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Bri-Mathias Hodge

Education:

Doctor of Philosophy in Chemical Engineering
2006-2010

School of Chemical Engineering, Purdue University, West Lafayette, Indiana
Thesis Title: *"A Multi-Paradigm Modeling Approach for Energy Systems Analysis"*
Advisors: Joseph F. Pekny & Gintaras V. Reklaitis
Intern – Sandia National Laboratory, Exploratory Simulation Technologies *2008*

Master of Science in Chemical Engineering with Distinction
2004-2005

Process Design Laboratory, Åbo Akademi University, Turku, Finland
Thesis Title: *"A Genetic Algorithm based Metaheuristic for Production Scheduling"*
Advisor: Tapio Westerlund

Bachelor of Science in Chemical Engineering with University and College Honors
2000-2004

Carnegie Mellon University, Pittsburgh, Pennsylvania
Minor in German
Exchange Student, Rheinisch-Westfälische Technische Hochschule – Aachen, Germany *2002-2003*

Experience:

Associate Professor
2018 – Present
Associate Director of the Renewable and Sustainable Energy Instiue (RASEI)
2021 – Present

University of Colorado – Boulder – Department of Electrical, Computer and Energy Engineering

- RASEI Fellow
- Lead a group of twelve Ph.D. students, Master's students, Postdocs, and Research Associates focusing on power & energys systems simulation and renewable energy integration.
- Started and direct a master's program in Next-Generation Power & Energy Systems.

Chief Scientist
2018 – Present
Distinguished Member of the Research Staff
2021 – Present

National Renewable Energy Laboratory

- Principal Investigator on DOE, ARPA-E, and industrial projects with a yearly funding level of over $3.5M in FY19.
- Principal Investigator on projects in the areas of: power system communications, power systems data, solar power forecasting, wind power forecasting visualization, wind and solar resource assessment, grid sensing and measurement, commercial building electricity savings, microgrid design, and ancillary service products from renewable energy.

Manager – Power System Design and Studies Group
2016 - 2018

National Renewable Energy Laboratory

- Management of 25 full-time NREL employees in addition to up to 20 visiting Ph.D. students and interns. Grew the group from 12 FTEs to 25 FTEs in first year.
- Principal Investigator on DOE, ARPA-E, and industrial projects with a yearly funding level of over $3.5M in FY18.
- Principal Investigator on projects in the areas of: power system communications, power systems data, solar power forecasting, wind power forecasting visualization, wind and solar resource assessment, grid sensing and measurement, commercial building electricity savings, microgrid design, and ancillary service products from renewable energy.

Lecturer and Assistant Professor Adjoint
2016 - 2018

University of Colorado – Boulder – Department of Electrical, Computer and Energy Engineering

- Taught graduate course – Renewable Energy and the Future of the Electricity Grid – every fall semester.
- Ph.D. advisor for two students working on renewable energy integration.

Adjunct and Affiliate Professor
2014 - Present

Colorado School of Mines – Department of Chemical and Biological Engineering

- Taught senior design course, CBEN402 – Chemical Engineering Design (Spring 2014)
- Co-supervising a Ph.D. student on the modeling of cyanobacteria consortia

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Fulbright Scholar   *Summer 2016*
VTT – Wind Power Integration Team, Finland
- Funded through a Fulbright-VTT Grant in Science, Technology and Innovation
- Research on the economics of bulk power flexibility options with high renewable energy penetrations

Section Supervisor – System Planning and Reliability   *2014 - 2015*
National Renewable Energy Laboratory – Transmission and Grid Integration Group
- Management of seven full-time NREL employees in addition to eight visiting students and interns.
- Managed wind, solar, and electricity projects with combined yearly funding level of over $1.8M in FY15.
- Principal investigator on projects in the areas of: power system flexibility requirements, integrated distribution-transmission systems modeling, the value of wind power forecasting, wind resource assessment, solar resource assessment, reliability impacts of wind power forecasting, solar power forecasting, and the impacts of electric vehicles on bulk power systems.

Senior Engineer   *2013 - 2014*
National Renewable Energy Laboratory – Transmission and Grid Integration Group
- Managed wind, solar, and electricity projects with combined yearly funding level of over $1.8M in FY14, including supervision of NREL staff, postdoctoral researchers, subcontractors, visiting graduate students, and student interns.
- Principal investigator on projects in the areas of: cyber-physical-energy systems, distribution level PMUs, mesoscale climate modeling (WIND Toolkit dataset), the value of wind power forecasting, solar power forecasting, and the impacts of distributed wind on transmission level operations.
- Presented at numerous conferences and technical review committees to disseminate key findings to stakeholders.

Research Engineer   *2011 - 2013*
National Renewable Energy Laboratory – Transmission and Grid Integration Group
- Managed wind, solar, and electricity projects with combined yearly funding level of over $400k in FY12 and $2M in FY13, including supervision of NREL staff, postdoctoral researchers, subcontractors, visiting graduate students, and student interns.
- Principal investigator on projects in the areas of: mesoscale climate modeling, wind power forecasting and resource assessment, solar power forecasting, renewable integration costs, the impacts of distributed wind on transmission level operations, the value of wind power forecasting, and sub-hourly solar variability.
- Presented at numerous conferences and technical review committees to disseminate key findings to stakeholders.
- Led statistical analysis of wind and solar forecasting errors for the Western Wind and Solar Integration Study Phase 2.

Post-Doctoral Researcher   *2010 - 2011*
National Renewable Energy Laboratory – Transmission and Grid Integration Group
- Examined statistical properties of wind and solar power forecast errors, leading to improved operating reserve requirements in Western utilities.
- Performed research on the role of stochastic unit commitment in systems with high wind power penetration.
- Conducted numerical simulations to establish the potential for residential demand response systems to provide flexibility reserve for wind and solar power integration.

Graduate Research Assistant   *2006 - 2010*
Purdue University – School of Chemical Engineering
- Developed a multi-paradigm modeling approach used to analyze the impact of plug-in hybrid electric vehicles on the United States electricity system infrastructure.
- Studied the interactions between plug-in hybrid electric vehicles and wind power integration through vehicle-to-grid power supply.
- Utilized the modeling approach to study the optimal placement of vehicle charging stations in Indianapolis, IN in collaboration with a local utility.

Graduate Research Assistant   *2005*
Åbo Akademi University – Process Design Laboratory
- Designed and implemented a genetic algorithm based metaheuristic for solving classes of classical scheduling problems.

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Senior Honors Research *2004*

Carnegie Mellon University - Department of Chemical Engineering
- Designed optimization methods for solving black box fitness function problems.
- Applied algorithms to the optimal production of Gibberellic acid in *Gibberella fujikuroi* fermentation.

Undergraduate Research *2002 - 2003*

RWTH-Aachen - Institute for Process Technology
- Developed mathematical models for crystallization separation processes.
- Optimized distillation column configurations and sequences for complex distillation processes.

Industry Experience:

Lonza, Inc., Williamsport, Pennsylvania *2004*

Intern -Production Research and Development Section
- Determined causes of deviation from production standards.
- Aided in the scale-up of new products in the from lab scale to pilot plant scale.

Book Chapters and Magazine Articles (*Senior Author, † Student/Intern, ‡ Postdoc):

1. Yifu Wu, Jin Wei, <u>Bri-Mathias Hodge</u>: "Towards an Adaptive and Attack-Resilient Communication Infrastructures for Smart Grids", in: Security of Cyber-Physical Systems, H. Karimipoureh, P. Srikantha, H. Farag, J. Wei-Kocsis (Eds.), Springer, 2020.

2. Yingchen Zhang, Rui Yang, Jie Zhang, Yang Weng, <u>Bri-Mathias Hodge</u>: "Predictive Analytics for Comprehensive Energy Systems State Estimation", in: Big Data Application in Power Systems, R. Arghandeh, Y. Zhou (Eds.), Elsevier, 2018.

3. Benjamin Kroposki, Brian Johnson, Yingchen Zhang, Vahan Gevorgian, Paul Deholm, <u>Bri-Mathias Hodge</u>, Bryan Hannegan: "Achieving 100% Renewable Grids – Operating Electric Power Systems with Extremely High Levels of Variable Renewable Energy", IEEE Power & Energy Magazine, Vol. 15, Issue 2, March/April 2017.

4. Brady Stoll, Rishabh Jain[†], Carlo Brancucci Martinez-Anido, Eduardo Ibanez, Anthony Florita, <u>Bri-Mathias Hodge</u>*: "Reserve Estimation in Renewable Integration Studies", in: Integration of Large Scale Renewable Energy into Bulk Power System: From Planning to Operation, P. Du, A. Tuohy (Eds.), Springer, 2017

5. Jason Ganley, Jie Zhang[‡], <u>Bri-Mathias Hodge</u>*: "Wind Energy", in: Alternative Energy Sources and Technologies: Process Design and Operations, M. Martin (Ed.), Springer, 2016.

6. Mohit Singh, Alicia Allen[‡], <u>Bri-Mathias Hodge</u>*: "Grid Connection and Power Conditioning of Wind Farms", in: Handbook of Clean Energy Systems, R. Boehm, H. Yang, J. Yan (Eds.), Wiley, 2015.

7. <u>Bri-Mathias Hodge</u>, Erik Ela, Paul Denholm: "Integration of Renewable Generation", in: Encyclopedia of Sustainability Science and Technology, R. Meyers (Ed.), Springer, 2012.

Journal Publications (*Senior Author, † Student/Intern, ‡ Postdoc):

1. Wenqi Zhang, William Kleiber, <u>Bri-Mathias Hodge</u>, Barry Mather: "A nonstationary and non-Gaussian moving average model for solar irradiance", Accepted for **Environmetrics**.

2. Thomas Powers[†], Amirhossein Sajadi[‡], <u>Bri-Mathias Hodge</u>*: "The Current Opportunities and Challenges for Offshore Wind in the United States", Accepted for **The Electricity Journal**.

3. Jose Daniel Lara[†], Oscar Dowson, Kate Doubleday[†], <u>Bri-Mathias Hodge</u>*, Duncan Callaway: "A Multi-Stage Stochastic Risk Assessment with Markovian Representation of Renewable Power", **IEEE Transactions on Sustainable Energy**, In Press.

4. Ana Somoza-Tornos[‡], Omar J. Guerra, Allison M. Crow, Wilson A. Smith, <u>Bri-Mathias Hodge</u>*: "Process modeling, techno-economic assessment, and life cycle assessment of the electrochemical reduction of CO2 – a literature review", **iScience**, Vol. 24, Iss. 7, 2021.

5. Marija Marković[†], Amirhossein Sajadi[‡], Robert Cruickshank, Anthony Florita, <u>Bri-Mathias Hodge</u>*: "Voltage Estimation in Low-Voltage Distribution Grids with Distributed Energy Resources", **IEEE Transactions on Sustainable Energy**, Vol. 12, Iss. 3, 2021.

6. Paul Denholm, Douglas Arent, Samuel Baldwin, Daniel Bilello, Gregory Brinkman, Jaquelin Cochran, Wesley Cole, Bethany Frew, Vahan Gevorgian, Jenny Heeter, <u>Bri-Mathias Hodge</u>, Benjamin Kroposki, Trieu Mai, Mark O'Malley, Bryan Palmintier, Daniel Steinberg, Yingchen Zhang: "The Challenges of Achieving a 100% Renewable Electricity System in the United States", **Joule**, Vol. 5, Iss. 6, 2021.

7. Iris van Beuzekom[†], <u>Bri-Mathias Hodge</u>, Han Slootweg: "Framework for optimization of long-term multi-period investment planning of integrated urban energy systems", **Applied Energy**, Vol. 292, 2021.

8. Rick Wallace Kenyon[†], Jeffrey Maguire, Elaina Present, Dane Christensen, <u>Bri-Mathias Hodge</u>*: "Bulk Electric Power System Risks from Coordinated Edge Devices", **IEEE Open Acces Journal of Power and Energy**, Vol. 8, 2021.

9. Omar Guerra[‡], Brian Sergi, Michael Craig, Kwabena Addo Pambour, Carlo Brancucci, <u>Bri-Mathias Hodge</u>*: "Coordinated Operation of Electricity and Natural Gas Systems from Day-ahead to Real-time Markets", **Journal of Cleaner Production,** Vol. 281, 2021.

10. Mariya Koleva[‡], Omar Guerra[‡], Joshua Eichman, <u>Bri-Mathias Hodge</u>, Jennifer Kurtz: "Optimal design of solar-driven electrolytic hydrogen production systems within electricity markets", **Journal of Power Sources**, Vol. 483, 2021.

11. Kate Doubleday[†], Stephen Jascourt, William Kleiber, <u>Bri-Mathias Hodge</u>*: "Probabilistic Solar Power Forecasting Using Bayesian Model Averaging", **IEEE Transactions on Sustainable Energy**, Vol. 12, Iss. 1, 2021.

12. Joseph DeCarolis, Paulina Jaramillo, Jeremiah Johnson, David McCollum, Evelina Trutnevyte, David Daniels, Gokce Akin-Olcum, Joule Bergerson, Soolyeon Cho, Joon-Ho Choi, Michael Craig, Anderson de Queiroz, Hadi Eshraghi, Christopher Galik, Timothy Gutowski, Karl Haapala, <u>Bri-Mathias Hodge</u>, Simi Hoque, Jesse Jenkins, Alan Jenn, Daniel Johansson, Noah Kaufman, Juha Kiviluoma, Zhenhong Lin, Heather MacLean, Eric Masanet, Mohammad Masnadi, Colin McMillan, Destenie Nock, Neha Patankar, Dalia Patino-Echeverri, Greg Schively, Sauleh Siddiqui, Amanda Smith, Aranya Venkatesh, Gernot Wagner, Sonia Yeh, Yuyu Zhou: "Leveraging open source tools for collaborative macro-energy system modeling efforts", **Joule**, Vol. 4, 2020.

13. Jose Daniel Lara[†], Jonathan T. Lee, Duncan Callaway, <u>Bri-Mathias Hodge</u>: "Experiment Design for Operations Model Computational Simulations", **Electric Power Systems Research**, Vol. 189, 2020.

14. Richard Wallace Kenyon[†], Barry Mather, <u>Bri-Mathias Hodge</u>: "Coupled Transmission and Distribution Simulations to Assess Distributed Generation Response to Power System Faults", **Electric Power Systems Research**, Vol. 189, 2020.

15. Ignacio Losada Carreno[†], Michael Craig, Michael Rossol, Moetasim Ashfaq, Fulden Batibeniz, Sue Ellen Haupt, Caroline Draxl, <u>Bri-Mathias Hodge</u>, Carlo Brancucci: "Potential impacts of climate change on wind and solar electricity generation in Texas", **Climatic Change**, Vol. 163, 2020.

16. Michael Emmanuel[‡], Kate Doubleday[†], Burcin Cakir, Marija Markovic[†], <u>Bri-Mathias Hodge</u>*: "A review of power system models for flexibility assessment in high solar energy penetration scenarios", **Solar Energy**, Vol. 210, 2020.

17. Rick Wallace Kenyon[†], Matthew Bossart[†], Marija Markovic[†], Kate Doubleday[†], Reiko Matsuda-Dunn[†], Stefania Mitova[†], Simon Julien[†], Elaine Hale, <u>Bri-Mathias Hodge</u>*: "Dynamic Stability and Control of Power Systems with High Penetrations of Inverter-Based Resources: An Accessible Review of Current Knowledge and Open Questions", **Solar Energy**, Vol. 210, 2020.

18. Carlos Mateo, Fernando Postigo, Fernando de Cuadra, Tomás Gómez, Tarek Elgindy, Pablo Dueñas, , <u>Bri-Mathias Hodge</u>, Venkat Krishnan, Bryan Palmintier: "Building Large-Scale U.S. Synthetic Electric Distribution System Models", **IEEE Transactions on Smart Grid**, Vol. 11, Iss. 6, 2020.

19. Omar Guerra[‡], Jiazi Zhang, Joshua Eichman, Paul Denholm, Jennifer Kurtz, <u>Bri-Mathias Hodge</u>: "The Value of Seasonal Energy Storage Technologies for the Integration of Wind and Solar Power", **Energy & Environmental Science**, Vol 13, 2020.

20. S M Shafiul Alam[‡], Anthony Florita, <u>Bri-Mathias Hodge</u>*: "Multi-Rate and Event-Driven Kalman Kriging (MREDRIKK) Filter for Distributed PV System State Estimation", **IET Smart Grid**, Vol. 3, Iss. 4, 2020.

21. <u>Bri-Mathias Hodge</u>*, Himanshu Jain, Carlo Brancucci, Gabsu Seo, Magnus Korpås, Juha Kiviluoma, Hannele Holttinen, J. Charles Smith, Antje Orths, Ana Estanqueiro, Lennart Söder, Damian Flynn, Til Krisitan Vrana, Rick Wallace Kenyon[†], Benjamin Kroposki: "Addressing Technical Challenges in 100% Variable Inverter-Based Renewable Energy Power Systems", **WIRES Energy and Environment**, Vol. 9, Iss. 5, 2020.

22. Xin Fang, Kwami Senam Sedzro, Haou Yuan, Hongxing Ye, <u>Bri-Mathias Hodge</u>*: "Deliverable Flexible Ramping Products Considering Spatiotemporal Correlation of Wind Generation and Demand Uncertainties", **IEEE Transactions on Power Systems**, Vol. 35, Iss. 4, 2020.

23. Kate Doubleday[†], Vanessa Van Scyoc Hernandez[†], <u>Bri-Mathias Hodge</u>*: "Benchmark Probabilistic Solar Forecasts: Characteristics and Recommendations", **Solar Energy**, Vol. 206, 2020.

24. Binghui Liu, Jie Zhang, Kwami Sedzro[‡], Xin Fang , <u>Bri-Mathias Hodge</u>: "A Clustering-Based Scenario Generation Framework for Power System Analysis with Wind Integration", **Journal of Renewable and Sustainable Energy**, Vol. 12, 2020.

25. Fernando Postigo Marcos, Carlos Mateo Domingo, Tomás Gómez San Román, Fernando de Cuadra Garcia, Pablo Dueñas Martinez, Tarek Elgindy, <u>Bri-Mathias Hodge</u>, Bryan Palmintier: "Phase-Selection Algorithms to Minimize Cost and Imbalance in U.S. Synthetic Distribution Systems", **International Journal of Electrical Power and Energy Systems**, Vol. 120, 2020.

26. Michael Craig, Omar Guerra[‡],Carlo Brancucci, Kwabena Pambour, <u>Bri-Mathias Hodge</u>*: "The Value of Intra-Day Coordination of Electric Power and Natural Gas System Operations", **Energy Policy**, Vol. 141, 2020.

27. Lennart Söder, Egill Tómasson, Ana Estanqueiro, Damian Flynn, <u>Bri-Mathias Hodge</u>, Juha Kiviluoma, Magnus Korpås, Emmanuel Neau, Antonio Couto, Danny Pudjianto, Goran Strbac, D.L. Burke, Tomás Gómez, Kaushik Das, Dirk Van Hertem, Hanspeter Höschle, Julia Matevosjana, Serafin von Roon, Enrico Maria Carlini, Mauro Caprabianca, Laurens de Vries: "Review of wind generation in adequacy calculations and capacity markets in different systems", **Renewable & Sustainable Energy Reviews**, Vol. 119, 2020.

28. Michael Craig, Paulina Jaramillo, <u>Bri-Mathias Hodge,</u> Bart Nijssen, Carlo Brancucci,: "Compounding climate change impacts during high stress periods for a high wind and solar power system in Texas", **Environmental Research Letters** Vol. 15, Iss. 2, 2020.

29. Jari Miettinen[†], Hannele Holttinen, <u>Bri-Mathias Hodge</u>: "Simulating wind power forecast error distributions for spatially aggregated wind power plants", **Wind Energy,** Vol. 23, Iss. 1, 2020.

30. Todd Zhen†, Tarek Elgindy, S M Shafiul Alam‡, <u>Bri-Mathias Hodge*</u>, Carl Laird: "Optimal Placement of Data Concentrators for Expansion of the Smart Grid Communications Network ", **IET Smart Grid**, Vol. 2, Iss. 4, 2019.

31. Joseph Gardner, <u>Bri-Mathias Hodge</u>, Nanette Boyle: "Multiscale MultiObjective Systems Analysis (MIMOSA): an advanced metabolic modeling framework for complex systems", **Scientific Reports**, Vol. 9, 2019.

32. Omar Guerra‡, Joshua Eichman, Jennifer Kurtz, <u>Bri-Mathias Hodge</u>: "Cost competitiveness of electrolytic hydrogen.", **Joule**, Vol. 3, Iss. 10, 2019.

33. Cong Feng, Mingjian Cui, <u>Bri-Mathias Hodge</u>, Siyuan Lu, Hendrik Hamann, Jie Zhang: "An Unsupervised Clustering-Based Short-Term Solar Forecasting Methodology", **IEEE Transactions on Sustainable Energy**, Vol. 10, Iss. 4, 2019.

34. Robert Cruickshank III†, Gregor Henze, Rajagopalan Balaji, <u>Bri-Mathias Hodge</u>, Anthony Florita: "Empirical Investigations of the Opportunity Limits of Automatic Residential Electric Load Shaping", **Energies**, Vol. 12, Iss. 17, 2019.

35. Cong Feng, Dazhi Yang, <u>Bri-Mathias Hodge</u>, Jie Zhang: "OpenSolar: Promoting the Openness and Accessibility of Diverse Public Solar Datasets", **Solar Energy**, Vol. 188, 2019.

36. Mingjian Cui, Venkat Krishnan, <u>Bri-Mathias Hodge</u>, Jie Zhang: "A Copula-Based Conditional Probabilistic Forecast Model for Wind Power Ramps", **IEEE Transactions on Smart Grid**, Vol. 10, Iss. 4, 2019.

37. Kate Doubleday†, Andrew Parker, Faeza Hafiz†, Benjamin Irwin, Samuel Hancock, Shanti Pless, <u>Bri-Mathias Hodge*</u>: "Toward a Sub-Hourly Net-Zero Energy District Design Through Integrated Building and Distribution System Modeling", **Journal of Renewable and Sustainable Energy**, Vol. 11, Iss. 3, 2019.

38. Xin Fang, <u>Bri-Mathias Hodge*</u>, Ershun Du†, Fangxing Li, Chongqing Kang: "Introducing Risk Components in Locational Marginal Pricing Wind Power and Load Uncertainty", **IEEE Transactions on Power Systems**, Vol. 34, Issue 3, 2019.

39. Andrew Kumler, Ignacio Losada Carreno†, Michael Craig, <u>Bri-Mathias Hodge</u>, Wesley Cole, Carlo Brancucci: "Inter-annual Variability of Wind and Solar Electricity Generation and Capacity Values in Texas", **Environmental Research Letters**, Vol. 14, 2019.

40. Cong Feng, Mucun Sun, Mingjian Cui, Erol Chartan, <u>Bri-Mathias Hodge</u>, Jie Zhang: "Characterizing Forecastability of Wind Sites in the United States", **Renewable Energy**, Vol. 133, 2019.

41. Niina Helistö Juha Kiviluoma, Hannele Holttinen, Jose Daniel Lara†, <u>Bri-Mathias Hodge</u>: "Including operational aspects in the planning of power systems with large amounts of variable generation: a review of modelling approaches", **WIRES Energy and Environment**, 2019.

42. Mucun Sun, Cong Feng, Erol Chartan, <u>Bri-Mathias Hodge</u>, Jie Zhang: "A Two-Step Short-Term Probabilistic Wind Forecasting Methodology Based on Predictive Distribution Optimization" **Applied Energy**, Vol. 238, 2019.

43. Mingjian Cui, Jie Zhang, Qin Wang, Venkat Krishnan, <u>Bri-Mathias Hodge*</u>: "A Data-Driven Methodology for Probabilistic Wind Power Ramp Forecasting", **IEEE Transactions on Smart Grid**, Vol. 10, Iss. 2, 2019.

44. Michael Craig, Ignacio Losada Carreno†, Michael Rossol, <u>Bri-Mathias Hodge</u>, Carlo Brancucci: "Effects on Power System Operations of Potential Changes in Wind and Solar Generation Potential under Climate Change", **Environmental Research Letters**, Vol 14, 2019.

45. Kate Doubleday[†], Faeza Hafiz[†], Andrew Parker, Tarek Elgindy, Anthony Florita, Graziano Salvalai, Gregor Henze, Shanti Pless, <u>Bri-Mathias Hodge</u>*: "Integrated Sustainable Urban District Planning and Distribution System Design", **WIRES Energy and Environment**, 2019.

46. Xinmin Zhang, Yuan Li, Siyuan Lu, Hendrik Hamann, <u>Bri-Mathias Hodge</u>, Brad Lehman: "A Solar Time-based Analog Ensemble Method for Regional Solar Power Forecasting", **IEEE Transactions on Sustainable Energy**, Vol. 10, Iss. 1, 2019.

47. Xin Fang, <u>Bri-Mathias Hodge</u>, Fangxing Li, Ershun Du[†], Chongqing Kang: "Adjustable and distributionally robust chance-constrained economic dispatch considering wind power uncertainty", **Journal of Modern Power Systems and Clean Energy**, Vol. 7, Iss. 3, 2019. **Best Paper Award.**

48. Ershun Du[†], Ning Zhang, Qin Wang, <u>Bri-Mathias Hodge</u>, Chongqing Kang, Benjamin Kroposki, Qing Xia: "Operation of a High Renewable Penetrated Power System with CSP plants: A Look-ahead Stochastic Unit Commitment Model", **IEEE Transactions on Power Systems**, Vol. 34, Iss. 1, 2019.

49. Wenqi Zhang[†], William Kleiber, Anthony Florita, <u>Bri-Mathias Hodge</u>, Barry Mather: "Modeling and Simulation of High Frequency Solar Irradiance", **IEEE Journal of Photovoltaics**, Vol. 9, Iss. 1, 2019.

50. Michael Craig, Stuart Cohen, Jordan Macknick, Caroline Draxl, Omar Guerra[‡], Manajit Sengupta, Sue Ellen Haupt, <u>Bri-Mathias Hodge</u>, Carlo Brancucci: "A Review of the Potential Impacts of Climate Change on Bulk Power System Planning and Operations in the United States", **Renewable & Sustainable Energy Reviews**, Vol. 98, 2018.

51. Xin Fang, <u>Bri-Mathias Hodge</u>*, Fangxing Li, Ershun Du[†], Chongqing Kang, Fangxing Li: "Modelling Wind Power Spatial-Temporal Correlation in Multi-Interval Optimal Power Flow: A Sparse Correlation Matrix Approach", **Applied Energy**, Vol. 230, 2018.

52. Xin Fang, Linquan Bai, Fangxing Li, <u>Bri-Mathias Hodge</u>: "Hybrid Component and Configuration Model for Combined-Cycle Units in the Unit Commitment Problem", **Journal of Modern Power Systems and Clean Energy**, Vol. 6, Iss. 6, 2018.

53. Xin Fang, <u>Bri-Mathias Hodge</u>, Linquan Bai, Hantao Cui, Fangxing Li: "Mean-Variance Optimization-Based Energy Storage Scheduling Considering Day-Ahead and Real-Time LMP Uncertainties", **IEEE Transactions on Power Systems**, Vol. 33, Iss. 6, 2018.

54. Ershun Du[†], Ning Zhang, Qin Wang, <u>Bri-Mathias Hodge</u>, Chongqing Kang, Benjamin Kroposki: "The Role of Concentrating Solar Power Towards High Renewable Energy Penetrated Power Systems", **IEEE Transactions on Power Systems**, Vol. 33, Iss. 6, 2018.

55. Mingjian Cui, Jie Zhang, <u>Bri-Mathias Hodge</u>, Siyuan Lu, Hendrik Hamann: "A Methodology for Quantifying Reliability Benefits from Improved Solar Power Forecasting in Multi-Timescale Power System Operations", **IEEE Transactions on Smart Grid**, Vol. 9 Iss. 6, 2018.

56. Wenqi Zhang[†], William Kleiber, Anthony Florita, <u>Bri-Mathias Hodge</u>, Barry Mather: "A Stochastic Downscaling Approach for Generating High-Frequency Solar Irradiance Scenarios", **Solar Energy**, Vol. 176, 2018.

57. Dominik Dominković[†], Greg Stark, <u>Bri-Mathias Hodge</u>, Allan Schrøder Pedersen: "Integrated energy planning with a high share of variable renewable energy sources for a Caribbean island", **Energies**, Vol. 11, Iss. 9, 2018.

58. Xin Fang, Venkat Krishnan, <u>Bri-Mathias Hodge</u>*: "Strategic Offering for Wind Power Producers Considering Energy and Flexible Ramping Products", **Energies**, Vol. 11, Iss. 5, 2018.

59. Michael Craig, Paulina Jaramillo, <u>Bri-Mathias Hodge</u>, Nathaniel Williams, Edson Severnini: "A Retrospective Analysis of the Market Price Response to Distributed Photovoltaic Generation in California", **Energy Policy**, Vol. 121, 2018.

60. Steven Davis, Nathan Lewis, Matthew Shaner, Sonia Aggarwal, Doug Arent, Ines Azevedo, Sally Benson, Thomas Bradley, Jack Brouwer, Yet-Ming Chiang, Christopher Clack, Armond Cohen, Stephen Doig, Jae Edmonds, Paul Fennell, Christopher Field, Bryan Hannegan, <u>Bri-Mathias Hodge</u>, Martin Hoffert, Eric Ingersoll, Paulina Jaramillo, Klaus Lackner, Katharine Mach, Michael Mastrandrea, Joan Ogden, Per Peterson, Daniel Sanchez, Daniel Sperling, Joseph Stagner, Jessika Trancik, Chi-Jen Yang, Ken Calderia: "Net-zero emissions energy systems", **Science**, Vol. 360 Iss. 6396, 2018.

61. Kwabena Pambour, Rostand Sopgwi, <u>Bri-Mathias Hodge</u>, Carlo Brancucci: "The value of day-ahead coordination of power and natural gas network operations", **Energies**, Vol. 11, Iss. 7, 2018.

62. Richard Bryce[†], Ignacio Losada Carreno[†], Andrew Kumler, <u>Bri-Mathias Hodge</u>, Billy Roberts, Carlo Brancucci Martinez-Anido: "Consequences of Neglecting the Interannual Variability of the Solar Resource: A Case Study of Photovoltaic Power Among the Hawaiian Islands", **Solar Energy**, Vol. 167, 2018.

63. Ershun Du[†], Ning Zhang, <u>Bri-Mathias Hodge</u>, Chongqing Kang, Benjamin Kroposki, Qing Xia: "Economic justification of concentrating solar power in high renewable energy penetrated power systems", **Applied Energy**, Vol. 222, 2018.

64. Jianhua Zhang[‡], Adarsh Hasandka[†], Jin Wei, S M Shafiul Alam[‡], Tarek Elgindy, Anthony Florita, <u>Bri-Mathias Hodge*</u>: "Simulating Hybrid Communications for Distributed Smart Grid Applications", **Energies,** Vol. 11, Iss. 4, 2018**.**

65. <u>Bri-Mathias Hodge</u>*, Carlo Brancucci Martinez-Andio, Qin Wang, Erol Chartan, Anthony Florita, Juha Kiviluoma: "The Combined Value of Wind and Solar Power Forecasting Improvements and Electricity Storage", **Applied Energy,** Vol. 214, 2018.

66. Andrew Clifton, <u>Bri-Mathias Hodge*</u>, Caroline Draxl, Jake Badger, Aron Habte: "Wind and Solar Resource Data Sets", **WIRES Energy and Environment**, Vol. 7, Iss. 2, 2018.

67. Michael Craig, Paulina Jaramillo, <u>Bri-Mathias Hodge</u>: "Carbon Dioxide Emissions Effects of Grid-Scale Electricity Storage in a Decarbonizing Power System", **Environmental Research Letters**, Vol. 13, No. 1, 2018.

68. Ivonne Peña[†], Carlo Brancucci Martinez-Anido[‡], <u>Bri-Mathias Hodge*</u>: "An Extended IEEE 118-bus Test System with High Renewable Penetration", **IEEE Transactions on Power Systems**, Vol. 33, Iss. 1, pp. 281 – 289, 2018.

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60. Nicholas Steckler[†], Anthony Florita, Jie Zhang[‡], <u>Bri-Mathias Hodge</u>*: "Analysis and Synthesis of Load Forecasting Data for Renewable Integration Studies", **12th International Workshop on Large-Scale Integration of Wind Power into Power Systems**, *October 22-24, 2013, London, UK.*

61. Jie Zhang[‡], <u>Bri-Mathias Hodge</u>*, Anthony Florita, Siyuan Lu, Hendrik F. Hamann, Venkat Banunarayanan: "Metrics for Evaluating the Accuracy of Solar Power Forecasting", **3rd International Workshop on Integration of Solar Power into Power Systems**, *October 21-22, 2013, London, UK.*

62. Jie Zhang[‡], Souma Chowdhury, Achille Messac, <u>Bri-Mathias Hodge</u>: "Assessing Long-Term Wind Conditions by Combining Different Measure-Correlate-Predict Algorithms", **International Design Engineering Technical Conferences and Computers and Information in Engineering Conference 2013**, *August 4-7, 2013, Portland, OR, USA.*

63. Jie Zhang[‡], <u>Bri-Mathias Hodge</u>*: "Investigating the Correlation Between Wind and Solar Power Forecast Errors in the Western Interconnection", **Proceedings of the ASME 2013 7th International Conference on Energy Sustainability & 11th Fuel Cell Science Engineering and Technology Conference**, *July 14-19, 2013, Minneapolis, MN, USA.*

64. Jing Wu, Zhi Zhou, Audun Botterud, Andrew Mills, <u>Bri-Mathias Hodge</u>, Michael Heaney: "Impact of Renewable Energy on Power System Cost and Reliability", **Proceedings of the 2013 Industrial and Systems Engineering Research Conference**, *May 18-22, 2013, San Juan, Puerto Rico, USA.*

65. <u>Bri-Mathias Hodge</u>*, Debra Lew, Michael Milligan: "Short-Term Load Forecasting Error Distributions and Implications for Renewable Integration Studies", **2013 IEEE Fifth Annual Green Technologies Conference**, *April 4-5, 2013, Denver, CO, USA.*

66. Anthony Florita, <u>Bri-Mathias Hodge</u>*, Kirsten Orwig: "Identifying Wind and Solar Ramping Events", **2013 IEEE Fifth Annual Green Technologies Conference**, *April 4-5, 2013, Denver, CO, USA.*

67. Sandra Shedd[†], <u>Bri-Mathias Hodge</u>*, Anthony Florita, Kirsten Orwig: "Statistical Characterization of Solar Photovoltaic Power Variability at Small Timescales", **The 2nd Annual International Workshop on Integration of Solar Power into Power Systems**, *November 12-13, 2012, Lisbon, Portugal.*

68. Debra Lew, Greg Brinkman, Eduardo Ibanez, Marissa Hummon, <u>Bri-Mathias Hodge</u>, Michael Heaney, Jack King: "Sub-Hourly Impacts of High Solar Penetrations in the Western United States", **The 2nd Annual International Workshop on Integration of Solar Power into Power Systems**, *November 12-13, 2012, Lisbon, Portugal.*

69. Kirsten Orwig, <u>Bri-Mathias Hodge</u>, Greg Brinkman, Erik Ela, Michael Milligan, Venkat Banunarayanan, Saleh Nasir, Jeff Freedman: "Economic Evaluation of Short-Term Wind Power Forecasts in ERCOT:

Preliminary Results", **The 11th International Workshop on Large-Scale Integration of Wind Power into Power Systems**, *November 13-15, 2012, Lisbon, Portugal.*

70. Debra Lew, Greg Brinkman, Eduardo Ibanez, <u>Bri-Mathias Hodge</u>, Jack King: "Western Wind and Solar Integration Study Phase 2", **The 11th International Workshop on Large-Scale Integration of Wind Power into Power Systems**, *November 13-15, 2012, Lisbon, Portugal.*

71. <u>Bri-Mathias Hodge</u>*, Sandra Shedd†, Anthony Florita: "Examining the Variability of Wind Power Output in the Regulation Time Frame", **The 11th International Workshop on Large-Scale Integration of Wind Power into Power Systems**, *November 13-15, 2012, Lisbon, Portugal.*

72. Anthony Florita, <u>Bri-Mathias Hodge</u>*, Michael Milligan: "Wind Power Forecasting Error Frequency Analyses for Operational Power System Studies", **The 11th International Workshop on Large-Scale Integration of Wind Power into Power Systems**, *November 13-15, 2012, Lisbon, Portugal.*

73. <u>Bri-Mathias Hodge</u>*, Hannele Holttinen, Samueli Sillanpää, Emilio Gómez-Lázaro, Richard Scharff, Lennart Söder, Xiaoli Larsén, Gregor Giebel, Damian Flynn, Debra Lew, Michael Milligan, Jan Dobschinski: "Wind Power Forecasting Error Distributions: An International Comparison", **The 11th International Workshop on Large-Scale Integration of Wind Power into Power Systems**, *November 13-15, 2012, Lisbon, Portugal.*

74. <u>Bri-Mathias Hodge</u>*, Kirsten Orwig, Michael Milligan: "Examining Information Entropy Approaches as Wind Power Forecasting Performance Metrics", **The 12th International Conference on Probabilistic Methods Applied to Power Systems**, *June 10-14, 2012, Istanbul, Turkey.*

75. Michael Milligan, <u>Bri-Mathias Hodge</u>, Brendan Kirby, Charlton Clark: "Integration Costs: Are They Unique to Wind and Solar Energy", **The American Wind Energy Association Conferece, WINDPOWER 2012**, *June 3-6, 2012, Atlanta, GA, USA.*

76. <u>Bri-Mathias Hodge</u>*, Anthony Florita, Kirsten Orwig, Debra Lew, Michael Milligan: "A Comparison of Wind Power and Load Forecasting Error Distributions", **The World Renewable Energy Forum**, *May 13-17, 2012, Denver, CO, USA.*

77. <u>Bri-Mathias Hodge</u>*, Marissa Hummon, Kirsten Orwig: "Solar Ramping Distributions over Multiple Timescales and Weather Patterns", **1st International Workshop on Integration of Solar Power into Power Systems**, *October 24, 2011, Aarhus, Denmark.*

78. Kirsten Orwig, Marissa Hummon, <u>Bri-Mathias Hodge</u>, Debra Lew: "Solar Data Inputs for Integration and Transmission Planning Studies", **1st International Workshop on Integration of Solar Power into Power Systems**, *October 24, 2011, Aarhus, Denmark.*

79. <u>Bri-Mathias Hodge</u>*, Erik Ela, Michael Milligan: "The Distribution of Wind Power Forecast Errors from Operational Systems", **10th International Workshop on Large-Scale Integration of Wind Power into Power Systems**, *October 25-26, 2011, Aarhus, Denmark.*

80. <u>Bri-Mathias Hodge</u>*, Debra Lew, Michael Milligan: "The Impact of High Wind Power Penetration on Hydroelectric Unit Operations", **10th International Workshop on Large-Scale Integration of Wind Power into Power Systems**, *October 25-26, 2011, Aarhus, Denmark.*

81. Michael Milligan, Erik Ela, <u>Bri-Mathias Hodge</u>, Brendan Kirby, Debra Lew, Charlton Clark, Jennifer DeCesaro, Kevin Lynn: "Are Integration Costs and Tariffs Based on Cost-Causation?" **10th International Workshop on Large-Scale Integration of Wind Power into Power Systems**, *October 25-26, 2011, Aarhus, Denmark.*

82. <u>Bri-Mathias Hodge</u>*, Michael Milligan: "Wind Power Forecasting Errors over Multiple Timescales", **Proceedings of the IEEE Power & Energy Society General Meeting**, *July 24-29, 2011, Detroit, MI, USA.*

83. <u>Bri-Mathias Hodge</u>, Austin Zeiler, Duncan Brooks, Gary Blau, Joseph Pekny, Gintaras Reklaitis: "Improved Wind Power Forecasting with ARIMA Models", **Proceedings of the 21st European Symposium on Computer Aided Process Engineering**, *May 29 – June 1, 2011, Chalkidiki , Greece.*

84. Shisheng Huang, <u>Bri-Mathias Hodge</u>, Jingjie Xiao, Joseph Pekny, Gintaras Reklaitis: "The Effects of Electricity Storage on Large Scale Wind Integration", **Proceedings of the 21st European Symposium on Computer Aided Process Engineering**, *May 29 – June 1, 2011, Chalkidiki , Greece.*

85. Jingjie Xiao, Andrew Liu, <u>Bri-Mathias Hodge</u>, Joseph Pekny, Gintaras Reklaitis: "Long-Term Planning of Wind Farm Siting in the Electricity Grid", **Proceedings of the 21st European Symposium on Computer Aided Process Engineering**, *May 29 – June 1, 2011, Chalkidiki , Greece.*

86. <u>Bri-Mathias Hodge</u>, Shisheng Huang, Joseph Pekny, Gintaras Reklaitis: "Process Systems Engineering Perspectives on Energy Systems Analysis and Policy", **Proceedings of the Second International Symposium on Sustainable Chemical Product and Process Engineering**, *May 9-12, 2010, Hangzhou, China.*

87. <u>Bri-Mathias Hodge</u>, Shisheng Huang, Aviral Shukla, Joseph Pekny, Gintaras Reklaitis: "The Effects of Vehicle-to-Grid Systems on Wind Power Integration in California", **Proceedings of the 20th European Symposium on Computer Aided Process Engineering**, *June 6-9, 2010, Ischia, Italy.*

88. Shisheng Huang, <u>Bri-Mathias Hodge</u>, Joseph Pekny, Gintaras Reklaitis: "The Value of Battery Storage and Discharge Logic with Solar Microgeneration", **Proceedings of the 20th European Symposium on Computer Aided Process Engineering**, *June 6-9, 2010, Ischia, Italy.*

89. Shisheng Huang, <u>Bri-Mathias Hodge</u>, Joseph F. Pekny, Gintaras V. Reklaitis: "The Impact of PHEV Adoption on Natural Gas Demand in Electricity Generation", **Proceedings of the 2nd Annual Gas Processing Symposium**, *January 11-14, 2010, Doha, Qatar.*

90. <u>Bri-Mathias Hodge</u>, Joseph F. Pekny, Gintaras V. Reklaitis: "Technology Pipelines for Learning in Energy System Models", **Proceedings of the 10th International Symposium on Process Systems Engineering**, *August 16-20, 2009, Salvador, Brazil.*

91. <u>Bri-Mathias Hodge</u>, Joseph F. Pekny, Gintaras V. Reklaitis: "A Multi-Paradigm Energy Model for Liquid Natural Gas Analysis", **Proceedings of the 1st Annual Gas Processing Symposium**, *January 10-12, 2009, Doha, Qatar.*

92. <u>Bri-Mathias Hodge</u>, Selen Aydogan-Cremaschi, Gary E. Blau, Joseph F. Pekny, Gintaras V. Reklaitis: "A Prototype Agent-Based Modeling Approach For Energy System Analysis", **Proceedings of the 18th European Symposium on Computer Aided Process Engineering**, *June 1-4, 2008, Lyon, France.*

Other Publications (*Senior Author, † Student/Intern, ‡ Postdoc):

1. Kate Doubleday†, Andrew Parker, Faeza Hafiz†, Benjamin Irwin, Samuel Hancock, Shanti Pless, <u>Bri-Mathias Hodge</u>*: "Peña Station NEXT Energy District Master Plan", **NREL Technical Report:** NREL/TP-5D00-76242, 2020.

2. Reiko Matsuda-Dunn†, Michael Emmanuel‡, Erol Chartan, <u>Bri-Mathias Hodge</u>*, Gregory Brinkman: "Duke Energy Carbon-Free Resource Integration Study", **NREL Technical Report:** NREL/TP-5D00-74337, 2020.

3. Carlo Brancucci, Riccardo Bracho, Gregory Brinkman, <u>Bri-Mathias Hodge</u>: "Baja California Sur Renewable Integration Study", **NREL Technical Report:** NREL/TP-5D00-72598, 2018.

4. Richard Bryce[†], Ignacio Losada Carreno[†], Andrew Kumler, <u>Bri-Mathias Hodge</u>, Billy Roberts, Carlo Brancucci Martinez-Anido: "Annually and monthly resolved solar irradiance and atmospheric temperature data across the Hawaiian archipelago from 1998 – 2015 with interannual summary statistics", **Data in Brief**, Vol. 19, 2018**.**

5. Bryan Palmintier, Elaine Hale, Timothy Hansen, Wesley Jones, David Biagioni, Kyri Baker, Hongyu Wu, Julieta Giraldez, Harry Sorensen, Monte Lunacek, Noel Merket, Jennie Jorgenson, <u>Bri-Mathias Hodge</u>*: "Integrated Distribution-Transmission Analysis for Very High Penetration Solar PV", **NREL Technical Report:** NREL/TP-5D00-65550, 2016.

6. Nick Schlag, Arne Olson, Elaine Hart, Ana Mileva, Ryan Jones, Carlo Brancucci Martinez-Anido[‡], <u>Bri-Mathias Hodge</u>*, Greg Brinkman, Anthony Florita, David Biagioni: "Western Interconnection Flexibility Assessment: Final Report", **Western Electricity Coordinating Council (WECC) Technical Report**, 2015.

7. Caroline Draxl, <u>Bri-Mathias Hodge</u>*, Andrew Clifton, James McCaa: "Overview and Meteorological Validation of the Wind Integration National Dataset Toolkit", **NREL Technical Report:** NREL/TP-5000-61740, 2015.

8. <u>Bri-Mathias Hodge</u>*, Anthony Florita, Justin Sharp, Michael Margulis, David Mcreavy: "The Value of Improved Short-Term Wind Power Forecasting", **NREL Technical Report:** NREL/TP-5D00-63175, 2015.

9. Jack King, Andrew Clifton, <u>Bri-Mathias Hodge</u>*: "Validation of Power Output for the WIND Toolkit", **NREL Technical Report:** NREL/TP-5D00-61714, 2014.

10. Carlo Brancucci Martinez-Anido[‡], <u>Bri-Mathias Hodge</u>*: "Impact of Utility-Scale Distributed Wind on Transmission-Level System Operations", **NREL Technical Report:** NREL/TP-5D00-61824, 2014.

11. Andrew Mills, Audun Botterud, Jing Wu, Zhi Zhou, <u>Bri-Mathias Hodge</u>, Michael Heaney: "Integrating Solar PV into Utility Operations", **ANL Technical Report:** ANL/DIS-13/18, 2013.

12. Kevin Porter, Sari Fink, Michael Buckley, Jennifer Rogers, <u>Bri-Mathias Hodge</u>*: "A Survey of Variable Generation Integration Charges", **NREL Technical Report**: TP – 5500-57583, 2013.

13. Debra Lew, Greg Brinkman, Eduardo Ibanez, <u>Bri-Mathias Hodge</u>, Marissa Hummon, Anthony Florita, Michael Heaney, Greg Stark, Jack King, Nikhil Kumar, Steve Lefton, Dwight Agan, Gary Jordan, Sundar Venkataraman: "The Western Wind and Solar Integration Study Phase 2", **NREL Technical Report**: TP – 5500-55888, 2012.

14. Michael Milligan, Erik Ela, <u>Bri-Mathias Hodge</u>, Brendan Kirby, Debra Lew, Charlton Clark, Jennifer DeCesaro, Kevin Lynn: "Cost-Causation and Integration Cost Analysis for Variable Generation", **NREL Technical Report**: TP – 5500-51860, 2011.

15. <u>Bri-Mathias Hodge</u>*, Debra Lew, Michael Milligan: "The Impact of High Wind Power Penetration on Hydroelectric Unit Operations in the WWSIS", **NREL Technical Report**: TP – 5500-52251, 2011.

16. Per Jernström, <u>Bri-Mathias Hodge</u>, K. Tapio Westerlund: "A Comparison Between a MILP-based Decomposition Method and a Genetic Algorithm in Scheduling Applications", Report of the Process Design Systems Engineering Institute, **Åbo Akademi Technical Report**: 06-190-A, ISBN 952-121-1793-6, 2006.

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Patents:

U.S. Patent No. 10,892,838 B2, "Heterogeneous Network Topology Management and Control", Patent Issued: January 12th, 2021.

Provisional Patent 63/168,636: "Curtailment Control with Statistically Optimized Topology for Utility Scale Variable Generation", Provisional Patent Filed: March 31st, 2021.

Selected Invited Presentations:

"*Designing a Sustainable and Reliable Future: Simulating Next Generation Energy Systems*", Carnegie Mellon University, Department of Chemical Engineering, Center for Advanced Process Decision-making (CAPD) Energy Systems Seminar, November 2021.

"*Overview of Advanced Renewable Energy Forecasting*", Global Power System Transformation Consortium, Deep Dive on Advanced Renewable Energy Forecasting Techniques, September 2021.

"Solar Uncertainty Management and Mitigation for Exceptional Reliability in Grid Operations (SUMMER-GO)", Meteorology & Market Design for Grid Services Workshop, Energy Systems Integration Group (ESIG), June 2021.

"*Designing a Sustainable and Reliable Future: Simulating Next Generation Energy Systems*", Cornell University, Cornell Energy Day, April 2021.

"*Probabilistic Solar Power Forecasting and Dynamic Reserves*", U.S. Department of Energy Solar Energy Technologies Office Colloquium Series, April 2021.

"*Ensuring the Resilience of the U.S. Electric Grid*", InfraGard, March 2021.

"*Distributed Energy Resources 2.0: New Challenges and Solutions*", IEEE Power & Energy Society General Meeting: New Trends with Integration of Distributed Energy Resources Panel, Montreal, CA, August 2020.

"*A Modified 118-bus Test System with Increased Renewable Penetration*", IEEE Power & Energy Society General Meeting: Test Systems for System Operations, Unit Commitment, System Planning with High Renewable Energy Penetration Panel, Montreal, CA, August 2020.

"*Incorporating Climate Uncertainty into Future Energy Systems*", Next-Generation Challenges in Energy-Climate Modelling Workshop, University of Reading, UK, June 2020.

"*Designing a Sustainable and Reliable Future: Simulating Next Generation Energy Systems*", Danish Technical University, Department of Applied Mathematics and Computer Science, June 2019.

"*Designing a Sustainable and Reliable Future: Simulating Next Generation Energy Systems*", University of California Berkeley, Energy and Resources Group Colloquium, November 2018.

"*The WIND Toolkit: A National Dataset for Wind Integration Studies*", 4th Conference on Stochastic Weather Generators (SWGEN 2018), October 2018.

"*Distribution Integration Research*", Colorado Public Utilities Commission, Commission's Review of its Rules Governing ERP, RES and Enabling New Technology Integration – Distribution System Planning, April 2018.

"*Renewable Energy Integration: from Resource Data to Power System Impacts*", Ascend Analytics 2017 Summit on Changing Market Dynamics for Portfolio Management and Planning Decisions, October 2017.

"*Solar Power Forecasting and Power System Impacts*", Yuannan Province Electric Power Research Institute, Southern China Power Grid, May 2017.

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"Renewable Energy Integration: from Resource Data to Solar Power Forecasting and Power System Impacts", North China Electric Power University, May 2017.

"Next Generation Power System Test Cases", Colorado School of Mines, Energy Seminar Series, April 2017.

"The Value of Wind and Solar Power Forecasting Improvements at Multiple Timescales", Electric Power Research Institute (EPRI) – Artificial Neural Network Short-Term Load Forecaster Users' Group Meeting, November 2016.

"Renewable Energy Integration: from Resource Data to Power System Impacts", Cranfield University, School of Water, Energy and Environment, July 2016.

"The Modern Grid with High Penetration of Renewables", Western Area Power Administration (WAPA) Resource Planning for Power Systems, April 2016.

"The Wind Integration National Dataset (WIND) and Solar Integration National Dataset (SIND) Toolkits", Conference on Data Analysis (CoDA) 2016, March 2016.

"Solar and Wind Resources Review", Colorado Public Utilities Commission, Commissioners' Information Meeting – Future Issues for Renewable Energy and Transmission, February 2016.

"Setting the Scene: Forecasting 101", USAID Regional Workshop for Asia on Advancing the Use of Wind and Solar Forecasting to Facilitate the Integration of Variable Renewable Energy to the Grid, Bangkok, Thailand, February 2016.

"Data Requirements for Forecasting", USAID Regional Workshop for Asia on Advancing the Use of Wind and Solar Forecasting to Facilitate the Integration of Variable Renewable Energy to the Grid, Bangkok, Thailand, February 2016.

"Renewable Energy Integration: from Resource Assessment to Power System Impacts", Colorado School of Mines, Department of Mechanical Engineering, February 2016.

"The Value of Forecasting", USAID Regional Workshop for Latin America and the Caribean on Advancing the Use of Wind and Solar Forecasting to Facilitate the Integration of Variable Renewable Energy to the Grid, Mexico City, Mexico, January 2016.

"Forecasting Requirements for System Operations", USAID Regional Workshop for Latin America and the Caribean on Advancing the Use of Wind and Solar Forecasting to Facilitate the Integration of Variable Renewable Energy to the Grid, Mexico City, Mexico, January 2016.

"Renewables Integration Research and Development", Western Electricity Coordinating Council (WECC) Dispatch Chief's Fall Meeting, October 2015.

"Regulatory & Policy Role: Renewable Energy Grid Integration International Experience & Lessons for India", Forum of Indian Regulators, June 2015.

"The Value of Very Short-Term Wind Power Forecasting in California in the Context of an Overall Forecasting Value Framework", Utility Variable Generation Integration Group Forecasting Workshop, February 2014.

"The State-of-the-Art in Wind and Solar Power Forecasting", Eskom and the 21st Century Power Partnership Workshop on Integrating Variable Renewable Energy into Transmission and Distribution Networks, Eskom (South African State Utility), December 2013.

"Renewable Energy: Grid Integration Panel", AMS 2013 Summer Community Meeting, American Meteorological Society, August 2013

"*Best Practices in Solar Interconnection and Operations*", ERCOT Photovoltaic/Storage Interconnection Workshop, Electric Reliability Council of Texas, October 2012.

"*Multi-Paradigm Energy Systems Modeling*", Purdue Energy Systems Workshop, Energy Center, Purdue University, September 2011.

"*Wind Forecasting Error Distributions and Implications*", Electricity Industry Center, Department of Engineering and Public Policy, Carnegie Mellon University, May 2011.

Selected Conference Presentations:
Bri-Mathias Hodge: "Challenges and Mitigation Options in Stability for Future Power Systems", **Wind Energy Science Conference 2021**, *May 25th, 2021, Hannover, Germany.*

Tarek Elgindy, Nicolas Gensollen, Bryan Palmintier, Carlos Mateo Domingo, Tomas Gomez San Roman, Venkat Krishnan, Bri-Mathias Hodge: "Smart-DS: Large-scale, synthetic distribution test systems for evaluating next-generation distributed grid algorithms and technologies", **2018 IEEE Power and Energy Society General Meeting**, *August 9th, 2018, Portland, OR.*

S.M. Shafiul Alam, Jianhua Zhang, Adarsh Hasandka, Bri-Mathias Hodge: "An Opportunistic Hybrid Communications Systems for Distributed PV Coordination", **2018 IEEE Power and Energy Society Transmission & Distribution Conference**, *April 18th, 2018, Denver, CO.*

S.M. Shafiul Alam, Tarek Elgindy, Anthony Florita, Bri-Mathias Hodge: "An Opportunistic Hybrid Communications System for Distributed PV Coordination and Control", **2016 AIChE Annual Meeting**, *November 17th, 2016, San Francisco, CA.*

Bri-Mathias Hodge: "The Wind Integration National Dataset (WIND) and Solar Integration National Dataset (SIND) Toolkits", **Conference on Data Analysis (CoDA) 2016**, *March 2nd, 2016, Sante Fe, NM.*

Andrew Weekley, Anthony Lopez, Marissa Hummon, Bri-Mathias Hodge: "The Solar Integration National Dataset (SIND) Toolkit", **2015 AIChE Annual Meeting**, *November 9th, 2015, Salt Lake City, UT.*

Bri-Mathias Hodge, Caroline Draxl, Dan Getman, Wesley Jones, Jim McCaa: "The Wind Integration National Dataset (WIND) Toolkit: Wind Power Forecasts and Production Time Series", **2014 AIChE Annual Meeting**, *November 17th, 2014, Atlanta, GA.*

Bri-Mathias Hodge, Elaine Hale, Bryan Palmintier, Jin Wei, Julieta Giraldez, Wesley Jones, David Biagioni, Roisin Mossop: "Cyber-Physical-Energy Systems Testbed: A Distributed Solar Power Case Study", **2014 AIChE Annual Meeting**, *November 19th, 2014, Atlanta, GA.*

Jie Zhang, Bri-Mathias Hodge, Anthony Florita, Siyuan Lu, Hendrik Hamann, Venkat Banunarayanan: "Metrics Development for Evaluating the Accuracy of Solar Power Forecasting", **American Meteorological Society 94th Annual Meeting**, *February 3rd, 2014, Atlanta, GA.*

Caroline Draxl, Dan Getman, Wesley Jones, Kirsten Orwig, Jim McCaa, Padriac Fowler, Eric Grimit, Bri-Mathias Hodge: "The Wind Integration National Dataset (WIND) Toolkit", **American Meteorological Society 94th Annual Meeting**, *February 3rd, 2014, Atlanta, GA.*

Jie Zhang, Anthony Florita, Bri-Mathias Hodge: "Joint Probability and Correlation Analysis of Wind and Solar Power Forecast Errors in the Western Interconnection", **2013 AIChE Annual Meeting**, *November 7th, 2013, San Francisco, CA.*

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Nicholas Steckler, Anthony Florita, Jie Zhang, <u>Bri-Mathias Hodge</u>: "Analysis and Synthesis of Load Forecasting Data for Renewable Integration Studies", **12th International Workshop on Large-Scale Integration of Wind Power into Power Systems**, *October 22-24, 2013, London, UK.*

Jie Zhang, <u>Bri-Mathias Hodge</u>, Anthony Florita, Siyuan Lu, Hendrik F. Hamann, Venkat Banunarayanan: "Metrics for Evaluating the Accuracy of Solar Power Forecasting", **3rd International Workshop on Integration of Solar Power into Power Systems**, *October 21-22, 2013, London, UK.*

<u>Bri-Mathias Hodge</u>, Debra Lew, Michael Milligan: "Short-Term Load Forecasting Error Distributions and Implications for Renewable Integration Studies", **2013 IEEE Fifth Annual Green Technologies Conference**, *April 4-5, 2013, Denver, CO, USA.*

<u>Bri-Mathias Hodge</u>, "The Value of Variable Generation Forecasting at Multiple Time Scales", **Utility Variable Generation Integration Group Workshop on Variable Generation Forecasting Applications to Utility Planning and Operations**, *February 26th, 2013, Salt Lake City, UT, USA.*

<u>Bri-Mathias Hodge</u>, Hannele Holttinen, Samueli Sillanpää, Emilio Gómez-Lázaro, Richard Scharff, Lennart Söder, Xiaoli Larsén, Gregor Giebel, Damian Flynn, Debra Lew, Michael Milligan, Jan Dobschinski: "Wind Power Forecasting Error Distributions: An International Comparison", **The 11th International Workshop on Large-Scale Integration of Wind Power into Power Systems**, *November 13, 2012, Lisbon, Portugal.*

<u>Bri-Mathias Hodge</u>, Sandra Shedd, Anthony Florita, and Kirsten Orwig: "Examining the Variability of Load, Wind, and Solar Power in the Regulation Timeframe", **2012 AIChE Annual Meeting**, *October 31, 2012, Pittsburgh, PA, USA.*

<u>Bri-Mathias Hodge</u>, Anthony Florita: "Characterizing and Modeling Wind Power Forecast Errors from Operational System for use in Wind Integration Planning Studies", **Modeling, Simulation and Optimization for the 21st Century Electric Power Grid**, *October 23, 2012, Lake Geneva, WI, USA.*

<u>Bri-Mathias Hodge</u>, Anthony Florita: "Characterizing and Modeling Wind Power Forecast Errors from Operational System for use in Wind Integration Planning Studies", **INFORMS 2012 Annual Meeting**, *October 17, 2012, Phoenix, AZ, USA.*

<u>Bri-Mathias Hodge</u>, Kirsten Orwig, Michael Milligan: "Examining Information Entropy Approaches as Wind Power Forecasting Performance Metrics", **The 12th International Conference on Probabilistic Methods Applied to Power Systems**, *June 12, 2012, Istanbul, Turkey.*

<u>Bri-Mathias Hodge</u>, Anthony Florita, Kirsten Orwig, Debra Lew, Michael Milligan: "A Comparison of Wind Power and Load Forecasting Error Distributions", **The World Renewable Energy Forum**, *May 15, 2012, Denver, CO, USA.*

<u>Bri-Mathias Hodge</u>, Erik Ela, Michael Milligan: "The Distribution of Wind Power Forecasting Errors from Operational Systems", **Utility Variable Generation Integration Group Workshop on Variable Generation Forecasting Applications to Utility Planning and Operations**, *February 8th, 2012, Tucson, AZ, USA.*

<u>Bri-Mathias Hodge</u>, Marissa Hummon, Kirsten Orwig: "Solar Ramping Distributions over Multiple Timescales and Weather Patterns", **1st International Workshop on Integration of Solar Power into Power Systems**, *October 24th, 2011, Aarhus, Denmark.*

<u>Bri-Mathias Hodge</u>, Erik Ela, Michael Milligan: "The Distribution of Wind Power Forecast Errors from Operational Systems", **10th International Workshop on Large-Scale Integration of Wind Power into Power Systems**, *October 25th, 2011, Aarhus, Denmark.*

<u>Bri-Mathias Hodge</u>, Erik Ela, Michael Milligan: "Stochastic Programming and Uncertainty Management in Electricity System Operation", **2011 AIChE Annual Meeting**, *October 19th, 2011, Minneapolis, MN, USA.*

<u>Bri-Mathias Hodge</u>, Michael Milligan: "Wind Power Forecasting Error Distributions over Multiple Timescales", **2011 IEEE Power & Energy Society General Meeting**, *July 27th, 2011, Detroit, MI, USA.*

<u>Bri-Mathias Hodge</u>, Shisheng Huang, Aviral Shukla, Joseph Pekny, Venkat Venkatasubramanian, Gintaras Reklaitis: "The Effects of Vehicle-to-Grid Systems on Wind Power Integration in California", **The 20th European Symposium on Computer Aided Process Engineering**, *June 8th, 2010, Ischia, Italy.*

<u>Bri-Mathias Hodge</u>, Selen Aydogan-Cremaschi, Gary E. Blau, Joseph F. Pekny, Gintaras V. Reklaitis: "A Prototype Agent-Based Modeling Approach For Energy System Analysis", **The 18th European Symposium on Computer Aided Process Engineering**, *June 3rd, 2008, Lyon, France.*

<u>Bri-Mathias Hodge</u>, Selen Aydogan-Cremaschi, Gary E. Blau, Joseph F. Pekny, Gintaras V. Reklaitis: "A Prototype Agent-Based Modeling Approach For Energy System Analysis", **2007 AIChE Annual Meeting**, *November 8th, 2007, Salt Lake City, Utah.*

Teaching Experience:

University of Colorado Boulder – Department of Electrical, Computer and Energy Engineering
ECEN 2250 – Introduction to Circuits and Electronics   *Fall 2018*
- Designed and conducted lectures
- Designed and conducted studio sessions focused on engineering design

ECEN 5407 – Renewable Energy and the Future Power Grid   *Fall 2016, 2017, 2019, 2020, 2021*
- Designed and conducted lectures
- Supervised and advised design project teams

ECEN 2310 – Programming with Mathematical Software   *Spring 2020*
- Designed and conducted lectures
- Supervised and advised projects

Colorado School of Mines – Department of Chemical and Biological Engineering
Adjunct Faculty – CHEN 402 – Chemical Engineering Design   *Spring 2014*
- Designed and conducted lectures
- Supervised and advised design project teams

Purdue University – School of Chemical Engineering
Teaching Assistant - CHE 450 - Design and Analysis of Processing Systems   *Spring 2007, 2009*
- Designed and supervised computer laboratory sessions
- Formulated design projects
- Designed and conducted lectures

Åbo Akademi, Process Design Laboratory
Lecturer – Basics in Process Design   *Fall 2005*
- Designed and conducted lectures and recitation sessions
- Created homework sets and solutions

Mentoring Experience:

University of Colorado Boulder – Department of Electrical, Computer & Energy Engineering
Ph.D. Students Advised
- Katharine Doubleday   *Ph.D. Summer 2021*
  - Ph.D. Student, Department of Electrical, Computer & Energy Engineering
  - Ph.D. Dissertation: *"Development and Application of Probabilistic Solar Power Forecasts for the Day-Ahead Unit Commitment"*
- Richard Wallace Kenyon   *Spring 2019 – Present*

- o Ph.D. Student, Department of Electrical, Computer & Energy Engineering
  - o Ph.D. Topic *"Power System Dynamics in High Variable Inverter-Based Renewable Energy Futures"*
- Marija Marković   *Spring 2019 – Present*
  - o Ph.D. Student, Department of Electrical, Computer & Energy Engineering
  - o Ph.D. Topic *"Advanced Distribution System Planning with Sustainable Energy Technologies"*
- Matthew Bossart   *Fall 2019 – Present*
  - o Ph.D. Student, Department of Electrical, Computer & Energy Engineering
  - o Ph.D. Topic *"Power System Stability with Power Electronic Devices"*
- Anthony Sauter   *Spring 2020 – Present*
  - o Ph.D. Student, Department of Electrical, Computer & Energy Engineering
  - o Ph.D. Topic *"Co-Simulation Approaches for Understanding Wireless Electric Vehicle Impacts"*
- Megan Rose   *Fall 2020 – Present*
  - o Ph.D. Student, Department of Electrical, Computer & Energy Engineering
  - o Ph.D. Topic *"A Framework for Preventing and Recovering from Cascading Failure Events for Space-Based DC Power Systems"*
- Marena Trujillo   *Fall 2021 – Present*
  - o Ph.D. Student, Department of Electrical, Computer & Energy Engineering
  - o Ph.D. Topic *"Power System Stability – Opportunities for Seasonal Storage Technologies"*

M.S. (Thesis) Students Advised
- Anne Hamilton   *Fall 2021 – Present*
  - o M.S. Student, Department of Electrical, Computer & Energy Engineering
  - o M.S. Thesis Topic: *"Sustainable Scheduling in the Decarbonization of the Chemical Industry"*
- Simon Julien   *Fall 2021 – Present*
  - o M.S. Student, Department of Applied Mathematics
  - o M.S. Thesis Topic: *"Examining Solvers for Stiff Differential Equations in Power System Stability Problems"*
- Jackson Curry   *Fall 2021 – Present*
  - o M.S. Student, Department of Applied Mathematics
  - o M.S. Thesis Topic: *"Surrogate Models for Transportation Systems Simulation"*
- Muhy Eddin Za'ter   *Fall 2021 – Present*
  - o M.S. Student, Department of Electrical, Computer & Energy Engineering
  - o M.S. Thesis Topic: *"Accelerating Scientific Machine Learning Methods in Power System Stability"*

Undergraduate Students Advised
- Mason Huyge   *Spring 2019, Fall 2019*
  - o B.Sc. Student, Department of Electrical, Computer & Energy Engineering
- Natasha Wischmeyer   *Spring 2019*
  - o B.Sc. Student, Department of Electrical, Computer & Energy Engineering
- Simon Julien   *Spring '19 – Summer '21*
  - o B.Sc./M.Sc. Student, Department of Applied Mathematics and Engineering Physics
- Jackson Curry   *Spring – Summer 2021*
  - o B.Sc./M.Sc. Student, Department of Applied Mathematics

Postdoctoral Researchers and Research Associates Mentored
- Amirhossein Sajadi   *Jan. 2020 – Aug. 2021*
  - o Ph.D. Case Western Reserve University – Electrical Engineering and Computer Science
  - o Projects: *Low-inertia power grids, power system control and stability*
- Ana Somoza-Tornos   *June 2020 – Present*
  - o Ph.D. Technical University of Catalonia (UPC) – Chemical Engineering
  - o Projects: *Power-to-X, tecno-economic analysis of electrolytic carbon production*
- Burcin Cakir Erdener   *July 2020 – Present*
  - o Ph.D. Gazi University – Industrial Engineering
  - o Projects: *Integrated power and natural gas systems, probabilistic forecasting*

Technical University of Eindhoven – Department of Electrical Engineering
Co-Promotor
- Iris van Beuzekom (co-advised with Han Slootweg – TU/E)   *Summer 2017 – Present*
  - Ph.D. Student, Department of Electrical Engineering
  - Ph.D Topic: *"Integrated Natural Gas and Power Systems Planning"*

National Renewable Energy Laboratory – Power System Design & Studies Group
Postdoctoral Researchers Mentored
- Jie Zhang   *Nov. 2012 – Nov. 2014*
  - Ph.D. Rensselaer Polytechnic Institute – Mechanical Engineering
  - Projects: *Solar power forecasting, wind power forecasting, wind resource assessment*
  - Current Position: Assistant Professor, University of Texas at Dallas – Mechanical Engineering
- Alicia Allen   *Mar. 2013 – Sept. 2014*
  - Ph.D. University of Texas Austin – Electrical Engineering
  - Project: *Impacts of utility-scale wind power on distribution systems*
- Carlo Brancucci Martinez-Anido   *Dec. 2013 – Dec. 2014*
  - Ph.D. Technical University of Delft – Technology, Policy, & Management
  - Projects: *Transmission systems modeling, unit commitment and economic dispatch*
- Giulia Gallo (co-advised with Michael Milligan - NREL)   *April 2014 -April 2016*
  - Ph.D. University of Genoa –Biophysical & Electronic Engineering
  - NREL Director's Fellowship – *Future electricity markets*
- Jin Wei Kocsis   *April 2014 – July 2014*
  - Ph.D. University of Toronto – Electrical & Computer Engineering
  - Project: *Cyber-physical energy systems*
  - Current Position: Assistant Professor, University of Akron - Electrical & Computer Engineering
- Qin Wang   *Feb. 2015 – Dec. 2016*
  - Ph.D. Iowa State University – Electrical & Computer Engineering
  - Project: *The value of wind power forecasting improvements*
- S M Shafiul Alam   *February '16 – Sept. '18*
  - Ph.D. Kansas State University – Electrical & Computer Engineering
  - Project: *Distribution State Estimation*
- Jianhua Zhang   *Aug. '16 – February '19*
  - Ph.D. North Carolina State University – Electrical & Computer Engineering
  - Project: *Communications systems design and simulation for distributed PV coordination*
  - Current Position: Assistant Professor, Clarkson University – Electrical & Computer Engineering
- Omar Guerra Fernandez   *May 2017 – May 2020*
  - Ph.D. Purdue University –School of Chemical Engineering
  - Project: *Combined hydrogen and power systems for renewables integration*
- Kwami Sedzro   *March 2018 – Aug. '20*
  - Ph.D. Lehigh University –Department of Electrical and Computer Engineering
  - Project: *Ancillary Services from Wind Power*
- Wenqi Flora Zhang   *June 2020 - Present*
  - Ph.D. University of Colorado Boulder – Department of Applied Mathematics
  - NREL Director's Fellowship – *Integrated Wind, Solar, and Load Forecasting*
- Cong Feng   *June 2020 - Present*
  - Ph.D. University of Texas - Dallas – Department of Mechanical Engineering
  - Project: *Spatio-Temporal Probabilistic Forecasting*

Students Mentored
- David Luke Oates   *Summer 2011*
  - Ph.D. Student, Carnegie Mellon University, Department of Engineering and Public Policy
  - Project: *"Emissions Implications of Coal Cycling in Systems with Large Wind Power Penetration"*
- Sandra Shedd   *Summer 2012*
  - DOE Science Undergraduate Laboratory Internship (SULI), Williams College

- o Project: *"Examining the Variability of Wind Power, Solar Power, and Load in the Regulation Timeframe"*
- Nicholas Steckler   *Summer 2013*
    - o DOE Science Undergraduate Laboratory Internship (SULI), University of Washington
    - o Project: *"Statistical Properties of Load Forecasting Errors for Renewable Integration Studies"*
- Robert Bantz   *Spring 2014*
    - o DOE Science Undergraduate Laboratory Internship (SULI), University of Central Florida
    - o Project: *"Bayesian Network Analysis of Load Forecasting Errors"*
- Jari Miettinen   *March – October 2014*
    - o Ph.D. Student, Lappenranta University of Technology, Department of Electrical Engineering
    - o Project: *"Wind Power Forecasting Errors"*
- Samuel Putnam   *Summer 2014*
    - o DOE Science Undergraduate Laboratory Internship (SULI), University of Vermont
    - o Project: *"The Value of Wind Power Forecasting Improvements"*
- Marc Hüsch   *Summer 2014*
    - o DAAD RISE Program, Technical University of Dortmund
    - o Project: *"Clustering of Wind Power and Forecasting Regimes"*
- Mingjian Cui   *Sept. '14 – Sept. '15*
    - o Ph.D. Student, Wuhan University, School of Electrical Engineering
    - o Project: *"Wind and Solar Power Ramp Forecasting"*
- Jesus Nieto-Martin   *April – October 2015*
    - o Ph.D. Student, Cranfield University
    - o Project: *"Simulation-Optimization for Design of Power System Operations"*
- Wan Yin (Wendy) Cheung   *Spring & Summer 2015*
    - o DOE Science Undergraduate Laboratory Internship (SULI), University of California, San Diego
    - o Project: *"Uncertainty Quantification and Propagation in Irradiance and Solar Power"*
- Hanchen Xu   *Summer 2015*
    - o Ph.D. Student, UIUC, Department of Electrical & Computer Engineering
    - o Project: *"Power System Flexibility Options for the Western Interconnection"*
- Rishabh Jain   *Summer 2015*
    - o Ph.D. Student, North Carolina State, Department of Electrical & Computer Engineering
    - o Project: *"Power System Reserves in Renewable Integration Studies"*
- Tarek Elgindy   *August '15 – May '16*
    - o M.S. Student, Carnegie Mellon University, Operations Research
    - o Project: *"Ultra-Short-Term Solar Power Forecasting"*
- Ivonne Pena   *Summer - Fall 2015*
    - o Ph.D., Carnegie Mellon University, Engineering & Public Policy
    - o Project: *"A New IEEE 118-Bus System for Renewables Integration"*
- Benjamin Botor   *Fall 2015*
    - o DAAD RISE Program, University of Duisburg-Essen
    - o Project: *"Modeling of Bulk Power System Flexibility Options"*
- Joshua Rosenkranz   *Fall 2015*
    - o DAAD RISE Program, University of Kiel
    - o Project: *"Multi-hour Ramping Constraints due to Solar Energy Integration"*
- Brandon Reyes   *Spring 2016*
    - o B.Sc. Student, Applied Mathematics, Colorado School of Mines
    - o Project: *"Spatio-Temporal Forecasting of Solar Power"*
- Merce Labordena Mir   *March – September 2016*
    - o Ph.D. Student, ETH – Zürich – Climate Policy Group
    - o Project: *"Co-locating Concentrating Solar Thermal and Wind Power Plants"*
- Lyle Collins   *July - December 2016*
    - o Ph.D. Student, University of Newcastle/CSIRO
    - o Project: *"Game Theoretic Approaches to Demand Response"*
- Cristiana Lopes Lara   *July – August 2016*
    - o Ph.D. Student, Carnegie Mellon University – Chemical Engineering

- o Project: *"Capacity Expansion Modeling with High Renewables"*
- Todd Zhen *July – December 2016*
  - o Ph.D. Student, Purdue University – Chemical Engineering
  - o Project: *"Facility Location Problem Applied to Communications System Planning for Distributed Solar PV"*
- Gyujung Cho *August '16 – Feb. '17*
  - o Ph.D. Student, Sungkyunkwan University – Power System Innovation Laboratory
  - o Project: *"Distribution Systems Modeling with High PV Penetration"*
- Min-Sung Kim *August '16 – Feb. '17*
  - o M.S. Student, Sungkyunkwan University – Power System Innovation Laboratory
  - o Project: *"Distribution Systems Modeling with High PV Penetration"*
- Ji-Soo Kim *August '16 – Feb. '17*
  - o M.S. Student, Sungkyunkwan University – Power System Innovation Laboratory
  - o Project: *"Distribution Systems Modeling with High PV Penetration"*
- Ershun Du *Sept. '16 – Sept. '17*
  - o Ph.D. Student, Tsinghua University – Power System Innovation Laboratory
  - o Project: *"Integration of Concentrating Solar Power Plants"*
- Adarsh Hasandhka *Jan. '17 – August '17*
  - o M.S. Student, University of Colorado Boulder, Department of Electrical, Computer & Energy Engineering
  - o Project: *"Communication System Simulation for Distributed PV Coordination and Control"*
- Bing Huang *May '17 – August '17*
  - o Ph.D. Student, University of Texas - Austin, Department of Electrical & Computer Engineering
  - o Project: *"Flexible Wind Power Ramping Products"*
- Katharine Doubleday *June '17 – August '17*
  - o Ph.D. Student, University of Colorado Boulder, Department of Electrical, Computer & Energy Engineering
  - o Project: *"Multi-energy System District Planning and Modeling"*
- Mohammed Masum Siraj Khan *June '17 – Present*
  - o M.S. Student, Florida State University, Department of Electrical & Computer Engineering
  - o Project: *"Hardware-in-the-loop Testing of Communications System Design"*
- Dustin Michels *June '17 – August '17*
  - o B.Sc. Student, Carleton College, Computer Science Department
  - o Project: *"Flexible Reserves in Unit Commitment and Economic Dispatch Models"*
- Naeem Turner-Bandele *June '17 – August '17*
  - o B.Sc. Student, Santa Clara University, Department of Electrical Engineering
  - o Project: *"Impact of Residential PV Policies on Battery Sizing"*
- Jose Daniel Lara *June '17 – August '17*
  - o Ph.D. Student, University of California Berkeley, Energy & Resources Group
  - o Project: *"Economic Dispatch of Solar Power with Probabilistic Forecasting"*
- Richard Bryce *June '17 – Present*
  - o Ph.D. Student, University of Massachusets, Department of Mechanical and Industrial Engineering
  - o Project: *"Inter-annual Variability of Wind and Solar Resources"* and *"Microgrid Simulation"*
- Iris van Beuzekom *July '17 – February '18*
  - o Ph.D. Student, TU Eindhoven, Department of Electrical Engineering
  - o Project: *"Integrated Natural Gas and Power Systems Planning"*
- Javier Antoñanzas Torres *Sept. '17 – Feb. '17*
  - o Ph.D. Student, Universidad de la Rioja, Department of Electrical Engineering
  - o Project: *"Probabilistic Solar Power Forecasting and their Usage in Power System Operations"*
- Dominik Dominkovic *January '18 –April '18*
  - o Ph.D. Student, Technical University of Denmark, , Department of Energy
  - o Project: *"Modeling Energy Supply of Future Smart Cities"*
- Tessa Rider *June '18 – Aug. '18*
  - o Ph.D. Student, Colorado School of Mines, Department of Mechanical Engineering

- o Project: *"Examining the Complementarity of Renewables and Small Modular Nuclear Reactors"*
- Reiko Matsuda-Dunn   *October '19 – Present*
  - o B.Sc.. Student, University of Colorado Boulder, Department of Electrical, Computer & Energy Engineering
  - o Project: *"Renewable Integration Studies for Island Power Systems"*
- Simon Julien   *Summer 2019*
  - o B.Sc.. Student, University of Colorado Boulder, Department of Applied Mathematics
  - o Project: *"Impacts of Power Electronic Loads on Power System Stability"*
- Vanessa van Syoc-Hernandez   *Summer 2019*
  - o B.Sc.. Student, University of Colorado Boulder, Department of Electrical, Computer & Energy Engineering
  - o Project: *"Probabilistic Solar Power Forecasting with Bayesian Model Averaging"*
- Simon Julien   *Summer 2020*
  - o B.Sc.. Student, University of Colorado Boulder, Department of Applied Mathematics
  - o Project: *"Operation of Solar PV Plants Under Proactive Curtailment"*
- Vanessa van Syoc-Hernandez   *Summer 2020*
  - o B.Sc.. Student, University of Colorado Boulder, Department of Electrical, Computer & Energy Engineering
  - o Project: *"Probabilistic Solar Power Forecasting"*
- Marena Trujillo   *Summer 2021*
  - o B.Sc.. Student, Loyola Marymount University, Electrical and Computer Engineering Department
  - o Project: *"Stationary Energy Storage Research Needs"*
- Jeffrey Sward   *Summer 2021*
  - o Ph.D.. Student, Cornell University, Sibley School of Mechanical and Aerospace Engineering
  - o Project: *"Quantile Changes in Probabilistic Solar Power Forecasting"*
- Mason Sake   *Summer 2021*
  - o B.Sc. Student, Auburn University, Mechanical Engineering and Physics
  - o Project: *"Power System Dynamics with High Levels of Inverters"*

Visiting Postdocs
- Jethro Browell   *May – June 2017*
  - o Postdoctoral Researcher, University of Strathclyde, Electronic and Electrical Engineering

Visiting Faculty Members
- Jun-Hyung Ryu   *August '15 – July '16*
  - o Associate Professor, Dongguk University, Department of Nuclear & Energy Systems

Student Committee Member/Co-Advisor
- Marc Hüsch   *Graduated Spring 2015*
  - o Technical University of Dortmund – Faculty of Statistics
  - o B.Sc. Thesis: *"Clustering of Wind Power"*
  - o B.Sc. Thesis Co-Advisor: Joachim Kunert
- David Luke Oates   *Graduated Spring 2015*
  - o Carnegie Mellon University – Department of Engineering and Public Policy
  - o Ph.D. Thesis: *"Low Carbon Policy and Technology in the Power Sector: Evaluating Economic and Environmental Effects"*
  - o Ph.D. Advisor: Paulina Jaramillo
- Michael Craig   *Graduated Fall 2017*
  - o Carnegie Mellon University – Department of Engineering and Public Policy
  - o Ph.D. Thesis: *"Economic and Environmental Costs, Benefits, and Trade-Offs of Low-Carbon Technologies in the Electric Power Sector"*
  - o Ph.D. Advisor: Paulina Jaramillo
- Emily Ruby   *Graduated Fall 2018*
  - o University of Colorado Boulder – Department of Environmental Science

- o M.S. Thesis: *"Analysis of California's Formative Energy Storage Policy"*
  - o M.S. Advisors: Max Boykoff and Susan Tegen
- Giulia De Zotti   *Graduated Summer 2019*
  - o Danish Technical University – Department of Applied Mathematics and Computer Science
  - o Ph.D. Thesis: *"Leveraging Consumers' Flexibility for the Provision of Ancillary Services"*
  - o Ph.D. Advisors: Niels Kjølstad Poulsen and Henrik Madsen
- Joseph Gardner (co-advised with Nanette Boyle - CSM)   *Graduated Summer 2019*
  - o Colorado School of Mines – Deparmtnet of Chemical and Biological Engineering
  - o Ph.D Topic: *"Multi-Scale Modeling of Photosynthetic Organisms"*
  - o Ph.D. Advisor: Nanette Boyle
- Robert Cruickshank III   *Graduated Summer 2019*
  - o University of Colorado Boulder – Department of Civil, Environmental and Architectural Engineering
  - o Ph.D. Thesis: *"Estimating the Spatiotemporal Value of Jointly Optimized Electric Power Generation and Residential Electrical Use"*
  - o Ph.D. Advisor: Gregor Henze
- Wenqi Zhang   *Graduated Spring 2020*
  - o University of Colorado Boulder – Department of Applied Mathematics
  - o Ph.D. Thesis: *"Statistical Approaches to Assess High Frequency Variability of Solar Irradiance"*
  - o Ph.D. Advisor: William Kleiber
- Gianni Goretti   *Graduated Summer 2020*
  - o Technological University Dublin – School of Civil and Structural Engineering
  - o Ph.D. Thesis: *"Forecasting the Short-term Value of Wind Power for Risk-aware Bidding Strategies in Single-Imbalance Price Electricity Markets"*
  - o Ph.D. Advisor: Aidan Duffy
- Sean Ericson   *Graduated Spring 2021*
  - o University of Colorado Boulder – Department of Economics
  - o Ph.D. Thesis: *"Picking Winners: When are technology-specific policies optimal?"*
  - o Ph.D. Advisor: Daniel Kaffine
- Jose Daniel Lara   *Anticipated Spring 2021*
  - o University of California Berkeley – Energy and Resources Group
  - o Ph.D. Thesis: *"Managing Uncertainty in Renewable Energy Integration"*
  - o Ph.D. Advisor: Duncan Calloway
- Amanda Lococo   *Graduated Fall 2021*
  - o University of Colorado Boulder – Department of Applied Mathematics
  - o M.S. Thesis: *"A New Approach to Assess Space-Time Variability in Solar Irradiances"*
  - o M.S. Advisor: William Kleiber

Purdue University – School of Chemical Engineering
Graduate Research Mentor
- Austin Zeiler – "Wind Power Forecasting with ARIMA Models"   *Summer 2010*
- Duncan Brooks – "Wind Energy Market Characterization and Forecasting"   *Fall 2009/Spring 2010*
- Adrienne Heinzelman – "Batteries: Large-scale Energy Storage Applications" *Fall 2009/Spring 2010*
- Eddie McLaughlin – "Mobile Batteries for EVs"   *Fall 2009*
- Zachary Singer – "Solar Photovoltaics: Technological Prospects"   *Fall 2009*
- Sam Steffen – "Solar Thermal Power: Market Prospects"   *Fall 2009*
- Eoin Hayes– "Statistical Modeling and Forecasting: A Tutorial"   *Summer 2007*

Workshops Attended:
Applied Management Principles Program - Krannert School of Management, Purdue University
West Lafayette, Indiana, May 17th to 28th, 2010

Next Generation Infrastructures Academy – Energy Markets Track
Venlo, The Netherlands, September 21st to 25th, 2009

15013 Denver W Pkwy MS ESIF200 Golden, CO 80401

Tel: (303) 384-6981, E-mail: bri-mathias.hodge@nrel.gov

Selected Honors:

- NREL Chairman's Award for Exceptional Performance *August 2020*
- 2019 Best Paper Award: Journal of Modern Power Systems and Clean Energy *August 2020*
  - "Adjustable and distributionally robust chance-constrained economic dispatch considering wind power uncertainty"
- NREL 2019 Outstanding Performance Award *March 2020*
  - "For technical leadership in power systems engineering and advancement of the NREL mission at multiple scales"
- NREL 2019 Directors Publication Impact Award *March 2020*
- NREL Outstanding Mentor Award *September 2018*
- Best Paper Award (x2), IEEE Power & Energy Society General Meeting *August 2018*
- NREL Outstanding New Partnership Award –Peña Station Next *March 2018*
- Best Paper Award, IEEE Power & Energy Society General Meeting *July 2017*
- NREL President's Award *August 2016*
- Fulbright Fellowship, VTT, Finland *May – August 2016*
- Best Paper Award, IEEE Power & Energy Society General Meeting *July 2016*
- NREL RPP Outstanding Mentor Award *September 2015*
- Best Paper Award, IEEE Power & Energy Society General Meeting *July 2015*
- NREL Outstanding SULI Mentor Award *Spring 2015*
- NREL RPP Outstanding Mentor Award *September 2014*
- FOCAPD Young Researcher Travel Grant *July 2014*
- NREL Outstanding SULI Mentor Award *Summer 2012*
- Undergraduate Award for Teaching Excellence – Purdue Chemical Engineering *Spring 2009*
- Eastman Graduate Student Travel Grant *Spring 2008*
- President, Chemical Engineering Graduate Student Organization - Purdue *2007-2008*
- Charlemagne Scholarship - RWTH Aachen, Germany *2002-2003*

Selected Student Awards:

- Megan Rose: National Aeronautics and Space Administration (NASA) Space Technology Graduate Research Opportunities Fellowship, 2021 - 2025
- Simon Julien: Undergraduate Research Award, University of Colorado Boulder College of Engineering & Applied Science, Spring 2021
- Matthew Bossart: National Science Foundation Graduate Research Fellowship, 2021 - 2024
- Matthew Bossart: 3rd Prize – Graduate Student Poster Contest; 2020 IEEE Power & Energy Society General Meeting
- Katharine Doubleday: Scholar Award – International Chapter of the P.E.O. Sisterhood
- Richard Wallace Kenyon: 2nd Prize – Graduate Student Poster Contest; 2019 IEEE Power & Energy Society General Meeting
- Katharine Doubleday: Outstanding Graduate Student Award, Department of Electrical, Computer & Energy Engineering, University of Colorado Boulder, 2019

Professional Activities:

Journal Reviewer for: *Applied Energy; Applied Soft Computing; Bulletin of the American Meteorological Society (BAMS); Computers & Chemical Engineering; Energy; Energy Conversion & Management; Energy Policy; Energy Research & Social Science; Energy Strategy Reviews; European Journal of Operational Research; Frontiers in Energy Research: Energy Systems and Policy; Frontiers in Energy Research: Process and Energy Systems Engineering; IEEE PES Letters; IEEE Power & Energy Technology Systems Journal; IEEE Transactions on Control Systems Technology; IEEE Transactions on Power Systems; IEEE Transactions on Sustainable Energy; IET Generation,Transmission & Distribution; IET Renewable Power Generation, Industrial & Engineering Chemistry Research; International Journal of Forecasting; International Journal of Power and Energy Systems; International Journal of Sustainable Transportation; Journal of Renewable and Sustainable Energy; Journal of Zhejiang University – Computers & Electronics; Materials and Manufacturing Processes; Mathematical Problems in Engineering; Nature Energy; PLOS One; Proceedings of the IEEE, Renewable Energy; Renewable Energy Focus; Resources; Solar Energy; Utilities Policy; Wind Energy.*

Conference Paper Reviewer for: *The 12th International Conference on Probabilistic Methods Applied to Power Systems (PMAPS) 2012; IEEE GreenTech 2013; IEEE GreenTech 2014, The 13th International Conference on Probabilistic Methods Applied to Power Systems (PMAPS) 2014; 8th International Conference on Foundations of Computer-Aided Process Design (FOCAPD) 2014; 2015 Summer Simulation Multi-Conference; IEEE GreenTech 2016; 55th IEEE Conference on Decision and Control; The 14th International Conference on Probabilistic Methods Applied to Power Systems (PMAPS) 2016; ASME Turbo Expo 2019; 9th International Conference on Foundations of Computer-Aided Process Design (FOCAPD) 2019, 54th Hawaii International Conference on System Sciences.*

Book Proposal Reviewer for: *Wiley – Electrical Engineering, Elsevier – Engineering.*

Associate Editor: *Journal of Renewable and Sustainable Energy; June 2019 – Present.*

Editorial Board: *IEEE Transactions on Sustainable Energy; January 2019 – Present.*

Funding Proposal Reviewer for: *National Science Foundation: Cyber-Enabled Sustainability Science and Engineering (CyberSEES) program, Small Business Innovation Research/Small Business Technology Transfer Energy, Power, Control, and Networks (EPCN) program; Department of Energy: Small Business Innovation Research/Small Business Technology Transfer.* High Performance Computing Proposal Reviewer for: *LinkSCEEM & Cy-Tera Joint Call for HPC Access.*

American Meteorological Society, Renewable Energy Committee Member, 2019-2022.

Industry Program Chair, 2021 IEEE Green Technologies Conference, April 7-9, 2021, Denver, CO, USA.

Technical Program Committee Member, 2020 IEEE Green Technologies Conference, April 1-3, 2020, Oklahoma City, OK, USA.

Guest Editor for: *Journal of Energy Engineering*, Special Issue on "*Modeling, Monitoring, and Algorithmic Opportunities in the Next-Generation Power Grid*".

Session Chair, "Forecasting 2", Energy Systems Integration Group (ESIG), Meteorology & Market Design for Grid Services Workshop, June 4-6 2019, Denver, CO USA.

International Programming Committee, Foundations of Computer Aided Process Design (FOCAPD) 2019, July 14-18, Copper Mountain, CO, USA.

Salt River Project Grid Modernization Advisory Board, 2018 - 2019.

Program Committee, 2017 Summer Computer Simulation Conference, July 9-12, Seattle, WA, USA.

Session Chair, "Industrial Applications of Data Analysis, Information Management, and Intelligent Systems", American Institute of Chemical Engineers Annual Meeting, November 13-18, 2016, San Francisco, CA, USA.

Session Chair, "Forecast Issues", 5th International Workshop on Integration of Solar Power into Power Systems, October 19-20, 2015, Brussels, Belgium.

Program Coordinator, AIChE CAST Division 10E: Information Management and Intelligent Systems, 2015

Session Co-Chair, "Data Analysis and Big Data in Chemical Engineering" American Institute of Chemical Engineers Annual Meeting, November 8-13, 2015, Salt Lake City, UT, USA.

Session Co-Chair, "Advances in Smart Grid" American Institute of Chemical Engineers Annual Meeting, November 8-13, 2015, Salt Lake City, UT, USA.

Session Co-Chair, "Advances in Data Analysis: Theory and Applications", American Institute of Chemical Engineers Annual Meeting, November 16-21, 2014, Atlanta, GA, USA.

Session Co-Chair, "Information Management and Intelligent Systems", American Institute of Chemical Engineers Annual Meeting, November 16-21, 2014, Atlanta, GA, USA.

Session Co-Chair, "Design of Energy Systems I", 8th International Conference on Foundations of Computer-Aided Process Design (FOCAPD), July 13 – 17, 2014, Cle Elum, WA, USA.

Technical Program Committee Member, 2014 Sixth Annual IEEE Green Technologies Conference, April 3-4, 2014, Corpus Christi, TX, USA.

Program Co-Coordinator, AIChE CAST Division 10E: Information Management and Intelligent Systems, 2014

Session Chair, "Big Data Applications in Chemical Engineering", American Institute of Chemical Engineers Annual Meeting, November 3-8, 2013, San Francisco, CA, USA.

Session Chair, "Forecasting I", 12th International Workshop on Large-Scale Integration of Wind Power into Power Systems as well as on Transmission Networks for Offshore Wind Power Plants, October 22-24, 2013, London, UK.

Program Committee Member, The American Meteorological Society 2013 Summer Community Meeting, August 12-16, 2013, Boulder, CO, USA.

Session Chair, "Wind Power – Session A", 5th Annual IEEE Green Technologies Conference, April 4th, 2013, Denver, CO, USA.

Session Co-Chair, "Energy and Sustainability in Operations", American Institute of Chemical Engineers Annual Meeting, October 28th, 2012, Pittsburgh, PA, USA.

Session Chair, "Smart Grid and Wind Power – Part II", 10th International Workshop on Large-Scale Integration of Wind Power into Power Systems, October 26th, 2011, Aarhus, Denmark.

Languages:

English:	Native Speaker
German:	Fluent
Swedish:	Fluent