

# Kyri Alysa Baker, Ph.D.

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<b>Summary</b>	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.	
<b>Current Position</b>	<b>Assistant Professor</b> <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
<b>Previous Position</b>	<b>Research Engineer, Power Systems Group</b> <i>National Renewable Energy Laboratory</i>	Feb. 2016 - August 2017
<b>Postdoctoral Position</b>	<b>Postdoctoral Researcher, Residential Buildings Group</b> <i>National Renewable Energy Laboratory</i>	Jan. 2015 - Feb. 2016
<b>Education</b>	<b>Ph.D, Electrical and Computer Engineering</b> <b>Carnegie Mellon University</b> , Pittsburgh, PA <i>Advisor:</i> Prof. Gabriela Hug (Now at ETH Zürich) <i>Co-Advisor:</i> Prof. Xin Li (Now at Duke University) <i>Thesis:</i> “Coordination of Resources across Areas for the Integration of Renewable Generation: Operation, Sizing and Siting of Storage Devices.” [ <a href="#">Online</a> ]	2010 - Dec. 2014
	<b>M.S., Electrical and Computer Engineering</b> <b>Carnegie Mellon University</b> , Pittsburgh PA <i>Research Focus:</i> Biometrics, Advised by Prof. Marios Savvides	2009-2010
	<b>B.S., Electrical and Computer Engineering</b> <b>Carnegie Mellon University</b> , Pittsburgh PA <i>Research Focus:</i> Bioinformatics, Advised by Prof. Takeo Kanade and Dr. Mei Chen	2006-2009
<b>Patents</b>	(P1) <b>K. Baker</b> , A. Bernstein, and E. Dall’Anese, “Network-Cognizant Voltage Droop Control,” <i>Patent Pending</i> . [ <a href="#">Online</a> ]	
<b>Publications</b>	<b><u>Journal Articles Under Review / Preprints</u></b>	
	(J10) K. Garifi, <b>K. Baker</b> , D. Christensen, and B. Touri, “Non-Simultaneous Charging and Discharging Guarantees in Energy Storage System Models for Home Energy Management Systems,” <i>under review</i> , 2018. [ <a href="#">Online</a> ]	
	(J10) <b>K. Baker</b> and A. Bernstein, “Joint Chance Constraints in AC Optimal Power Flow: Improving Bounds through Learning,” <i>under revision</i> , 2018. [ <a href="#">Online</a> ]	

### Peer-reviewed Journal Articles

- (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,” *IEEE Transactions on Power Systems* to appear, 2018. [[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,” *IEEE Transactions on Power Systems*, to appear, 2018. [[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*, to appear, 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, “Foresee<sup>TM</sup>: 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

- (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. Vaidhyanathan, W. Jones, D. Christensen, B. Sparr, 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

### **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

### **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

### **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

## 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.

**Masters Students:**

*Zachary Peterson*, Architectural Engr., Fall 2017 - Present.

*Sameera Gudladona*, Electrical and Computer Engr., Summer 2018 - Present.

**Undergraduate Students:**

*Landon Baxter*, Computer Science, Fall 2018 - Present.

**Teaching**

**AREN 4830/CVEN 5830: Grid Connected Systems** - Spring 2018.

*Course created from scratch by Dr. Baker.*

**AREN 5001: Building Energy Systems (co-taught)** - Fall 2018.

**ECEN 3030: Circuits for Non-Majors** - Fall 2018.

**AREN 4830: Electrical Circuits for Architectural Engineers** - Spring 2018.

*Course created from scratch by Dr. Baker.*

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

*Note: CVEN 5830 is a catch-all for special topics graduate courses in our department.*

**Faculty Course Questionnaire (FCQ) Results**

Class/Semester	Response Rate	Amount Learned	Overall Course	Overall Instructor
S18: AREN 4830	14/14 (100%)	5.5/6.0	5.7/6.0	5.7/6.0
F17: AREN 4570/CVEN 5830	12/12 (100%)	5.1/6.0	5.3/6.0	5.8/6.0

**Professional Service**

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

**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**

**Technical Committee Member**, SmartGridComm 2016, International Workshop on Non-Intrusive Load Monitoring 2018, IEEE Power & Energy Society Smart Buildings, Loads, and Customer Services 2019  
**Session Chair**, North American Power Symposium, 2016, International Workshop on Non-Intrusive Load Monitoring 2018

**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, Energies

**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, International Conference on Acoustics, Speech, and Signal Processing

**Journal  
Impacts**

<b>Journal</b>	<b>No. of Papers</b>	<b>Impact Factor</b>
IEEE Transactions on Smart Grid	1	7.364
Applied Energy	1	7.00
IEEE Transactions on Sustainable Energy	1	6.235
IEEE Transactions on Power Systems	4	5.255
Electric Power Systems Research	1	2.856
New Space	1	N/A