

Kyri Alysa Baker, Ph.D.

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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 <i>University of Colorado Boulder</i> Department of Civil, Environmental, and Architectural Engineering Department of Electrical, Energy, and Computer Engineering (by courtesy) Joint Appointment in the Renewable and Sustainable Energy Institute (RASEI)	August 2017 - Present
Previous Position	Research Engineer, Power Systems Group <i>National Renewable Energy Laboratory</i>	Feb. 2016 - August 2017
Postdoctoral Position	Postdoctoral Researcher, Residential Buildings Group <i>National Renewable Energy Laboratory</i>	Jan. 2015 - Feb. 2016
Education	Ph.D, Electrical and Computer Engineering Carnegie Mellon University , Pittsburgh, PA <i>Thesis:</i> “Coordination of Resources across Areas for the Integration of Renewable Generation: Operation, Sizing and Siting of Storage Devices.” [Online]	2010 - Dec. 2014
	M.S., Electrical and Computer Engineering Carnegie Mellon University , Pittsburgh PA	2009-2010
	B.S., Electrical and Computer Engineering Carnegie Mellon University , Pittsburgh PA	2006-2009
Patents	(P1) K. Baker , A. Bernstein, and E. Dall’Anese, “Network-Cognizant Voltage Droop Control,” <i>Patent Pending</i> . [Online]	
Publications	<u>Peer-reviewed Journal Articles</u>	
	(J10) K. Baker and A. Bernstein, “Joint Chance Constraints in AC Optimal Power Flow: Improving Bounds through Learning,” <i>IEEE Transactions on Smart Grid (to appear)</i> , 2019. [Online]	
	(J9) Y. Guo , K. Baker , E. Dall’Anese, Z. Hu, and T.H. Summers, “Data-based distributionally robust stochastic optimal power flow, Part I: Methodologies,” <i>IEEE Transactions on Power Systems</i> , Vol. 34, No. 2, Mar. 2019. [Online]	
	(J8) 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,” <i>IEEE Transactions on Power Systems</i> , Vol. 34, No. 2, Mar. 2019. [Online]	

- (J7) N. Glascock, B. Huber, C. Cantrall, W. Evonosky, E. Robinson, B. Dharmadasa, and **K. Baker**, “MAFSA: Mars Autonomous and Foldable Solar Array,” *New Space*, Vol. 6, No. 4, Dec. 2018. [[Online](#)]
- (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, “ForeseeTM: 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](#)]

Journal Articles Under Review

- (J11) 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,” *under review*, 2018. [[Online](#)]

Peer-reviewed Conference Proceedings

- (C22) H. Hava, L. Zhou, E. Lombardi, K. Cui, H. Joung, S. Manzano, A. King, H. Kinlaw, **K. Baker**, A. Kaufman, and N. Correll, “SIRONA: Sustainable Integration of Regenerative Outer-space Nature and Agriculture,” *International Conference on Environmental Systems (ICES)*, Boston, MA, 2019.
- (C21) S. Chakraborty, M. Cvetkovic, **K. Baker**, R. Verzijlbergh, and Z. Lukszo, “Consumer Hedging Against Price Volatility Under Uncertainty,” *IEEE PES PowerTech*, Milan, Italy, 2019.
- (C20) K. Garifi, **K. Baker**, D. Christensen, and B. Touri, “Stochastic Home Energy Management Systems with Varying Controllable Resources,” *IEEE Power and Energy Society General Meeting*, Atlanta, GA, 2019.
- (C19) S. Chakraborty, **K. Baker**, M. Cvetkovic, R. Verzijlbergh, and Z. Lukszo, “Directly Constraining Marginal Prices in Distribution Grids Using Demand-Side Flexibility,” *IEEE Power and Energy Society General Meeting*, Atlanta, GA, 2019.
- (C18) S. Chakraborty, R. Verzijlbergh, M. Cvetkovic, **K. Baker** and Z. Lukszo, “The Role of Demand-Side Flexibility in Hedging Electricity Price Volatility in Distribution Grids,” *IEEE Innovative Smart Grid Technologies Conference*, Washington DC, 2019.

- (C17) **K. Baker** and A. Bernstein, “Joint Chance Constraints Reductions through Learning in Active Distribution Networks,” *IEEE Global Conference on Signal and Information Processing (GlobalSIP) (Invited Paper)*, Anaheim, CA, 2018.
- (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,” *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. Sparrn, 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

(TR4) *Home Battery System for Cybersecure Energy Efficiency and Demand Response*, Technical Report NREL/TP-5500-72184, D. Christensen, X. Jin, B. Sparr, S. Isley, S. Balamurugan, S. Carmichael, A. Michalski, A. Sanghvi, M. Martin, **K. Baker**, K. Garifi, W. Gillies, S. Averitt, E. Gantumur, B. Mendrick, S. Suryanarayanan, P. Aloise-Young, R. Kadavil, S. Lurbe, National Renewable Energy Laboratory, Nov. 2018 [[Online](#)].

(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](#)].

Datasets

K. Baker et. al., *Grid Connected Functionality*, NREL, 2016. [[Online](#)]

Sponsored Projects

Intelligent System Partitioning for Agent-Based Security Constrained Optimal Power Flow

Sponsor: U.S. Department of Energy Advanced Research Projects Agency - Energy (ARPA-E) Grid Optimization (GO) Competition

Total Award: **\$249,178**

PI: **Kyri Baker**

Co-PIs: Javad Mohammadi and Soumya Kar (Carnegie Mellon University)

Period: 11/2018 - 10/2019

Drought-Contingent Regional Coordination of Thermoelectric Power Plants

Sponsor: University of Colorado Boulder, Water Energy Nexus IRT

Total Award: **\$45,682**

PI: Joseph Kasprzyk

Co-PIs: **Kyri Baker**, Ben Livneh, and Ashlynn Stillwell (UIUC)

Period: 6/2019 - 6/2020

Integrative Reengineering of Infrastructure for Tomorrow's Communities

Sponsor: U.S. Department of Education Graduate Assistance in Areas of National Need (GAANN)

Total Award: **\$1,210,235** (\$895,500 federal, \$314,735 cost share)

PI: Abbie Liel

Co-PIs: **Kyri Baker**, Sherri Cook, Shideh Dashti, Amy Javernick-Will, and Joseph Kasprzyk

Affiliates: Wil Srubar, Cristina Torres-Machi, and Brad Wham

Period: 1/2019 - 12/2021

**Past
Projects**

Reducing Water Consumption via Free Market Renewable Integration

Sponsor: University of Colorado Boulder, Water Energy Nexus IRT

Total Award: **\$19,197**

PI: **Kyri Baker**

Co-PI: Rafael Frongillo (Computer Science)

Period: 2/2018 - 12/2018

Gifts

Mars Autonomous and Foldable Solar Array (MAFSA)

Sponsor: National Institute of Aerospace (NIA) / NASA

Total Amount: **\$6,000**

Sustainable Integration of Regenerative Outer-space Nature & Agriculture (SIRONA)

Sponsor: National Institute of Aerospace (NIA) / NASA

Total Amount: **\$6,000**

**Research
Student
Advising**

PhD Students:

Amy Allen, Architectural Engr. (Co-advised by Gregor Henze), Fall 2017 - Present.

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

James Hurtt, Electrical and Computer Engr., Fall 2017 - Present.

Ana Ospina Sierra, Electrical and Computer Engr. (Co-advised by Emiliano Dall'Anese), Dec 2018 - Present.

Former Advisees:

Zachary Peterson, M.S. thesis in Architectural Engr, Fall 2017 - Spring 2019.

Landon Baxter, B.S. Computer Science, Fall 2018.

Sameera Gudladona, M.S. Electrical and Computer Engr., Summer 2018 - Jan. 2019.

Teaching

AREN 4830/CVEN 5830: Grid Connected Systems - Spring 2019.

Course created by Dr. Baker.

AREN 5001: Building Energy Systems (co-taught with 2 others) - Fall 2018, Fall 2019.

ECEN 3030: Circuits for Non-Majors - Fall 2018, Fall 2019.

AREN 4830: Electrical Circuits for Architectural Engineers - Spring 2018.
Course created by Dr. Baker.

AREN 4570/CVEN 5830: Electrical Systems for Buildings - Fall 2017.

Faculty Course Questionnaire (FCQ) Results

Semester/Course	Response Rate	Amount Learned	Overall Course	Overall Instructor
S19: AREN 4830/CVEN 5830	18/20 (90%)	5.3	5.7	5.8
F18: ECEN 3030	27/27 (100%)	5.5	5.6	5.9
F18: AREN 5001	8/11 (73%)	5.3	5.4	5.9
S18: AREN 4830	14/14 (100%)	5.5	5.7	5.7
F17: AREN 4570/CVEN 5830	12/12 (100%)	5.1	5.3	5.8
Department Average	–	4.9/6.0	4.7/6.0	5.1/6.0

Professional Service

Faculty Advisor, University of Colorado Boulder Energy Club 2018 - Present
Faculty Advisor, NASA BIG Idea Challenge 2017 - 2019
Faculty Advisor, IEEE, University of Colorado Boulder Chapter 2017 - 2019
Vice President, CMU Energy Club, Carnegie Mellon University, 2012
Member, Institute of Electrical and Electronic Engineers (IEEE), 2015 - Present.

Selected Awards and Honors

Most Innovative Award, NASA BIG Idea Challenge (Faculty advisor), 2019
R&D 100 Award, for *foresee*, led by NREL, 2018
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

Reviewing/Organizing Activities

Technical Committee Member, SmartGridComm 2016, 2019; International Workshop on Non-Intrusive Load Monitoring 2018; IEEE Power & Energy Society Smart Buildings, Loads, and Customer Services 2019

Session Chair, Modeling and Optimization: Theory and Applications (MOPTA) 2019; North American Power Symposium 2016; International Workshop on Non-Intrusive Load Monitoring 2018

Session Organizer, Modeling and Optimization: Theory and Applications (MOPTA) 2019.

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

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, SoftwareX, MDPI Energies, MDPI Applied Sciences

Conference Reviewer, Conference on Decision and Control, Power and Energy Society General Meeting, 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, IEEE International Conference on Acoustics, Speech and Signal Processing, International Federation of Automatic Control, International Workshop on Non-Intrusive Load Monitoring, Architectural Engineering Institute Conference, American Controls Conference, Intl. Conference on Acoustics, Speech, and Signal Processing

Full list of invited talks and conference papers/presentations not published in proceedings and M.S. / Ph.D. thesis committees served on available upon request.