

# Kyri Alysa Baker, Ph.D.

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Boulder, CO, USA

<b>Vision</b>	I tackle climate change by developing computationally sustainable and efficient optimization and machine learning algorithms to solve large-scale energy challenges.	
<b>Research Interests</b>	Power systems, Optimization, Smart Grid, Renewable Energy, Building-to-Grid Integration, Applications of Machine Learning in Energy	
<b>Current Position</b>	<b>Assistant Professor</b> <i>University of Colorado Boulder</i> Department of Civil, Environmental, and Architectural Engineering	8/2017 - Present
	<b>Assistant Professor</b> (by courtesy) <i>University of Colorado Boulder</i> Department of Electrical, Computer, and Energy Engineering	8/2017 - Present
	<b>Fellow</b> Renewable and Sustainable Energy Institute (RASEI)	5/2020 - Present
<b>Previous Position</b>	<b>Research Engineer, Power Systems Group</b> <i>National Renewable Energy Laboratory</i>	2/2016 - 8/2017
<b>Postdoctoral Position</b>	<b>Postdoctoral Researcher, Residential Buildings Group</b> <i>National Renewable Energy Laboratory</i>	1/2015 - 2/2016
<b>Education</b>	<b>Ph.D, Electrical and Computer Engineering</b> Carnegie Mellon University, Pittsburgh, PA	7/2010 - 12/2014
	<b>M.S., Electrical and Computer Engineering</b> Carnegie Mellon University, Pittsburgh PA	8/2009-5/2010
	<b>B.S., Electrical and Computer Engineering</b> Carnegie Mellon University, Pittsburgh PA	8/2006-5/2009
<b>Selected Awards and Honors</b>	<b>International Awards</b>	
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	<b>Outstanding Young Investigator Award Runner Up,</b> Institute of Industrial and Systems Engineers, Energy Systems Division	2022
	<b>Outstanding Associate Editor,</b> IEEE Transactions on Smart Grid	2021
	<b>Best Paper Runner-up,</b> ACM e-Energy	2021
	<b>Best Paper Award,</b> two papers, IEEE Transactions on Power Systems (8 awards given across 1442 papers published from 2017-2019)	2020
	<b>Best Paper Finalist,</b> IEEE Power & Energy Society General Meeting	2019
<b>Best Paper Award Honorable Mention,</b> International Workshop on NILM	2018	

## National Awards

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<b>CAREER Award</b> , National Science Foundation	2021
<b>Top Five Performer</b> , DOE ARPA-E Grid Optimization (GO) Competition	2021
<b>Top Ten Performer</b> , DOE ARPA-E Grid Optimization (GO) Competition	2020
<b>R&amp;D 100 Award</b> , for <i>foresee</i> , led by NREL	2018
<b>Best Paper Award</b> , Power and Energy Conference at Illinois (PECI)	2017
<b>Employee of the Month</b> , National Renewable Energy Lab.	2016

## Campus Awards

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<b>John and Mercedes Peebles Innovation in Education Award</b> , (student nominated)	2022
<b>Outstanding Mentor Award</b> , (student nominated)	2021
<b>Dean’s Faculty Fellowship</b>	2021

## Department Awards

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<b>AREN Faculty Appreciation Award</b> , (student vote)	2022
<b>CEAE Department Teaching Award</b>	2022
<b>CEAE Department Early Career Researcher Award</b>	2021
<b>AREN Faculty Appreciation Award</b> , (student vote)	2020

## Patents

(P1) K. Baker, A. Bernstein, and E. Dall’Anese, “Network-Cognizant Voltage Droop Control,” Pub. No. US20180226799A1, awarded Sept. 2020. [[Online](#)]

## Publications

*Note: underline denotes CU graduate student (at time of submission); double underline denotes undergraduate (at time of submission), † denotes a postdoctoral researcher advised by me (at time of submission), and asterisk (\*) denotes my PhD advisor(s).*

## Journal Articles

(J29) D. S. Mallapragada, Y. Dvorkin, M. Modestino, D. V. Esposito, W. Smith, B-M. Hodge, M. P. Harold, V. M. Donnelly, A. Nuz, C. Bloomquist, K. Baker, L. C. Grabow, Y. Yan, N. N. Rajput, R. Hartman, E. J. Biddinger, E. Aydil, and A. Taylor, “Decarbonization of the Chemical Industry through Electrification: Barriers and Opportunities,” *Joule*, accepted, 2022.

(J28) C. Crozier<sup>†</sup> and K. Baker, “The Effect of Renewable Electricity Generation on the Value of Cross-border Interconnection,” *Applied Energy*, vol. 324, Oct. 2022. [[Online](#)]

(J27) K. Baker, “Emulating AC OPF solvers with Neural Networks,” *IEEE Transactions on Power Systems (Letters)*, vol. 37, no. 6, Nov. 2022. [[Online](#)]

(J26) A. Allen, G. Henze, K. Baker, G. Pavlak, and M. Murphy, “An optimization framework for the network design of advanced district thermal energy systems,” *Energy Conversion and Management*, vol. 266, Aug. 2022. [[Online](#)]

(J25) A. Pigott, C. Crozier<sup>†</sup>, K. Baker, and Z. Nagy, “GridLearn: Multiagent Reinforcement Learning for Grid-Aware Building Energy Management,” *Electric Power Systems Research*, vol. 213, Dec. 2022. [[Online](#)]

(J24) M. Krarti, S. Dafoe, and K. Baker, “Optimal Designs of Grid-Connected Energy

Efficient and Resilient Residential Communities,” *ASME Journal of Engineering for Sustainable Buildings and Cities*, vol. 3, no. 1, Feb. 2022.

(J23) C. Crozier<sup>†</sup>, K. Baker, and B. Toomey, “Feasible Region-Based Heuristics for Optimal Transmission Switching,” *Sustainable Energy, Grids and Networks*, vol. 30, June 2022. [[Online](#)]

(J22) J. Kravits, J. Kasprzyk, K. Baker, and A. Stillwell, “Incorporating thermoelectric power plant water use into multi-objective optimal power flow,” *Environmental Research: Infrastructure and Sustainability*, vol. 2, Mar. 2022. [[Online](#)]

(J21) J. Busby, K. Baker, M. Bazilian, A. Gilbert, E. Grubert, V. Rai, J. Rhodes, S. Shidore, C. Smith, and M. Webber, “Cascading Risks: Understanding the 2021 Winter Blackout in Texas,” *Energy Research & Social Science*, vol. 77, Jul. 2021. [[Online](#)]

(J20) J. Kravits, J. Kasprzyk, K. Baker, and K. Andreadis, “Screening Tool for Dam Hazard Potential Classification Using Machine Learning and Multi-Objective Hyperparameter Tuning,” *Journal of Water Resources Planning and Management*, vol. 147, no. 10, 2021. [**Editor’s Choice Paper**] [[Online](#)]

(J19) D. Biagioni, P. Graf, X. Zhang, A. Zamzam, K. Baker, and J. King, “Learning-Accelerated ADMM for Distributed DC Optimal Power Flow,” *IEEE Control Systems Letters*, vol. 6, 2022. [[Online](#)]

(J18) J. Hurtt and K. Baker, “Sensitivity Analysis of Photovoltaic System Design Parameters to Passively Mitigate Ramp Rates,” *IEEE Journal of Photovoltaics*, vol. 11, no. 2, pp. 545-551, Mar. 2021. [[Online](#)]

(J17) J. Wang, K. Garifi, K. Baker, W. Zuo, Y. Zhang, S. Huang, D. Vrabie, “Optimal Renewable Resource Allocation and Load Scheduling of Resilient Communities,” *Energies*, Special Issue on Building-to-Grid Integration through Intelligent Optimization and Control, Vol. 13, No. 21, Oct 2020. [[Online](#)]

(J16) J. Chin, K. Baker, and G. Hug\*, “Consumer privacy protection using flexible thermal loads: Theoretical limits and practical considerations,” *Applied Energy*, vol. 281, Jan. 2021. [[Online](#)]

(J15) Y. Fu, X. Han, K. Baker, and W. Zuo, “Assessments of Data Centers for Provision of Frequency Regulation,” *Applied Energy*, vol. 277, Nov. 2020. [[Online](#)]

(J14) H. Hava, L. Zhou, C. Mehlenbeck, E. Lombardi, A. King, K. Baker, A. Kaufman, and N. Correll, “SIRONA: Sustainable Integration of Regenerative Outer-space Nature and Agriculture. Part 2 - Design Development and Projected Performance,” *Acta Astronautica*, 2020. [[Online](#)]

(J13) A. Allen, G. Henze, K. Baker, and G. Pavlak, “Evaluation of Low-Exergy Heating and Cooling Systems and Topology Optimization for Deep Energy Savings at the Urban District Level,” *Energy Conversion and Management*, vol. 222, Oct. 2020. [[Online](#)]

(J12) K. Garifi, K. Baker, D. Christensen, and B. Touri, “Convex Relaxation of Grid-Connected Energy Storage System Models with Complementarity Constraints in DC OPF,” *IEEE Transactions on Smart Grid*, vol. 11, no. 5, pp. 4070 - 4079, Sept. 2020. [[Online](#)]

(J11) S. Chakraborty, R. Verzijlbergh, K. Baker, M. Cvetkovic, L. de Vries, and Z. Lukszo, “A Coordination Mechanism for Reducing Price Spikes in Distribution Grids,” *Energies*, Special Issue on Flexibility in Distribution Systems from EVs and Batteries, Vol. 13, No. 10, May 2020 [**Editor’s Choice Paper**]. [[Online](#)]

- (J10) K. Baker and A. Bernstein, “Joint Chance Constraints in AC Optimal Power Flow: Improving Bounds through Learning,” *IEEE Transactions on Smart Grid*, Vol. 10., No. 6, Nov. 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,” *IEEE Transactions on Power Systems*, Vol. 34, No. 2, Mar. 2019 [**Best Paper Award**]. [[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*, Vol. 34, No. 2, Mar. 2019 [**Best Paper Award**]. [[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, “Foresee™: 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](#)]

### **Book Chapters**

- (B2) J. F. Reyez-Meza, J. G. Elvir-Hernandez, W. C. Flores, H. R. Chamorro, J. Aguilon-Garcia, V. K. Sood, K. Baker, A. Al-Sumaiti, F. Gonzalez-Longatt, and W. Martinez, “Energy Scenarios Due to Southern Pine Beetle Outbreak in Honduras,” *Renewable Energy Technologies: Advances and Emerging Trends for Sustainability*, N. Kumar and P. Prabhansu (Eds.), Wiley-Scrivener, 2022.
- (B1) K. Baker, “Power, Buildings, and Other Critical Networks: Integrated Multi-System Operation,” *New Technologies for Power System Operation and Analysis*, H. Jiang, Y. Zhang, and E. Muljadi (Eds.), Cambridge, MA: Academic Press, 2020.

### **Peer-reviewed Conference Proceedings**

- (C47) K. Baertlein, A. Pyle, and K. Baker, “Solar and Battery Sizing for Continuous Operation of Electrified Ethylene Plants,” *54th North American Power Symposium (NAPS 2022)*,” accepted, 2022.
- (C46) S. Stroessner, R. Lucero, J. Kravits, A. Russell, S. Johannes, K. Baker, J. Kasprzyk,

and Z. Popovic, “Power Amplifier Design Using Interactive Multi-Objective Visualization,” *European Microwave Week (EuMW)*, 2022.

(C45) M. Mohammadian, K. Baker, M.H. Dinh, and F. Fioretto, “Learning Solutions for Intertemporal Power Systems Optimization with Recurrent Neural Networks,” *17th International Conference on Probabilistic Methods Applied to Power Systems (PMAPS)*, 2022.

(C44) C. Crozier<sup>†</sup>, K. Baker, Y. Du, J. Mohammadi, and M. Li, “Data-driven Contingency Selection for Fast Security Constrained Optimal Power Flow,” *17th International Conference on Probabilistic Methods Applied to Power Systems, (PMAPS)*, 2022.

(C43) C. Crozier<sup>†</sup>, A. Pigott, and K. Baker, “Spatial Arbitrage through Bidirectional Electric Vehicle Charging,” *IEEE Power and Energy Society General Meeting*, 2022.

(C42) A. Pigott, C. Crozier<sup>†</sup>, K. Baker, and Z. Nagy, “GridLearn: Multiagent Reinforcement Learning for Grid-Aware Building Energy Management,” *Power Systems Computation Conference*, 2022.

(C41) M. Yi, Y. Du, J. Mohammadi, C. Crozier<sup>†</sup>, K. Baker, and S. Kar, “Numerical Comparisons of Linear Power Flow Approximations: Optimality, Feasibility, and Computation Time,” *IEEE Power and Energy Society General Meeting*, 2022.

(C40) C. Crozier<sup>†</sup> and K. Baker, “Data-driven Probabilistic Constraint Elimination for Accelerated Optimal Power Flow,” *IEEE Power and Energy Society General Meeting*, 2022.

(C39) J. Kravits, K. Baker, J. Kasprzyk, and A. Stillwell, “Assessing Trade-offs Between Water, Emissions, and Cost in Multi-objective Optimal Power Flow,” *IEEE Power and Energy Society General Meeting*, 2022.

(C38) A. Pigott, K. Baker, S. A. Dorado-Rojas, and L. Vanfretti “Dymola-Enabled Reinforcement Learning for Real-time Generator Set-point Optimization,” *IEEE Innovative Smart Grid Technologies Conference*, 2022.

(C37) T. Joswig-Jones, K. Baker, and A. Zamzam, “OPF-Learn: An Open-Source Framework for Creating Representative AC Optimal Power Flow Datasets,” *IEEE Innovative Smart Grid Technologies Conference*, 2022.

(C36) K. Baker, “Solutions to DC OPF are Never AC Feasible,” *ACM e-Energy*, 2021.

(C35) B. Chen, P. Donti, K. Baker, Z. Kolter, and M. Berges, “Enforcing Policy Feasibility Constraints through Differentiable Projection for Energy Optimization,” *ACM e-Energy* (full paper acceptance rate **22.6%**), [**Best Paper Runner-up**], 2021.

(C34) J. Hurtt and K. Baker, “Minimum Battery Energy Storage System Sizing Integrated with a Photovoltaic Plant Considering Practical Limitations,” *IEEE PowerTech*, 2021.

(C33) A. Pigott, K. Baker, and C. Mosiman, “Deep Q-Learning for Aggregator Price Design,” *IEEE Power and Energy Society General Meeting*, 2021.

(C32) C. Crozier<sup>†</sup> and K. Baker, “Optimal Sizing of an Energy Storage Portfolio Considering Multiple Timescales,” *IEEE Power and Energy Society General Meeting*, 2021.

(C31) J. Kravits, K. Baker, and J. Kasprzyk, “Multi-Objective Optimal Power Flow Considering Emissions and Voltage Violations,” *IEEE Power and Energy Society General Meeting*, 2021.

(C30) S. Kim, K. Baker, and J. Kasprzyk, “Operational Revenue Insufficiency in

Highly Renewable DC and AC-based LMP Markets,” *52nd North American Power Symposium*, 2020.

(C29) A. Zamzam and K. Baker, “Learning Optimal Solutions for Extremely Fast AC Optimal Power Flow,” *IEEE SmartGridComm*, Dec. 2020. [Online]

(C28) J. Wang, K. Garifi, K. Baker, W. Zuo, and Y. Zhang, “Optimal Operation for Resilient Communities through a Hierarchical Load Scheduling Framework,” *2020 Building Performance Analysis Conference and SimBuild*, Chicago, IL, 2020. [Online]

(C27) Y. Fu, W. Zuo, and K. Baker, “Multi-market Optimization of a Data Center without Storage Systems,” *The American Modelica Conference*, Boulder, CO, 2020.

(C26) K. Garifi and K. Baker, “Considering Integer Chance Constraints for Enforcing Flexible Line Flow Ratings,” *American Control Conference*, Denver, CO, 2020. [Online]

(C25) B. Kreiger, K. Baker, and W.V. Srubar, “Quantifying Grid Interaction Capabilities of Dynamic Building Envelopes,” *ASHRAE Annual Conf.*, Austin, TX, 2020.

(C24) K. Baker, “Learning Warm-Start Points for AC Optimal Power Flow,” *IEEE International Conference on Machine Learning for Signal Processing* (acceptance rate  $\approx 48\%$ ), Pittsburgh, PA, 2019. [Online]

(C23) A. Allen, G. Henze, K. Baker, and G. Pavlak, “Analysis of HVAC Systems for Deep Energy Savings at the Urban District Level,” *The International Centre for Sustainable Development of Energy, Water and Environment Systems (SDEWES) Conference*, Dubrovnik, Croatia, 2019.

(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 [Best Paper Finalist]*, 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)*, 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*, 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](#)].

### Technical Reports

(TR3) *Home Battery System for Cybersecure Energy Efficiency and Demand Response*, Technical Report NREL/TP-5500-72184, D. Christensen, X. Jin, B. Sparn, 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, Nat. Renewable Energy Lab., Nov. 2018 [[Online](#)].

(TR2) *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, Nat. Renewable Energy Lab., May 2016 [[Online](#)].

(TR1) *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, Nat. Renewable Energy Lab., Jan. 2016 [[Online](#)].

### Public Datasets

T. Joswig-Jones, A. Zamzam, and K. Baker, *OPFLearnData: Dataset for Learning AC Optimal Power Flow*, 2021. [[Online](#)]

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

### Active Projects

Lead institution specified if not CU Boulder. My portion specified for external grants.

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Total external funding (neglecting cost share) on grants for which I am PI: **\$4,567,420**

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Total external funds directly allocated to me: **\$1,427,124**

Portion of this from government agencies: **\$1,330,284**

Portion of this from industry: **\$74,764**

Portion of this from philanthropic nonprofit organizations: **\$22,076**

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Funding from CU Boulder and CU Boulder-affiliated institutes: **\$52,697**

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Research funding from gifts: **\$125,000**

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### **Fast and robust strategies for large-scale mixed-integer SCOPF**

Sponsor: U.S. Dept. of Energy Advanced Research Projects Agency-Energy (ARPA-E)

Total Award: \$400,000

My Portion: \$150,000

Lead Institution: University of Texas at Austin, PI: Javad Mohammadi

CU PI: Kyri Baker, CU co-PI: Constance Crozier

Period: 9/6/2022 - 9/5/2023



**CAREER: Learning-Assisted Optimal Power Flow with Confidence**

Sponsor: National Science Foundation

Total Award: \$515,600

PI: Kyri Baker

Period: 3/1/2021 - 2/28/2026

**Center Development on Decarbonization of Chemical Manufacturing - DC-MUSE**

Sponsor: Alfred P. Sloan Foundation

Total Award: \$700,000

My Portion: \$22,076

Lead Institution: New York University, PI: Andre Taylor

CU PI: Kyri Baker, CU co-PI: Bri-Mathias Hodge

Period: 9/1/2021 - 8/31/2023

**Optimal Co-Design of Integrated Thermal-Electrical Networks and Control Systems for Grid-interactive Efficient District (GED) Energy Systems**

Sponsor: Department of Energy - Advanced Manufacturing Office

Total Award: \$4,159,922 (\$3,327,878 federal, \$832,044 cost share)

My Portion: \$300,684

PI: Kyri Baker (PI as of 3/2022)

Co-PIs: Wangda Zuo, Michael Wetter, Kyle Benne, Luigi Vanfretti, Atila Novoselac, and Raymond Kaiser

Period: 10/1/2020 - 9/30/2024

**Resilient and Equitable Infrastructure through Inclusive Engineering**

Sponsor: Office of Postsecondary Education: Graduate Areas of National Need (GAANN)

Total Award: \$1,143,732 (\$913,140 federal, \$230,592 cost share)

PI: Amy Javernick-Will

coPI: Abbie Liel, Joseph Kasprzyk, Evan Thomas, Kyri Baker, Shideh Dashti

Senior Personel: Karl Linden, Ben Livneh, Laura MacDonald, Ross Corotis

Period: 2021-2024.

**IUCRC Proposal Phase I: University of Colorado Boulder: Center for Building Energy Smart Technologies (BEST)**

Sponsor: National Science Foundation

Total Award: \$750,000

PI: Moncef Krarti

Co-PIs: Kyri Baker, Wangda Zuo, John Zhai, Gregor Henze

Period: 8/1/2021 - 7/31/2026

**Previous Projects**

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

Sponsor: U.S. Dept. of Energy Advanced Research Projects Agency-Energy (ARPA-E)

Total Award: \$649,178

My Portion: \$364,000

PI: Kyri Baker

Co-PIs: Javad Mohammadi

Period: 12/13/2018 - 8/11/2022

**Efficacy and equity of demand response programs across socioeconomic groups**

Sponsor: Renewable and Sustainable Energy Institute (RASEI)

Total Award: \$25,000

PI: Kyri Baker  
Period: 8/1/2021 - 2/11/2022

**Predicting Binding Constraints**

Sponsor: Solea Energy  
Total Award: \$20,772  
PI: Kyri Baker  
Period: 9/1/2021-12/31/2021

**Electric vehicle adoption and associated impacts on infrastructure and society**

Sponsor: University of Colorado Boulder, Resilient Infrastructure with Sustainability and Equity  
Total Award: \$8,500  
PI: Kyri Baker  
Co-PIs: Cristina Torres-Machi, Amy Javernick-Will, and Constance Crozier  
Period: 1/11/2021 - 9/1/2021

**Optimization Under Uncertainty for Improved Economic Efficiency of Cold Storage Warehouses**

Sponsor: Lineage Logistics  
Total Award: \$53,992  
PI: Kyri Baker  
Period: 12/9/2019 - 8/24/2020

**Integrative Reengineering of Infrastructure for Tomorrow's Communities**

Sponsor: Dept. of Education Graduate Assistance in Areas of National Need (GAANN)  
Total Award: \$1,210,235 (\$895,500 federal, \$314,735 cost share)  
Director: Abbie Liel  
Co-directors: Kyri Baker, Sherri Cook, Shideh Dashti, Amy Javernick-Will, and Joseph Kasprzyk, Wil Srubar, Cristina Torres-Machi, and Brad Wham  
Period: 1/2019 - 12/2021

**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

**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  
Period: 2/2018 - 12/2018

**Gifts**

**Prize money for ARPA-E Grid Optimization (GO) competition**

Sponsor: U.S. Dept. of Energy Advanced Research Projects Agency-Energy (ARPA-E)  
Total Amount: \$140,000  
My Portion: \$110,000

**Coordinating benefits of community solar and demand response**

Sponsor: Cloudbreak Energy  
Total Amount: \$15,000

**Mars Autonomous and Foldable Solar Array**

Sponsor: National Institute of Aerospace (NIA) / NASA  
Total Amount: \$6,000

**Sustainable Integration of Regenerative Outer-space Nature & Agriculture**

Sponsor: National Institute of Aerospace (NIA) / NASA  
Total Amount: \$6,000

**Research  
Advising**

**Postdoctoral Researchers:**

*Constance Crozier*, Civil, Environmental, and Architectural Engr, Sept. 2020 - Present.

**PhD Students:**

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

*Jacob Kravits*, Civil Systems (Co-advised by Joseph Kasprzyk), Summer 2019 - Present.

*Aisling Pigott*, Architectural Engr. Summer 2020 - Present.

*Mostafa Mohammadian*, Civil Systems. Spring 2021 - Present.

*Jasmine Garland*, Architectural Engr. (Co-advised by Ben Livneh), Jan 2022 - Present.

*Eli Evers*, Civil Engr. (Co-advised by Cristina Torres-Machi), Summer 2022 - Present.

**Masters Students:**

*John Montagu*, Applied Mathematics, Sept. 2022 - Present.

*Anna Pyle*, Architectural Engr., Nov. 2021 - Present.

*Nick Barancyk*, Mechanical Engr., Summer 2021 - Present.

**Undergraduate Students:**

*Simone Curtis*, Architectural Engr., Sept. 2022 - Present.

*Kendall Baertlein*, Architectural Engr., Nov. 2021 - Present.

**Former  
Advisees**

**Postdoctoral Researchers:**

*Mohammadhafez Bazrafshan*, Postdoctoral Researcher, Civil, Environmental, and Architectural Engr, July 2019 - November 2019.

**PhD Students:**

*Amy Allen*, PhD in Architectural Engr. (Primary advisor Gregor Henze), Fall 2017 - Summer 2021.

*Kaitlyn Garifi*, PhD in Electrical and Computer Engr. (Co-advised by Behrouz Touri), Fall 2017- Oct. 2020.

**Masters Students:**

*Andrew Thibeault*, Electrical and Computer Engr., Summer 2021 - Fall 2021.

*Sung Min Kim*, M.S. in Civil Systems. (Co-advised by Joseph Kasprzyk), Fall 2019 - Summer 2021.

*Nick Shenberger*, M.S. Project in Architectural Engr., Fall 2020 - Summer 2021.

*Jessica Stershic*, M.S. Thesis in Architectural Engr., Summer 2020 - Spring 2021.

*Sarah Dafoe*, M.S. thesis in Architectural Engr., Summer 2020 - Spring 2021.

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

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

**Undergraduate Students:**

*Calla Winner*, Electrical Engineering (Colorado School of Mines), Summer 2022.

*John Montagu*, Applied Math., Summer 2021 - Spring 2022.

*Liam Daniel*, Architectural Engr., Spring 2021 - Fall 2021.

*Ryan Davies*, Physics and Environmental Studies (Macalester College), Summer 2021.

*Sarah Dafoe*, B.S. in Architectural Engr., Fall 2019 - Summer 2020.

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

**Thesis  
Committees**

Anthony Florita (PhD), Robert Cruickshank (PhD), Baqer Ameer (PhD), Yangyang Fu (PhD), Katherine Glasheen (PhD), Mohammad Dabbagh (PhD), Margarite Jacoby (PhD), Jing Wang (PhD), Ammar Dehwah (PhD), Ayesah Al-Awadhi (PhD), Leo Guadagnin (PhD), Brendan Purcell (MS), Robin Walz (MS), Chrissa Turley (MS) Fatemah Ashraf (MS), Franklin Chiu (MS), Cory Mosiman (MS), Brenton Krieger (MS), Angelique Fathy (MS), Mohammed Almansour (MS), Matthew Steen (MS), Jordan Thompson (MS), Amir Salib (MS), Sourav Dey (PhD), Hayley Kinlaw (MS), Yingli Lou (PhD), Nick Engler (MS), Katy Hinkelman (Penn State, PhD), Thomas Kauffman (Economics BA honors thesis), Anne Hamilton (ECEN MS), Kyle Barber (AREN MS), Emily Schwartz (AREN MS), Maggie Sullivan (AREN MS), Adam Ferrer (AREN MS), Logan Cole (AREN MS), Andrew Klavekoske (AREN MS), Nicole Lantonio (AREN MS), Nicholas Elsasser (CS MS), Abdurahman Alrobaie (AREN MS), Ilgiz Murzakhanov (Denmark Technical University PhD), David Milner (AREN MS).

**Teaching**

**AREN 4830/CVEN 5830: Grid Connected Systems** - S19, S20, S21, F22.  
*Course created by Dr. Baker.*

**AREN 5001: Building Energy Systems (co-taught)** - F18, F19, F20, F21, F22.

**AREN 3040: Electrical Circuits for Architectural Engineers** - S18, S20, S21, S22. *Course created by Dr. Baker.*

**ECEN 3030: Circuits for Non-Majors** - F18, F19.

**AREN 4570/CVEN 5830: Electrical Systems for Buildings** - F17, F20, F21.

**CVEN 5849/AREN 4849: Independent Study** - S19, F19, S20, S22, F22.

**Student Group  
Advising**

<b>Faculty Advisor</b> , University of Colorado Boulder Energy Club	2018 - Present
<b>Faculty Advisor</b> , NASA BIG Idea Challenge	2017 - 2019
<b>Faculty Advisor</b> , IEEE, University of Colorado Boulder Chapter	2017 - 2019
<b>Vice President</b> , CMU Energy Club, Carnegie Mellon University,	2012

**Selected Invited  
Talks / Panels**

**Leading with Impact**, CU Engineering Alumni Event, Nov. 9, 2022.

**WeaveGrid**, Nov. 9, 2022.

**Keynote speaker at the National Federation of Municipal Analysts: Fall Advanced Seminar on Public Power**, Nov. 4, 2022.

**The Ohio State University**, Sept. 7, 2022.

**Camus Energy**, Jun. 1, 2022.

University of California, Berkeley, [\[video\]](#), Mar. 29, 2022.

Rice University, Mar. 25, 2022.

Keynote speaker at CU Energy Frontiers 2022, Mar. 9, 2022.

West Virginia University, Feb. 28, 2022.

University of North Texas, Feb. 10, 2022.

Pacific Northwest National Laboratory, Feb. 4, 2022.

Keynote speaker at the Q4Climate Workshop, Feb 2, 2022.

University of Oxford, Jan 24, 2022.

Princeton University Energy Conference, Nov 5, 2021.

Texas A&M University, Oct 15, 2021.

Carnegie Mellon University, Sept 1, 2021.

Wyoming Bar Continuing Legal Education (CLE), May 27, 2021.

21st Century Energy Transition Symposium, May 14, 2021.

Massachusetts Institute of Technology, [\[video\]](#), Apr. 30, 2021.

University of Wisconsin Madison, Apr. 30, 2021.

City University of Hong Kong, Mar. 23, 2021.

New York University, Mar. 11, 2021.

Stanford University, Feb. 12, 2021.

UK Energy Systems Catapult, [\[video\]](#), Feb. 10, 2021.

Climate Change AI and the Energy Innovation Network, [\[video\]](#), Nov. 23, 2020.

Newcastle University, [\[video\]](#), Nov. 11, 2020.

Denver Museum of Nature and Science and the Institute of Science and Policy, [\[video\]](#), Oct. 13, 2020.

Keynote speaker at the International Virtual Conference on AI and ML Applications in Smart Buildings (AMSB2020), July 22, 2020.

CU Boulder Alumni Exclusive COVID-19 Webinar Series, [\[video\]](#), May 26, 2020.

Colorado State University, Fort Collins, CO, Oct. 24, 2019.

**Selected  
Media  
Appearances/  
Research  
Mentions**

*ABC Denver 7*, “As states report more attacks on their critical infrastructure, Colorado says it’s as prepared as it can be,” Broadcast (interview), [\[link\]](#), Dec. 8, 2022.

*Thomson Reuters Foundation*, “Low-carbon bitcoin? Crypto miners’ green power talk angers Texas locals,” Online (interview), [\[link\]](#), Sept. 6, 2022.

*The Conversation*, “Does turning the air conditioning off when you’re not home actually save energy? Three engineers run the numbers,” Op-Ed, [\[link\]](#), Aug. 22, 2022.

*E&E News*, “3 issues to watch as heat strains the grid,” Online (interview), [\[link\]](#), Aug 11, 2022.

*Inverse*, “Blackouts are likely this summer - here’s how to prepare,” Online (interview), [\[link\]](#), July 19, 2022.

*Inverse*, “Summer really is getting hotter - how to prepare and stay cool,” Online (interview), [\[link\]](#), July 12, 2022.

*Popular Science*, “What the bans on Russian fossil fuels actually mean,” Online (interview), [\[link\]](#), Mar. 10, 2022.

*Vox Recode*, “California wants to use electric cars to back up the power grid,” Online (interview), [\[link\]](#), Mar. 9, 2022.

*Vox Recode*, “Biden’s offshore wind plan is also a jobs plan,” Online (interview), [\[link\]](#), Jan. 19, 2022.

*Vox Recode*, “Electric cars aren’t just vehicles. They’re big batteries.” Online (interview), [\[link\]](#), Jan. 8, 2022.

*PBS Weathered*, “Could The Next Blackout Be More Deadly Than Katrina?,” Video (interview), [\[link\]](#), Dec. 8, 2021.

*Vox Recode*, “The futuristic plan to fix America’s power grid,” Online (interview), [\[link\]](#), Dec. 2, 2021.

*Last Week Tonight with John Oliver*, “The Power Grid,” Content contributor (my name appeared under “Special Thanks” in the credits), [\[link\]](#), Nov. 7, 2021.

*E&E News*, “FERC weighs grid plan that could revolutionize clean energy,” Online (interview), [\[link\]](#), Oct. 15, 2021.

*E&E News*, “4 issues to watch as heat disrupts the grid,” Online (interview), [\[link\]](#), Aug. 6, 2021.

*Freethink*, “Will power plants move into the cloud?” Online (interview), [\[link\]](#), Jul. 30, 2021.

*Vox Recode*, “The US power grid isn’t ready for climate change,” Online (interview), [\[link\]](#), Jul. 3, 2021.

*ABC Denver 7*, “Xcel Energy starts installing “smart meters” for cleaner energy project,” Broadcast (interview), [\[link\]](#), Jun. 30, 2021.

*VICE News*, “Solar Was Only Energy Source to Outperform Expectations During Texas Blackout,” Online (interview, research article featured), [\[link\]](#), Jun. 24, 2021.

*The Guardian*, “Sweltering Texans urged to reduce cooking and cleaning to ease grid strain,” Online (interview), [\[link\]](#), Jun. 16, 2021.

*ABC Denver 7*, “High heat means significant strain on power grid,” Broadcast (interview), [\[link\]](#), Jun. 14, 2021.

*Gizmodo*, “Why the Texas Grid Failed, According to Science,” Online (research article featured), [\[link\]](#), Jun. 7, 2021.

*The Arizona Republic*, “Risk for Texas-style power grid failure is growing in Western states,” Newspaper/Online (interview), [\[link\]](#), Apr. 1, 2021.

*Fox 4 Kansas City*, “What needs to be done to avoid future rolling power outages,” Broadcast (interview), [\[link\]](#), Feb. 17, 2021.

*Fox 31 Denver*, “Texas-like blackouts unlikely in Colorado,” Broadcast (interview), [\[link\]](#), Feb. 17, 2021.

*ABC Denver 7*, “Could the Texas energy crisis happen in Colorado? Unlikely, but climate change a concern,” Online (interview), [\[link\]](#), Feb. 17, 2021.

**National/  
International  
Service**

**Guest Editor**, IET Cyber-Physical Systems: Theory & Applications, Oct 2022 - Present

**Section Editor**, Springer Current Sustainable/Renewable Energy Reports, Jan 2022 - Present

**Editorial Board**, Elsevier Sustainable Energy, Grids and Networks, June 2021 - Present

**Associate Editor**, IEEE Transactions on Smart Grid and IEEE Power Engineering Letters, May 2020 - Present

**Guest Editor**, Journal of Modern Power Systems and Clean Energy (MPCE), Special Issue on “Power Systems with Increasing Renewable Penetration: Market, Operations, Planning and Regulation,” 2020-21.

**Guest Editor**, MDPI Energies, Special Issue on “Building-to-Grid Integration through Intelligent Optimization and Control,” 2020

**Vice Chair**, IEEE Smart Buildings, Loads, and Customer Services (SBLC) Loads subcommittee, Fall 2019 - Fall 2021.

**Conference Session/Panel Organizer** (responsible for inviting speakers, organizing, and chairing session), IEEE Power and Energy Society General Meeting 2021; ASCE Architectural Engineering Institute Conference 2021; Modeling and Optimization: Theory and Applications (MOPTA) 2019.

**Technical Committee Member** (responsible for making decisions on papers and finding reviewers), IEEE Innovative Smart Grid Technologies 2022, ACM BuildSys 2021, ASCE Architectural Engineering Institute Conference 2021, IEEE SmartGrid-Comm 2016, 2019, 2021, ACM International Workshop on Non-Intrusive Load Monitoring 2018, 2020

**Conference Session Chair** (responsible for chairing conference session), IEEE North American Power Symposium 2016, 2021, 2022, ASCE Architectural Engineering Institute Conference 2021, Modeling and Optimization: Theory and Applications (MOPTA) 2019; IEEE Power & Energy Society General Meeting 2019, ACM International Workshop on Non-Intrusive Load Monitoring 2018

**Panel Reviewer**, National Science Foundation (NSF), 2015, 2016, 2021.

**Steering Committee/Moderator**, NSF/P SERC Workshop: Grid at the Edge, 2021.

**Journal, Conference, Proposal, and Book Reviewer**, available upon request.

**Service to  
the Campus**

**Education and Outreach Committee**, Renewable and Sustainable Energy Institute (RASEI), 2021-present

**Seminars and Conferences Committee**, Renewable and Sustainable Energy Institute (RASEI), 2020-2021

**Search Committee Member**, For institute searches, 2019, 2020, 2021, 2022, 2023

**ACTIVE volunteer**, Speaker, application reviewer, participant in the CU Engineering Faculty Development and Leadership Intensive, 2018, 2019.

**Service to  
the College  
and Dept.**

**Search Committee Member**, For a college-wide search, 2018-2019; for a department-level search, 2021, 2022, 2023

**Graduate Committee Member**, Fall 2019 - present

**Computer Committee Member**, Fall 2017 - present

**Curriculum Committee Member**, Fall 2018 - Spring 2019