Kyri Alysa Baker, Ph.D.

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Boulder, CO, USA

Summary

Creative researcher passionate about transforming the electric power grid, renewable energy, and interdisciplinary collaboration. Expertise in stochastic and distributed optimization spanning electricity markets, power grids, and buildings. Excellent communication and analytical skills that support both theoretical and applied energy research.

Current Position

Assistant Professor August 2017 - Present
University of Colorado Boulder
Department of Civil, Environmental, and Architectural Engineering
Deptartment of Electrical, Energy, and Computer Engineering (by courtesy)
Joint Appointment in the Renewable and Sustainable Energy Institute (RASEI)

Previous Position

Research Engineer, Power Systems Group
National Renewable Energy Laboratory Feb. 2016 - August 2017

Postdoctoral Position

Postdoctoral Researcher, Residential Buildings Group
National Renewable Energy Laboratory Jan. 2015 - Feb. 2016

Education

Ph.D, Electrical and Computer Engineering 2010 - Dec. 2014
Carnegie Mellon University, Pittsburgh, PA
Advisor: Prof. Gabriela Hug (Now at ETH Zürich)
Co-Advisor: Prof. Xin Li (Now at Duke University)
Thesis: "Coordination of Resources across Areas for the Integration of Renewable Generation: Operation, Sizing and Siting of Storage Devices." [Online]

M.S., Electrical and Computer Engineering 2009-2010
Carnegie Mellon University, Pittsburgh PA
Research Focus: Biometrics, Advised by Prof. Marios Savvides

B.S., Electrical and Computer Engineering 2006-2009
Carnegie Mellon University, Pittsburgh PA
Research Focus: Bioinformatics, Advised by Prof. Takeo Kanade and Dr. Mei Chen

Patents

(P1) K. Baker, A. Bernstein, and E. Dall'Anese, "Network-Cognizant Voltage Droop Control," *Patent Pending.*

Publications

Journal Articles Under Review / Preprints

(J10) K. Garifi, **K. Baker**, D. Christensen, and B. Touri, "Non-Simultaneous Charging and Discharging Guarantees in Energy Storage System Models for Home Energy Management Systems," *submitted to IEEE Transactions on Smart Grid*, 2018. [Online]

(J9) N. Glascock, B. Huber, C. Cantrall, W. Evonosky, E. Robinson, B. Dharmadasa, and **K. Baker**, "MAFSA: Mars Autonomous and Foldable Solar Array," *submitted to New Space*, 2018.

(J8) Y. Guo, **K. Baker**, E. Dall'Anese, Z. Hu, and T.H. Summers, "Data-based distributionally robust stochastic optimal power flow, Part I: Methodologies," *submitted to IEEE Transactions on Power Systems*, 2018. [Online]

(J7) Y. Guo, **K. Baker**, E. Dall'Anese, Z. Hu, and T.H. Summers, "Data-based distributionally robust stochastic optimal power flow, Part II: Case Studies," *submitted to IEEE Transactions on Power Systems*, 2018. [Online]

Peer-reviewed Journal Articles

(J6) **K. Baker**, A. Bernstein, E. Dall'Anese, and C. Zhao, "Network-Cognizant Voltage Droop Control for Distribution Grids," *IEEE Transactions on Power Systems*, Vol. 33, No. 2, pp 2098-2108, Mar 2018. [Online]

(J5) X. Jin, **K. Baker**, D. Christensen, and S. Isley, "Foresee^{TM}: A User-Centric Home Energy Management System for Energy Efficiency and Demand Response," *Applied Energy*, Vol. 205, pp 1583-1595, Nov 2017. [Online]

(J4) E. Dall'Anese, **K. Baker**, and T.H. Summers, "Chance-Constrained AC Optimal Power Flow for Distribution Systems with Renewables," *IEEE Transactions on Power Systems*, Vol. 32, No. 5, pp 3427-3438, Sep 2017. [Online]

(J3) **K. Baker** and B. Toomey, "Efficient Relaxations for Joint Chance Constrained AC OPF," *Electric Power Systems Research*, 148 (2017), pp. 230-236. [Online]

(J2) K. Baker, G. Hug, and X. Li, "Energy Storage Sizing Taking into Account Wind Forecast Uncertainties," *IEEE Transactions on Sustainable Energy*, Vol. 8, No. 1, pp. 331-340, Jan 2017. [Online]

(J1) K. Baker, G. Hug, and X. Li, "Distributed MPC for Efficient Coordination of Storage and Renewable Energy Sources across Control Areas," *IEEE Transactions on Smart Grid, Special Issue on Distributed Energy Management Systems*, Vol. 7, No. 2, pp. 992-1001, Mar. 2016 (444 submissions, 20 published). [Online]

Peer-reviewed Conference Articles

(C16) K. Garifi, **K. Baker**, B. Touri, and D. Christensen, "Stochastic Model Predictive Control for Demand Response in a Home Energy Management System," *IEEE Power and Energy Society General Meeting*, Portland, OR, 2018.

(C15) K. Baker and K. Garifi, "Power Signature Obfuscation using Flexible Building Loads," *4th International Workshop on Non-Intrusive Load Monitoring*, **[Best Paper Award Honorable Mention]**, Austin, TX, 2018. [Online].

(C14) Y. Guo, **K. Baker**, E. Dall'Anese, Z. Hu, and T.H. Summers, "Stochastic optimal power flow based on data-driven distributionally robust optimization," *accepted to the American Controls Conference*, Milwaukee, WI, 2018. [Online].

(C13) K. Baker, A. Bernstein, C. Zhao, and E. Dall'Anese, "Network-cognizant Design of Decentralized Volt/VAR Controllers," *Innovative Smart Grid Technologies (ISGT)*, Arlington, VA, 2017. [Online].

(C12) X. Jin, **K. Baker**, S. Isley, and D. Christensen, "User-Preference-Driven Multi-Objective Model Predictive Control of Residential Building Loads and Battery Storage for Demand Response," *American Controls Conference (Invited Paper)*, Seattle, WA, 2017 [Online].

(C11) X. Zhou, L. Chen, E. Dall'Anese, and **K. Baker**. "Incentive-Based Voltage Regulation in Distribution Networks," *American Controls Conference*, Seattle, WA, 2017. [Online]

(C10) E. Raszmann, **K. Baker**, Y. Shi, and D. Christensen, "Modeling Stationary Lithium-Ion Batteries for Optimization and Predictive Control," *Power and Energy Conference at Illinois (PECI)*, **[Best Paper Award]**, Champaign, IL, 2017. [Online]

(C9) E. Dall'Anese, **K. Baker**, and T.H. Summers, "Adaptive Optimal Power Flow for Distribution Systems under Uncertain Forecasts," *2016 Conference on Decision and Control (CDC)*, Las Vegas, NV, Dec. 2016. [Online]

(C8) **K. Baker**, X. Jin, D. Vaidhynathan, W. Jones, D. Christensen, B. Sparn, J. Woods, H. Sorensen, and M. Lunacek, "Short Paper: Frequency Regulation Services from Connected Residential Devices," *ACM BuildSys '16*, Stanford, CA, Nov. 2016. **[5 out of 68 Short Papers accepted $\approx$ 7%]**. [Online]

(C7) **K. Baker**, E. Dall'Anese, and T.H. Summers, "Distribution-Agnostic Stochastic Optimal Power Flow for Distribution Grids," *IEEE North American Power Symposium*, Denver, CO, Sept. 2016. [Online]

(C6) B. Palmintier, E. Hale, B.-M. Hodge, **K. Baker**, and T. Hansen, "Experiences integrating transmission and distribution simulations for DERs with the Integrated Grid Modeling System (IGMS)," *Power Systems Computation Conference (PSCC)*, Genoa, Italy, 2016. [Online]

(C5) F. Ding, B. Mather, N. Ainsworth, P. Gotseff, and **K. Baker**, "Locational Sensitivity Investigation on PV Hosting Capacity and Fast Track PV Screening," *IEEE PES T&D*, Dallas, TX, 2016 [Online].

(C4) **K. Baker**, G. Hug, and X. Li, "Optimal Storage Sizing using Two-Stage Stochastic Optimization for Intra-Hourly Dispatch," *IEEE North American Power Symposium*, Pullman, WA, 2014 [Online].

(C3) **K. Baker**, D. Zhu, G. Hug, and X. Li, "Jacobian Singularities in Optimal Power Flow Problems Caused by Intertemporal Constraints," *IEEE North American Power Symposium*, Manhattan, KS, 2013 [Online].

(C2) **K. Baker**, G. Hug, and X. Li, "Inclusion of Inter-Temporal Constraints into a Distributed Newton-Raphson Method," *IEEE North American Power Symposium*, Urbana-Champaign, IL, 2012 [Online].

(C1) **K. Baker**, G. Hug, and X. Li, "Optimal Integration of Intermittent Energy Sources Using Distributed Multi-step Optimization," *IEEE Power and Energy Society General Meeting*, San Diego, CA, 2012 [Online].

Poster Presentations

(R1) **K. Baker** and J. Kasprzyk, "A Guide for the Use of Internet Memes in Engineering Education," *American Society of Engineering Education Zone IV Conference*, Boulder, CO, 2018.

Technical Reports

(TR3) *On the Path to SunShot: Emerging Issues and Challenges in Integrating Solar with the Distribution System*, Technical Report NREL/TP-5D00-6533, B. Palmintier,

R. Broderick, B. Mather, M. Coddington, **K. Baker**, F. Ding, M. Reno, M. Lave, and A. Bharatkumar, National Renewable Energy Laboratory, May 2016 [Online].

(TR2) *Integrated Distribution-Transmission Analysis for Very High Penetration Solar PV*, Technical Report NREL/TP-5D00-65550, B. Palmintier, E. Hale, T. Hansen, W. Jones, D. Biagioni, **K. Baker**, H. Wu, J. Giraldez, H. Sorensen, M. Lunacek, N. Merket, J. Jorgenson, B-M. Hodge, National Renewable Energy Laboratory, Jan. 2016 [Online].

(TR1) *Model Predictive Control of a Steam Turbine*, **K. Baker** and T.S. Leong, 2009. [Online].

Data Management

Public Dataset. Baker, Kyri et al. (2016): *Grid Connected Functionality*. National Renewable Energy Laboratory. [Online]

Sponsored Projects

Reducing Water Consumption via Free Market Renewable Integration
Sponsor: University of Colorado, Boulder, Water Energy Nexus IRT
Total Award: **$15,697**
PI: **Kyri Baker**
Co-PI: Rafael Frongillo (Computer Science)
Period: 2/2018 - 12/2018

Student Advising

PhD Students:
Amy Allen, Architectural Engineering (Co-advised by Gregor Henze), Fall 2017 - Present.

Kaitlyn Garifi, Electrical and Computer Engineering (Co-advised by Behrouz Touri), Fall 2017- Present.

James Hurtt, Electrical and Computer Engineering, Spring 2018 - Present.

Masters Students:
Zachary Peterson, Architectural Engineering, Fall 2017 - Present.

Teaching

Circuits for Non-Majors (ECEN 3030) - CU Boulder, Fall 2018.

Electrical Circuits for Architectural Engineers (AREN 4830) - CU Boulder Spring 2018.

Electrical Systems for Buildings (AREN 4570/CVEN 5830) - CU Boulder Fall 2017.

Optimization of Energy Networks (18-879) - Carnegie Mellon University Teaching Assistant and Recitation Leader. Fall 2011, Spring 2013.

Outreach

Volunteer - *Andrew Carnegie Society (ACS)* April 2014.
Demonstrated CMU Energy Club's solar cooker at the Andrew Carnegie Society (ACS) Environment and Energy Showcase to families and members of the community.

Volunteer - *Summer Engineering Experience for Girls (SEE)* Summer 2011, 2013-14.
Helped develop a guide for middle school girls and assisted them in building and testing miniature wind generators.

Volunteer - *SWE High School Days @ CMU* Fall 2011.
Mentored students as they learned how to read schematics and construct circuits.

Professional Service

Faculty Advisor, IEEE, University of Colorado Boulder Chapter 2017 - Present
Faculty Advisor, NASA BIG Idea Challenge 2017 - 2018
Technical Advisor, The Alt-E Fund 2017 - 2018
Member, Women in ECE (WinECE), Carnegie Mellon University, 2007 - 2014
Vice President, CMU Energy Club, Carnegie Mellon University, 2012
Member, Institute of Electrical and Electronic Engineers (IEEE), 2015 - Present
Webmaster, CMU Energy Club, Carnegie Mellon University 2013 - 2014
Member, Engineering Graduate Organization (EGO), 2010 - 2014.

Awards and Honors

Best Paper Award Honorable Mention, International Workshop on NILM, 2018
2nd Place, NASA BIG Idea Challenge (Faculty advisor), 2018
Best Paper Award, Power and Energy Conference at Illinois (PECI), 2017
Employee of the Month, National Renewable Energy Lab., Oct. 2016
Graduate Fellowship, Benjamin Garver Lamme/Westinghouse Fellowship 2010
Tuition Fellowship, Carnegie Institute of Technology Dean's Tuition Fellowship 2010
Research Support Award, Intel First Year Research Experience Award 2008

Reviewing/ Organizing Activities

Panel Reviewer, National Science Foundation (NSF), 2015, 2016.

Technical Committee Member, SmartGridComm 2016, International Workshop on Non-Intrusive Load Monitoring 2018

Session Chair, North American Power Symposium, 2016, International Workshop on Non-Intrusive Load Monitoring 2018

Journal Reviewer, IEEE Transactions on Power Systems, IEEE Transactions on Smart Grid, IEEE Transactions on Automatic Control, IEEE Transactions on Sustainable Energy, IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Energy Conversion, IEEE Transactions on Industrial Electronics, IEEE Systems Journal, IEEE Transactions on Control Systems Technology, IEEE Transactions on Industry Applications, IET Generation, Transmission, and Distribution, IET Cyber-Physical Systems, International Transactions on Electrical Energy Systems, Energies

Conference Reviewer, Conference on Decision and Control, Power Systems Computation Conference, ACM Transactions on Cyber-Physical Systems, North American Power Symposium, IEEE SmartGridComm, Complex Networks, Power and Energy Conference at Illinois, IEEE Green Technologies Conference, International Federation of Automatic Control, International Workshop on Non-Intrusive Load Monitoring

Other Research Experience

Carnegie Mellon University - *Masters Researcher* Mar. 2010 - May 2010.
Worked with a team of researchers performing long range iris recognition under low-lighting conditions, and facial detection and classification in YouTube videos.

Carnegie Mellon University - *Student Researcher* Sept. 2008 - Jun. 2009.
Assisted in the modeling of stem cell growth. Developed a software program in Java for importing, parameter specification, and visualizing population growth of stem cells using mathematical models.

Boise State University - *Undergraduate Researcher* Jun. - Aug. 2008.
Wrote Verilog code for memory (SRAM) testing on FPGAs, worked with a class VI laser to characterize light sensitive materials, and monitored optical absorption of test structures using DC probe stations.

Intel Research - *Undergraduate Researcher* Feb. - May 2008.
Developed a stem cell labeling program in C++ for verifying tracking results.

Industry Experience

Xerox Corporation - *Imaging Intern* Jun. - Aug. 2009.
Created a framework for automatic control of laser printer equipment in Labview easing the testing process for fellow engineers.

Hewlett-Packard - *Software Intern* Jun. - Aug. 2007.
I exercised my creativity with printer functionality testing in C# and Visual Basic.

Sapidyne Instruments - *General Assistant Emphasizing in Information Technology*
Mar. - Aug. 2005.
Setup and configuration of company's Linux backup server. Converted C++ application to Adobe Flash for interactive use on the company's website.