and Transportation Committee Chamber; Washington, D.C. April 19, 2012.
Invited panelist. “Offshore drilling safety.” Briefing for Congressional staffers hosted by Oceana and Sierra Club. Mott House, Washington, D.C. February 29, 2012.

Conference Presentations

2020

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. *Michigan University-wide Sustainability and Environment Conference*. Ann Arbor, MI.

2019

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. *International Symposium for Sustainable Systems and Technology*, Portland, OR.

Craig, M.T., O.J. Guerra, C. Brancucci, K.A. Pambour, and B.-M. Hodge. Intra-day coordination of electric power and natural gas systems operations. *United States Association for Energy Economics*. Denver, CO.

2018

M.T. Craig, I.L. Carreño, C. Brancucci. Power system operation and cost implications of changes in wind and solar resources under climate change. *American Geophysical Union Fall Meeting*. Washington, D.C.

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 the planning and the expansion of SERC's power plant fleet. *American Geophysical Union Fall Meeting*. Washington, D.C.

2017

Craig, M.T., P. Jaramillo, and B.-M. Hodge. Carbon dioxide emissions effects of grid-scale electricity storage in a decarbonizing power system. *INFORMS Annual Meeting*, Houston, TX.

Craig, M.T., P. Jaramillo, and B.-M. Hodge. Carbon dioxide emissions effects of grid-scale electricity storage in a decarbonizing power system. *Energy Policy Research Conference*, Park City, UT.

Craig, M.T., P. Jaramillo, and B.-M. Hodge. Effects of grid-scale electricity storage on system carbon dioxide emissions in a decarbonizing power system. *International Symposium on Sustainable Systems and Technology and International Society for Industrial Ecology Joint Conference*, Chicago, IL.

2016

Craig, M.T., P. Jaramillo, H. Zhai, and K. Klima. Assessing the economic merits of flexible carbon capture and sequestration as a compliance strategy with the Clean Power Plan. *International Symposium on Sustainable Systems and Technology*, Phoenix, AZ.

Craig, M.T., P. Jaramillo, H. Zhai, and K. Klima. Assessing the economic merits of flexible carbon capture and sequestration as a compliance strategy with the Clean Power Plan. *Technology, Management, and Policy Graduate Consortium*, Cambridge, UK.

2015

Craig, M.T., P. Jaramillo, H. Zhai, and K. Klima. Cost-effectiveness of flexible carbon capture and sequestration for complying with the Clean Power Plan. *United States Association for Energy Economics*, Pittsburgh, PA.

TEACHING

EAS615: Renewable Electricity and the Grid

EAS677.023: Technologies and Policies for Deep Decarbonization to Mitigate Climate Change

EAS501.023: Tools for Policy and Environmental Analysis