Duncan S. Callaway

Contact Information

Energy and Resources Group, University of California
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Education

Ph.D. Cornell University, Ithaca, New York, Theoretical and Applied Mechanics. Minor in Applied Mathematics. Thesis advisor: Steven Strogatz.
B.S. University of Rochester, Rochester, New York, Mechanical Engineering.

Research Interests

Energy systems analysis; Modeling and optimization for grid integration of renewable electricity; Control and economics of spatially distributed energy resources.

Positions

Chair, Energy and Resources Group, University of California, Berkeley (2022-present)
Professor, Energy and Resources Group, University of California, Berkeley (2022-present)
Acting Chair, Energy and Resources Group, University of California, Berkeley (Fall 2021)
Affiliated Faculty, Energy Institute at Haas, University of California, Berkeley (2021-present)
Visiting Professor, Power Systems Laboratory, Swiss Federal Institute of Technology Zürich (Spring 2018)
Associate Professor, Energy and Resources Group, University of California, Berkeley (2016-2022)
Affiliated Faculty, Department of Electrical Engineering and Computer Science, University of California, Berkeley (2016-present)
Faculty Scientist, Environmental Energy Technologies Division, Lawrence Berkeley National Laboratory (2010-present)
Affiliated Faculty, Department of Mechanical Engineering, University of California, Berkeley (2009-2016)
Assistant Professor, Energy and Resources Group, University of California, Berkeley (2009-2016)
Visiting Scholar, Department of Mechanical Engineering, University of California, Berkeley (Fall 2008)
Assistant Research Scientist, School of Natural Resources and Environment and Department of Mechanical Engineering (by courtesy), University of Michigan (2008-2009)
Research Investigator, School of Natural Resources and Environment and Department of Mechanical Engineering (by courtesy), University of Michigan (2006-2008)
Senior Design Engineer, PowerLight Corporation, Berkeley, CA (2005-2006)
Senior Engineer, Davis Energy Group, Davis, CA (2003-2005)

Fellowships & Awards

R&D 100 Award: Grid Regulation Delivered by Aggregations of Loads (GRID-BAL) (with Los Alamos National Lab, Pecan Street Inc, and University of Michigan)

NSF Faculty Early Career Development (CAREER) Award
Hellman Faculty Fellow (UC Berkeley)
NSF Postdoctoral Fellow
NSF IGERT Fellow (Program focus: nonlinear systems)
NSF Predoctoral Fellow
General Motors Scholar (full tuition undergraduate academic scholarship)

Student / Postdoc Supervision

Former Postdocs:

Mengqi Yao (University of Michigan ECE PhD). 2020-2022, now Senior Data Scientist at Lucid Motors

Bala Kameshwar Poolla (ETH Zürich PhD in Control). 2019-2020, now Researcher at NREL.

Antoine Lesage-Landry (University of Toronto ECE PhD). 2019-2020, now Assistant Professor of Electrical Engineering, Polytechnique Montréal.

Mingxi Liu (University of Victoria ME PhD). 2016-2018, now Assistant Professor of Electrical and Computer Engineering, University of Utah.

Matias Negrete-Pincetic (UIUC EECS PhD). 2012-2014, now Associate Professor of Electrical Engineering, Pontifical Catholic University of Chile.

Joshua Taylor (MIT ME PhD). 2011-2012, now Associate Professor, Electrical and Computer Engineering, University of Toronto

Zhongjing Ma (McGill ECE Ph.D), 2009-2010, now Associate Professor, Department of Automation, Beijing Institute of Technology

Current Ph.D.

Gabriel Colon-Reyes (Berkeley EECS)
Cristina Crespo (Berkeley ERG)
Ruth Kravis (Berkeley EECS)
Jason MacDonald (Berkeley ERG)
Jill Moraski (Berkeley ERG)
Sunash Sharma (Berkeley EECS)
Cody Warner (Berkeley ERG)

Former Ph.D.:

Salma Elmallah (Berkeley ERG, 2023), now Postdoctoral Fellow, Temple University

Phillippe Phanivong (Berkeley ERG, 2023), now Postdoc at California Institute for Energy and Environment

Ciaran Roberts (Berkeley EECS, 2023), now Staff Power Systems Control Engineer, SPAN

Rodrigo Henriquez (Berkeley EECS, 2022), now Research Engineer, NREL

Will Gorman (Berkeley ERG, 2022), now Staff Scientist, LBNL

José Daniel Lara (Berkeley ERG, 2022), now Senior Staff Researcher, NREL

Jonathan Lee (Berkeley ERG, 2022), now Director of Research at New Sun Road, P.B.C.

Anna Brockway (Berkeley ERG, 2022), now Advisor, Climate Adaptation & Resilience Planning, SCE

Froy Sifuentes (Berkeley ERG, 2018), now Assistant Professor at Western Washington University

Felipe Castro (Berkeley ERG, 2017), now Economist at Fiscalía Nacional Económica de Chile

Imran Sheikh (Berkeley ERG, 2017) now Assistant Professor at Western Washington University

Ranjit Deshmukh (Berkeley ERG, 2016), now Assistant Professor of Environmental Science, UC Santa Barbara

Michael Cohen (Berkeley ERG, 2016), now at Lead Developer at New Sun Road

Daniel Arnold (Berkeley ME; co-Chair with David Auslander, 2016), now Research Scientist, Lawrence Berkeley National Lab.

Michaelangelo Tabone (Berkeley ERG, 2016), now at Energy Algorithms Engineer at Nest.

Autumn Preskill (Berkeley ERG, 2015), Staff Software Engineering Manager at Flatiron Health

Sam Borgeson (Berkeley ERG, 2014), now at Convergence Data Analytics.

Johanna Mathieu (Berkeley ME), graduated 2012, now Associate Professor, University of Michigan ECE.

Publications & Patents

(A-List) Peer-Reviewed Journals

85. Will Gorman and Duncan Callaway. Do notifications affect households' willingness to pay to avoid power outages? evidence from an experimental stated-preference survey in california. *The Electricity Journal*, 37(3):107385, 2024

84. Phillippe K Phanivong and Duncan S Callaway. The impacts of retail tariff design on electric vehicle charging for commercial customers. *IEEE Transactions on Energy Markets, Policy and Regulation*, 2023

83. Antoine Lesage-Landry and Duncan S Callaway. Approximated multi-agent fitted q iteration. *Systems & Control Letters*, 177:105563, 2023

82. Ciaran Roberts, Daniel Arnold, and Duncan S Callaway. An online adaptive damping controller for converter-interfaced generation. *IEEE Transactions on Power Systems*, 2023

81. Antoine Lesage-Landry, Félix Pellerin, Duncan S Callaway, and Joshua A Taylor. Optimally scheduling public safety power shutoffs. *Stochastic Systems*, 2023

80. Isa Ferrall, Duncan Callaway, and Daniel M Kammen. Measuring the reliability of sdg 7: The reasons, timing, and fairness of outage distribution for household electricity access solutions. *Environmental Research Communications*, 4(5):055001, 2022

79. Mengqi Yao, Meghana Bharadwaj, Zheng Zhang, Baihong Jin, and Duncan S Callaway. Predicting electricity infrastructure induced wildfire risk in california. *Environmental Research Letters*, 17(9):094035, 2022

78. Anna M Brockway, Liyang Wang, Laurel N Dunn, Duncan Callaway, and Andrew Jones. Climate-aware decision-making: lessons for electric grid infrastructure planning and operations. *Environmental Research Letters*, 17(7):073002, 2022

77. Antoine Lesage-Landry and Duncan S Callaway. Batch reinforcement learning for network-safe demand response in unknown electric grids. *Electric Power Systems Research*, 212:108375, 2022

76. Ciaran Roberts, José Daniel Lara, Rodrigo Henriquez-Auba, Matthew Bossart, Ranjan Anantharaman, Chris Rackauckas, Bri-Mathias Hodge, and Duncan S Callaway. Continuous-time echo state networks for predicting power system dynamics. *Electric Power Systems Research*, 212:108562, 2022

75. Salma Elmallah, Anna M Brockway, and Duncan Callaway. Can distribution grid infrastructure accommodate residential electrification and electric vehicle adoption in northern california? *Environmental Research: Infrastructure and Sustainability*, 2(4):045005, 2022

74. José Daniel Lara, Oscar Dowson, Kate Doubleday, Bri-Mathias Hodge, and Duncan S Callaway. A multi-stage stochastic risk assessment with markovian representation of renewable power. *IEEE Transactions on Sustainable Energy*, 13(1):414–426, 2021

73. Jonathan T Lee, Rodrigo Henriquez-Auba, Bala Kameshwar Poolla, and Duncan S Callaway. Pricing and energy trading in peer-to-peer zero marginal-cost microgrids. *IEEE Transactions on Smart Grid*, 13(1):702–714, 2021

72. Anna Brockway, Jennifer Conde, and Duncan S Callaway. Inequitable access to distributed energy resources due to grid infrastructure limits in california. *Nature Energy*, in press

71. Rodrigo Henriquez-Auba, Patricia Hidalgo-Gonzalez, Patricia Pauli, Dileep Kalathil, Duncan S Callaway, and Kameshwar Poolla. Sharing economy and optimal investment decisions for distributed solar generation. *Applied Energy*, 294:117029, 2021

70. José Daniel Lara, Clayton Barrows, Daniel Thom, Dheepak Krishnamurthy, and Duncan Callaway. Powersystems. jl—A power system data management package for large scale modeling. *SoftwareX*, 15:100747, 2021

69. Uros Markovic, Ognjen Stanojev, Petros Aristidou, Evangelos Vrettos, Duncan S Callaway, and Gabriela Hug. Understanding small-signal stability of low-inertia systems. *IEEE Transactions on Power Systems*, 2021

68. Antoine Lesage-Landry, Joshua A Taylor, and Duncan S Callaway. Online convex optimization with binary constraints. *IEEE Transactions on Automatic Control*, 2021

67. Jonathan T Lee, Sean Anderson, Claudio Vergara, and Duncan S Callaway. Non-intrusive load management under forecast uncertainty in energy constrained microgrids. *Electric Power Systems Research*, 190:106632, 2021

66. Ranjit Deshmukh, Amol Phadke, and Duncan S Callaway. Least-cost targets and avoided fossil fuel capacity in india's pursuit of renewable energy. *Proceedings of the National Academy of Sciences*, 118(13), 2021

65. Roel Dobbe, Patricia Hidalgo-Gonzalez, Stavros Karagiannopoulos, Rodrigo Henriquez-Auba, Gabriela Hug, Duncan S Callaway, and Claire J Tomlin. Learning to control in power systems: Design and analysis guidelines for concrete safety problems. *Electric Power Systems Research*, 189:106615, 2020

64. Jose Daniel Lara, Jonathan T Lee, Duncan S Callaway, and Bri-Mathias Hodge. Computational experiment design for operations model simulation. *Electric Power Systems Research*, 189:106680, 2020

63. Bala Kameshwar Poolla, Ashish R Hota, Saverio Bolognani, Duncan S Callaway, and Ashish Cherukuri. Wasserstein distributionally robust look-ahead economic dispatch. *IEEE Transactions on Power Systems*, 36(3):2010–2022, 2020

62. Jason S MacDonald, Evangelos Vrettos, and Duncan S Callaway. A critical exploration of the efficiency impacts of demand response from hvac in commercial buildings. *Proceedings of the IEEE*, 108(9):1623–1639, 2020

61. Ognjen Stanojev, Uros Markovic, Petros Aristidou, Gabriela Hug, Duncan S Callaway, and Evangelos Vrettos. Mpc-based fast frequency control of voltage source converters in low-inertia power systems. *IEEE Transactions on Power Systems*, 2020

60. Antoine Lesage-Landry and Duncan S Callaway. Dynamic and distributed online convex optimization for demand response of commercial buildings. *IEEE Control Systems Letters*, 4(3):632–637, 2020

59. Will Gorman, Stephen Jarvis, and Duncan Callaway. Should i stay or should i go? the importance of electricity rate design for household defection from the power grid. *Applied Energy*, 262:114494, 2020

58. Felipe A Castro and Duncan S Callaway. Optimal electricity tariff design with demand-side investments. *Energy Systems*, 11(3):551–579, 2020

57. Veronica Jacome, Noah Klugman, Catherine Wolfram, Belinda Grunfeld, Duncan Callaway, and Isha Ray. Power quality and modern energy for all. *Proceedings of the National Academy of Sciences*, 116(33):16308–16313, 2019

56. Imran Sheikh and Duncan Callaway. Decarbonizing space and water heating in temperate climates: the case for electrification. *Atmosphere*, 10(8):435, 2019

55. Juan-Pablo Carvallo, Jay Taneja, Duncan Callaway, and Daniel M Kammen. Distributed resources shift paradigms on power system design, planning, and operation: An application of the gap model. *Proceedings of the IEEE*, 107(9):1906–1922, 2019

54. Jonathan T Lee, Jordan Freitas, Isa L Ferrall, Daniel M Kammen, Eric Brewer, and Duncan S Callaway. Review and perspectives on data sharing and privacy

in expanding electricity access. *Proceedings of the IEEE*, 107(9):1803–1819, 2019

53. Roel Dobbe, Oscar Sondermeijer, David Fridovich-Keil, Daniel Arnold, Duncan Callaway, and Claire Tomlin. Toward distributed energy services: Decentralizing optimal power flow with machine learning. *IEEE Transactions on Smart Grid*, 11(2):1296–1306, 2019

52. Roel Dobbe, Werner van Westering, Stephan Liu, Daniel Arnold, Duncan Callaway, and Claire Tomlin. Linear single-and three-phase voltage forecasting and bayesian state estimation with limited sensing. *IEEE Transactions on Power Systems*, 35(3):1674–1683, 2019

51. Ranjit Deshmukh, Grace C Wu, Duncan S Callaway, and Amol Phadke. Geospatial and techno-economic analysis of wind and solar resources in india. *Renewable Energy*, 134:947–960, 2019

50. Mingxi Liu, Stef Peeters, Duncan S Callaway, and Bert J Claessens. Trajectory tracking with an aggregation of domestic hot water heaters: Combining model-based and model-free control in a commercial deployment. *IEEE Transactions on Smart Grid*, 10(5):5686–5695, 2019

49. Jonathan T Lee and Duncan S Callaway. The cost of reliability in decentralized solar power systems in sub-saharan africa. *Nature Energy*, 3(11):960–968, 2018

48. Mingxi Liu, Phillippe K Phanivong, Yang Shi, and Duncan S Callaway. Decentralized charging control of electric vehicles in residential distribution networks. *IEEE Transactions on Control Systems Technology*, 27(1):266–281, 2017

47. Diego Ponce de Leon Barido, Stephen Suffian, Daniel M Kammen, and Duncan Callaway. Opportunities for behavioral energy efficiency and flexible demand in data-limited low-carbon resource constrained environments. *Applied energy*, 228:512–523, 2018

46. Emre C Kara, Ciaran M Roberts, Michaelangelo Tabone, Lilliana Alvarez, Duncan S Callaway, and Emma M Stewart. Disaggregating solar generation from feeder-level measurements. *Sustainable Energy, Grids and Networks*, 2017

45. Daniel B Arnold, Michael D Sankur, Matias Negrete-Pincetic, and Duncan S Callaway. Model-free optimal coordination of distributed energy resources for provisioning transmission-level services. *IEEE Transactions on Power Systems*, 33(1):817–828, 2017

44. Grace C Wu, Ranjit Deshmukh, Kudakwashe Ndhlukula, Tijana Radojicic, Jessica Reilly-Moman, Amol Phadke, Daniel M Kammen, and Duncan S Callaway. Strategic siting and regional grid interconnections key to low-carbon futures in african countries. *Proceedings of the National Academy of Sciences*, 114(15):E3004–E3012, 2017

43. George Wenzel, Matias Negrete-Pincetic, Daniel E Olivares, Jason MacDonald, and Duncan S Callaway. Real-time charging strategies for an electric vehicle aggregator to provide ancillary services. *IEEE Transactions on Smart Grid*, 9(5):5141–5151, 2017

42. Duncan S Callaway, Meredith Fowlie, and Gavin McCormick. Location, location, location: The variable value of renewable energy and demand-side efficiency resources. *Journal of the Association of Environmental and Resource Economists*, 5(1):39–75, 2018

41. Michaelangelo D Tabone, Christoph Goebel, and Duncan S Callaway. The effect of pv siting on power system flexibility needs. *Solar Energy*, 139:776–786, 2016

40. Evangelos Vrettos, Emre C Kara, Jason MacDonald, Göran Andersson, and Duncan S Callaway. Experimental demonstration of frequency regulation by commercial buildings—part ii: Results and performance evaluation. *IEEE Transactions on Smart Grid*, 9(4):3224–3234, 2016

39. Evangelos Vrettos, Emre C Kara, Jason MacDonald, Göran Andersson, and Duncan S Callaway. Experimental demonstration of frequency regulation by commercial buildings—part i: Modeling and hierarchical control design. *IEEE Transactions on Smart Grid*, 9(4):3213–3223, 2016

38. Michael A Cohen, Greg O Niemeyer, and Duncan S Callaway. Griddle: Video gaming for power system education. *IEEE Transactions on Power Systems*, 32(4):3069–3077, 2016

37. Insoon Yang, Duncan S Callaway, and Claire J Tomlin. Variance-constrained risk sharing in stochastic systems. *IEEE Transactions on Automatic Control*, 62(4):1865–1879, 2016

36. Josh A Taylor, Sairaj V Dhople, and Duncan S Callaway. Power systems without fuel. *Renewable and Sustainable Energy Reviews*, 57:1322–1336, 2016

35. Joshua A Taylor, Johanna L Mathieu, Duncan S Callaway, and Kameshwar Poolla. Price and capacity competition in balancing markets with energy storage. *Energy Systems*, 8(1):169–197, 2017

34. AA Solomon, Daniel M Kammen, and D Callaway. Investigating the impact of wind–solar complementarities on energy storage requirement and the corresponding supply reliability criteria. *Applied energy*, 168:130–145, 2016

33. Daniel L Sanchez and Duncan S Callaway. Optimal scale of carbon-negative energy facilities. *Applied Energy*, 170:437–444, 2016

32. Zhiwei Xu, Duncan S Callaway, Zechun Hu, and Yonghua Song. Hierarchical coordination of heterogeneous flexible loads. *IEEE Transactions on Power Systems*, 2016

31. Daniel B Arnold, Matias Negrete-Pincetic, Michael D Sankur, David M Auslander, and Duncan S Callaway. Model-free optimal control of var resources

in distribution systems: An extremum seeking approach. *IEEE Transactions on Power Systems*, 2016

30. MA Cohen, PA Kauzmann, and DS Callaway. Effects of distributed PV generation on California's distribution system, part 2: Economic analysis. *Solar Energy*, 128:139–152, 2016

29. MA Cohen and DS Callaway. Effects of distributed PV generation on California's distribution system, part 1: Engineering simulations. *Solar Energy*, 128:126–138, 2016

28. Vineet Raichur, Duncan S Callaway, and Steven J Skerlos. Estimating emissions from electricity generation using electricity dispatch models: the importance of system operating constraints. *Journal of Industrial Ecology*, 20(1):42–53, 2016

27. Diego Ponce de Leon Barido, Josiah Johnston, Maria V Moncada, Duncan Callaway, and Daniel M Kammen. Evidence and future scenarios of a low-carbon energy transition in central america: a case study in nicaragua. *Environmental Research Letters*, 10(10):104002, 2015

26. Johanna L Mathieu, Mark EH Dyson, and Duncan S Callaway. Resource and revenue potential of California residential load participation in ancillary services. *Energy Policy*, 80:76–87, 2015

25. Nathan J Addy, Sila Kiliccote, Duncan S Callaway, and Johanna L Mathieu. How baseline model implementation choices affect demand response assessments. *Journal of Solar Energy Engineering*, 137(2):021008, 2015

24. Michaelangelo D Tabone and Duncan S Callaway. Modeling variability and uncertainty of photovoltaic generation: A hidden state spatial statistical approach. *IEEE Transactions on Power Systems*, 2015

23. Johanna L Mathieu, Maryam Kamgarpour, John Lygeros, Göran Andersson, and Duncan S Callaway. Arbitraging intraday wholesale energy market prices with aggregations of thermostatic loads. *IEEE Transactions on Power Systems*, 2015

22. AA Solomon, Daniel M Kammen, and D Callaway. The role of large-scale energy storage design and dispatch in the power grid: a study of very high grid penetration of variable renewable resources. *Applied Energy*, 134:75–89, 2014

21. Mark EH Dyson, Samuel D Borgeson, Michaelangelo D Tabone, and Duncan S Callaway. Using smart meter data to estimate demand response potential, with application to solar energy integration. *Energy Policy*, 73:607–619, 2014

20. Christoph Goebel, Duncan S Callaway, and Hans-Arno Jacobsen. The impact of state of charge management when providing regulation power with energy storage. *IEEE Transactions on Power Systems*, 29(3):1433–1434, 2013

19. Anand Subramanian, Manuel J Garcia, Duncan S Callaway, Kameshwar Poolla, and Pravin Varaiya. Real-time scheduling of distributed resources. *IEEE Transactions on Smart Grid*, 4(4):2122–2130, 2013

18. Joshua A Taylor, Ashutosh Nayyar, Duncan S Callaway, and Kameshwar Poolla. Consolidated dynamic pricing of power system regulation. *IEEE Transactions on Power Systems*, 28(4):4692–4700, 2013

17. Zhongjing Ma, Duncan S Callaway, and Ian A Hiskens. Decentralized charging control of large populations of plug-in electric vehicles. *IEEE Transactions on Control Systems Technology*, 21(1):67–78, 2013

16. Joshua A Taylor, Duncan S Callaway, and Kameshwar Poolla. Competitive energy storage in the presence of renewables. *IEEE Transactions on Power Systems*, (99):1–1, 2013

15. Christoph Goebel and Duncan S Callaway. Using ict-controlled plug-in electric vehicles to supply grid regulation in california at different renewable integration levels. *IEEE Transactions on Smart Grid*, 4(2):729–740, 2012

14. Johanna L Mathieu, Stephan Koch, and Duncan S Callaway. State estimation and control of electric loads to manage real-time energy imbalance. *IEEE Transactions on Power Systems*, (99):1–1, 2012

13. Johanna L Mathieu, Duncan S Callaway, and Sila Kiliccote. Variability in automated responses of commercial buildings and industrial facilities to dynamic electricity prices. *Energy and Buildings*, 43(12):3322–3330, 2011

12. Scott Jason Moura, Hosam K Fathy, Duncan S Callaway, and Jeffrey L Stein. A stochastic optimal control approach for power management in plug-in hybrid electric vehicles. 19(3):545–555, 2011

11. Duncan S Callaway and Ian A Hiskens. Achieving controllability of electric loads. *Proceedings of the IEEE*, 99(1):184–199, 2011

10. Duncan S Callaway. Sequential reliability forecasting for wind energy: Temperature dependence and probability distributions. *IEEE Transactions on Energy Conversion*, 25(2):577–585, 2010

9. Scott J Moura, Duncan S Callaway, Hosam K Fathy, and Jeffrey L Stein. Tradeoffs between battery energy capacity and stochastic optimal power management in plug-in hybrid electric vehicles. *Journal of Power Sources*, 195(9):2979–2988, 2010

8. Duncan S Callaway. Tapping the energy storage potential in electric loads to deliver load following and regulation, with application to wind energy. *Energy Conversion and Management*, 50(5):1389–1400, 2009

7. Duncan S Callaway and Alan Hastings. Consumer movement through differentially subsidized habitats creates a spatial food web with unexpected results. *Ecology Letters*, 5(3):329–332, 2002

6. Michelle Girvan, Duncan S Callaway, Mark EJ Newman, and Steven H Strogatz. Simple model of epidemics with pathogen mutation. *Physical Review E*, 65(3):031915, 2002

5. Duncan S Callaway and Alan S Perelson. Hiv-1 infection and low steady state viral loads. *Bulletin of mathematical biology*, 64(1):29–64, 2002

4. Duncan S Callaway, John E Hopcroft, Jon M Kleinberg, Mark EJ Newman, and Steven H Strogatz. Are randomly grown graphs really random? *Physical Review E*, 64(4):041902, 2001

3. Duncan S Callaway, Mark EJ Newman, Steven H Strogatz, and Duncan J Watts. Network robustness and fragility: Percolation on random graphs. *Physical Review Letters*, 85(25):5468–5471, 2000

2. Duncan S Callaway, Ruy M Ribeiro, and Martin A Nowak. Virus phenotype switching and disease progression in hiv-1 infection. *Proceedings of the Royal Society of London. Series B: Biological Sciences*, 266(1437):2523–2530, 1999

1. Manohar R Furtado, Duncan S Callaway, John P Phair, Kevin J Kunstman, Jennifer L Stanton, Catherine A Macken, Alan S Perelson, and Steven M Wolinsky. Persistence of hiv-1 transcription in peripheral-blood mononuclear cells in patients receiving potent antiretroviral therapy. *New England Journal of Medicine*, 340(21):1614–1622, 1999

(B-List) Book Chapters

1. Zhongjing Ma, Duncan Callaway, and Ian Hiskens. Optimal charging control for plug-in electric vehicles. In *Control and Optimization Methods for Electric Smart Grids*, pages 259–273. Springer, New York, NY, 2012

(C-List) Other Technical Reports and Conference Proceedings

7. Rodrigo Henriquez-Auba, Jose Daniel Lara, Duncan S Callaway, and Clayton Barrows. Transient simulations with a large penetration of converter-interfaced generation: Scientific computing challenges and opportunities. *IEEE Electrification Magazine*, 9(2):72–82, 2021

6. Ranjit Deshmukh, Duncan Callaway, Nikit Abhyankar, and Amol Phadke. Cost and value of wind and solar in india's electric system in 2030. In *Proceedings of the 1st International Conference on Large-Sale Integration of Renewable Energies in India, New Delhi, India*, pages 6–8, 2017

5. Insoon Yang, Duncan S Callaway, and Claire J Tomlin. Risk-limiting dynamic contracts for direct load control. *arXiv preprint arXiv:1409.1994*, 2014

4. Anuradha Annaswamy, Duncan Callaway, Joseph Chow, Christopher DeMarco, David Hill, Pramod Khargonekar, Anders Rantzer, and Jakob Stoustrup. Guest editorial special section on control theory and technology. *IEEE Transactions on smart grid*, 5(4):2031–2032, 2014

3. Shmuel Oren, Duncan Callaway, Anthony Papavasiliou, Johanna Mathieu, Timothy Mount, Robert Thomas, Max Zhang, Alejandro Dominguez-Garcia, and George Gross. Renewable energy integration: Technological and market design challenges. 2013

2. Joshua A Taylor, Johanna L Mathieu, Duncan S Callaway, and Kameshwar Poolla. Price and capacity competition in zero-mean storage and demand response markets. In *2012 50th Annual Allerton Conference on Communication, Control, and Computing (Allerton)*, pages 1316–1323. IEEE, 2012

1. Johanna L Mathieu and Duncan S Callaway. The value of real-time data in controlling electric loads for demand response. In *Carnegie Mellon Conference on the Electricity Industry: Data Driven Sustainable Energy Systems*, pages 12–14, 2012

(F-List) Peer-Reviewed Conference Proceedings

51. Gabriel E Colón-Reyes, Kaylene C Stocking, Duncan S Callaway, and Claire J Tomlin. Stability and robustness of a hybrid control law for the half-bridge inverter. In *2023 European Control Conference (ECC)*, pages 1–8. IEEE, 2023

50. José Daniel Lara, Rodrigo Henriquez-Auba, Duncan S Callaway, and Bri-Mathias Hodge. Agc simulation model for large renewable energy penetration studies. In *2020 52nd North American Power Symposium (NAPS)*, pages 1–6. IEEE, 2021

49. Ciaran Roberts, José Daniel Lara, Rodrigo Henriquez-Auba, Bala Kameshwar Poolla, and Duncan S Callaway. Grid-coupled dynamic response of battery-driven voltage source converters. In *2020 IEEE International Conference on Communications, Control, and Computing Technologies for Smart Grids (SmartGridComm)*, pages 1–6. IEEE, 2020

48. Rodrigo Henriquez-Auba, Jose D Lara, Ciaran Roberts, and Duncan S Callaway. Grid forming inverter small signal stability: Examining role of line and voltage dynamics. In *IECON 2020 The 46th Annual Conference of the IEEE Industrial Electronics Society*, pages 4063–4068. IEEE, 2020

47. Ognjen Stanojev, Uros Markovic, Evangelos Vrettos, Petros Aristidou, Duncan Callaway, and Gabriela Hug. Enhanced mpc for fast frequency control in inverter-dominated power systems. In *2020 International Conference on Smart Energy Systems and Technologies (SEST)*, pages 1–6. IEEE, 2020

46. Maxime Baudette, Michael D Sankur, Craig Breaden, Daniel Arnold, Duncan S Callaway, and Jason MacDonald. Implementation of an extremum seeking controller for distributed energy resources: Practical considerations. In *2020 IEEE Power & Energy Society General Meeting (PESGM)*, pages 1–5. IEEE, 2020

45. Maxime Baudette, Daniel Arnold, Craig Breaden, Michael D Sankur, Duncan S Callaway, and Jason MacDonald. Hil-validation of an extremum seeking-based controller for advanced der management. In *2020 IEEE Power & Energy*

Society Innovative Smart Grid Technologies Conference (ISGT), pages 1–5. IEEE, 2020

44. Patricia Hidalgo-Gonzalez, Rodrigo Henriquez-Auba, Duncan S Callaway, and Claire J Tomlin. Frequency regulation using data-driven controllers in power grids with variable inertia due to renewable energy. In *2019 IEEE Power & Energy Society General Meeting (PESGM)*, pages 1–5. IEEE, 2019

43. Stavros Karagiannopoulos, Roel Dobbe, Petros Aristidou, Duncan Callaway, and Gabriela Hug. Data-driven control design schemes in active distribution grids: Capabilities and challenges. In *2019 IEEE Milan PowerTech*, pages 1–6. IEEE, 2019

42. Patricia Hidalgo-Gonzalez, Duncan S Callaway, Roel Dobbe, Rodrigo Henriquez-Auba, and Claire J Tomlin. Frequency regulation in hybrid power dynamics with variable and low inertia due to renewable energy. In *2018 IEEE Conference on Decision and Control (CDC)*, pages 1592–1597. IEEE, 2018

41. Rodrigo Henriquez-Auba, Patricia Pauli, Dileep Kalathil, Duncan S Callaway, and Kameshwar Poolla. The sharing economy for residential solar generation. In *2018 IEEE Conference on Decision and Control (CDC)*, pages 7322–7329. IEEE, 2018

40. Noah Klugman, Veronica Jacome, Meghan Clark, Matthew Podolsky, Pat Pannuto, Neal Jackson, Aley Soud Nassor, Catherine Wolfram, Duncan Callaway, Jay Taneja, et al. Experience: Android resists liberation from its primary use case. In *Proceedings of the 24th Annual International Conference on Mobile Computing and Networking*, pages 545–556, 2018

39. Nkiruka Avila, Julian Bacon, Sahana Rangarajan, Juan-Pablo Carvallo, Duncan Callaway, and Daniel M Kammen. Generation expansion analysis in low data settings. In *2018 IEEE PES/IAS PowerAfrica*, pages 943–947. IEEE, 2018

38. Deborah A Sunter, John Dees, Sergio Castellanos, Duncan Callaway, and Daniel M Kammen. Political affiliation and rooftop solar adoption in new york and texas. In *2018 IEEE 7th World Conference on Photovoltaic Energy Conversion (WCPEC)(A Joint Conference of 45th IEEE PVSC, 28th PVSEC & 34th EU PVSEC)*, pages 2426–2429. IEEE, 2018

37. Mingxi Liu, Phillippe K Phanivong, and Duncan S Callaway. Customer-and network-aware decentralized ev charging control. In *2018 Power Systems Computation Conference (PSCC)*, pages 1–7. IEEE, 2018

36. Mingxi Liu, Phillippe K Phanivong, and Duncan S Callaway. Electric vehicle charging control in residential distribution network: A decentralized event-driven realization. In *2017 IEEE 56th Annual Conference on Decision and Control (CDC)*, pages 214–219. IEEE, 2017

35. Roel Dobbe, Daniel Arnold, Stephan Liu, Duncan Callaway, and Claire Tomlin. Real-time distribution grid state estimation with limited sensors and load fore-

casting. In *2016 ACM/IEEE 7th International Conference on Cyber-Physical Systems (ICCPS)*, pages 1–10. IEEE, 2016

34. Daniel B Arnold, Michael Sankur, Roel Dobbe, Kyle Brady, Duncan S Callaway, and Alexandra Von Meier. Optimal dispatch of reactive power for voltage regulation and balancing in unbalanced distribution systems. In *2016 IEEE Power and Energy Society General Meeting (PESGM)*, pages 1–5. IEEE, 2016

33. Frederik Juul, Matias Negrete-Pincetic, Jason MacDonald, and Duncan Callaway. Real-time scheduling of electric vehicles for ancillary services. In *2015 IEEE Power & Energy Society General Meeting*, pages 1–5. IEEE, 2015

32. Daniel B Arnold, Matias Negrete-Pincetic, Emma M Stewart, David M Auslander, and Duncan S Callaway. Extremum seeking control of smart inverters for var compensation. In *2015 IEEE Power & Energy Society General Meeting*, pages 1–5. IEEE, 2015

31. Insoon Yang, Duncan S Callaway, and Claire J Tomlin. Indirect load control for electricity market risk management via risk-limiting dynamic contracts. In *2015 American Control Conference (ACC)*, pages 3025–3031. IEEE, 2015

30. Emre Can Kara, Michaelangelo D Tabone, Jason S MacDonald, Duncan S Callaway, and Sila Kiliccote. Quantifying flexibility of residential thermostatically controlled loads for demand response: a data-driven approach. In *Proceedings of the 1st ACM conference on embedded systems for energy-efficient buildings*, pages 140–147, 2014

29. Mehdi Maasoumy, Catherine Rosenberg, Alberto Sangiovanni-Vincentelli, and Duncan S Callaway. Model predictive control approach to online computation of demand-side flexibility of commercial buildings hvac systems for supply following. In *2014 American Control Conference*, pages 1082–1089. IEEE, 2014

28. Insoon Yang, Duncan S Callaway, and Claire J Tomlin. Dynamic contracts with partial observations: application to indirect load control. In *2014 American Control Conference*, pages 1224–1230. IEEE, 2014

27. Michael A Cohen and Duncan S Callaway. Modeling the effect of geographically diverse pv generation on california's distribution system. In *2013 IEEE International Conference on Smart Grid Communications (SmartGridComm)*, pages 702–707. IEEE, 2013

26. Maryam Kamgarpour, Christian Ellen, Sadegh Esmaeil Zadeh Soudjani, Sebastian Gerwinn, Johanna L Mathieu, Nils Müllner, Alessandro Abate, Duncan S Callaway, Martin Fränzle, and John Lygeros. Modeling options for demand side participation of thermostatically controlled loads. In *2013 IREP Symposium Bulk Power System Dynamics and Control-IX Optimization, Security and Control of the Emerging Power Grid*, pages 1–15. IEEE, 2013

25. Michaelangelo D Tabone and Duncan S Callaway. Parameterizing fluctuations in solar photovoltaic generation using hidden markov models. In *2013 IEEE Power & Energy Society General Meeting*, pages 1–6. IEEE, 2013

24. Joshua A Taylor, Ashutosh Nayyar, Duncan S Callaway, and Kameshwar Poolla. Dynamic pricing in consolidated ancillary service markets. In *2013 European Control Conference (ECC)*, pages 3032–3037. IEEE, 2013

23. Johanna L Mathieu, Maryam Kamgarpour, John Lygeros, and Duncan S Callaway. Energy arbitrage with thermostatically controlled loads. In *2013 European Control Conference (ECC)*, pages 2519–2526. IEEE, 2013

22. Anand Subramanian, Joshua A Taylor, Eilyan Bitar, D Callaway, Kameshwar Poolla, and Pravin Varaiya. Optimal power and reserve capacity procurement policies with deferrable loads. In *2012 IEEE 51st IEEE Conference on Decision and Control (CDC)*, pages 450–456. IEEE, 2012

21. Jason MacDonald, Peter Cappers, DS Callaway, and Sila Kiliccote. Demand response providing ancillary services: A comparison of opportunities and challenges in the us wholesale markets. In *Grid-Interop, Irving, TX*, 2012

20. J.L Mathieu, M.E Dyson, and D.S. Callaway. Using residential electric loads for fast demand response: The potential resource and revenues, the costs, and policy recommendations. In *Summer Study on Energy Efficiency in Buildings*. ACEEE, 2012

19. Nathan Addy, Johanna L Mathieu, Sila Kiliccote, and Duncan S Callaway. Understanding the effect of baseline modeling implementation choices on analysis of demand response performance. In *ASME International Mechanical Engineering Congress and Exposition*, volume 45264, pages 133–141. American Society of Mechanical Engineers, 2012

18. Joshua A Taylor, Duncan S Callaway, and Kameshwar Poolla. Inventory control of storage in distribution systems. In *American Control Conference (ACC), 2012*, pages 2147–2152. IEEE, 2012

17. A Subramanian, M Garcia, A Dominguez-Garcia, D Callaway, K Poolla, and P Varaiya. Real-time scheduling deferrable electric loads. In *2012 American Control Conference*, 2012

16. Johanna L Mathieu and Duncan S Callaway. State estimation and control of heterogeneous thermostatically controlled loads for load following. In *System Science (HICSS), 2012 45th Hawaii International Conference on*, pages 2002–2011. IEEE, 2012

15. Johanna L Mathieu, Duncan S Callaway, and Sila Kiliccote. Examining uncertainty in demand response baseline models and variability in automated responses to dynamic pricing. In *2011 50th IEEE Conference on Decision and Control and European Control Conference*, pages 4332–4339. IEEE, 2011

14. Mahnoosh Alizadeh, Anna Scaglione, Robert J Thomas, and Duncan Callaway. Information infrastructure for cellular load management in green power delivery systems. In *Smart Grid Communications (SmartGridComm), 2011 IEEE International Conference on*, pages 13–18. IEEE, 2011

13. Zhongjing Ma, Ian Hiskens, and Duncan Callaway. A decentralized mpc strategy for charging large populations of plug-in electric vehicles. *IFAC Proceedings Volumes*, 44(1):10493–10498, 2011

12. Stephan Koch, Johanna L Mathieu, and Duncan S Callaway. Modeling and control of aggregated heterogeneous thermostatically controlled loads for ancillary services. In *Proc. PSCC*, pages 1–7, 2011

11. Taylor M Keep, Froylan E Sifuentes, David M Auslander, and Duncan S Callaway. Using load switches to control aggregated electricity demand for load following and regulation. In *Power and Energy Society General Meeting, 2011 IEEE*, pages 1–7. IEEE, 2011

10. Duncan S Callaway. Can smaller loads be profitably engaged in power system services? In *Power and Energy Society General Meeting, 2011 IEEE*, pages 1–3. IEEE, 2011

9. Zhongjing Ma, Duncan Callaway, and Ian Hiskens. Decentralized charging control for large populations of plug-in electric vehicles: Application of the nash certainty equivalence principle. In *2010 IEEE International Conference on Control Applications*, pages 191–195. IEEE, 2010

8. Ashwin Kashyap and Duncan Callaway. Controlling distributed energy constrained resources for power system ancillary services. In *2010 IEEE 11th International Conference on Probabilistic Methods Applied to Power Systems*, pages 407–412. IEEE, 2010

7. Ashwin Kashyap and Duncan Callaway. Estimating the probability of load curtailment in power systems with responsive distributed storage. In *Probabilistic Methods Applied to Power Systems (PMAPS), 2010 IEEE 11th International Conference on*, pages 18–23. IEEE, 2010

6. Johanna L Mathieu, Ashok J Gadgil, Duncan S Callaway, Phillip N Price, and Sila Kiliccote. Characterizing the response of commercial and industrial facilities to dynamic pricing signals from the utility. In *Energy Sustainability*, volume 43949, pages 1019–1028, 2010

5. Ian Hiskens and Duncan Callaway. Achieving controllability of plug-in electric vehicles. In *2009 IEEE Vehicle Power and Propulsion Conference*, pages 1215–1220. IEEE, 2009

4. Scott Jason Moura, Duncan S Callaway, Hosam K Fathy, and Jeffrey L Stein. A stochastic optimal control approach for power management in plug-in hybrid electric vehicles. In *2008 Dynamic Systems and Control Conference*. ASME, 2008

3. Scott J Moura, Duncan S Callaway, Hosam K Fathy, and Jeffrey L Stein. Impact of battery sizing on stochastic optimal power management in plug-in hybrid electric vehicles. In *Vehicular Electronics and Safety, 2008. ICVES 2008. IEEE International Conference on*, pages 96–102. IEEE, 2008

2. Dwiggins H. Bourne D., Callaway D. and Lee E. Durability testing of a low cost ics solar water heater. In *Solar 2004, Proceedings, 33rd American So- lar Energy Society Annual Conference*, 2004

1. Lee E. Bourne D., Callaway D. and Plaisted J. Design and development of a low-cost ics solar water heater. In *Solar 2003, Proceedings, 32nd American Solar Energy Society Annual Conference*, 2003

Patents

2. Richard C Bourne, Brian Eric Lee, and Duncan Callaway. Vertical counterflow evaporative cooler, January 25 2005. US Patent 6,845,629

1. Richard C Bourne, Brian Eric Lee, and Duncan Callaway. A two stage indirect evaporative cooling system, July 14 2005. US Patent 6,931,883

Invited talks

Stanford Doerr School Conference on Scaling Geologic Storage of CO2 to Impact Global Emissions, "How does CCS Integrate with a Larger Energy System," November 14, 2023

UC Davis Energy Graduate Group, "End-use electrification and its impact on distribution systems," November 11, 2023

Net Zero Electricity Research Initiative, University of Calgary, "End-use electrification and its impact on distribution systems," October 25, 2023

Power Systems Engineering Research Center, "Investigating options to accelerate power system dynamic simulations," October 11, 2023

California State Assembly, Utilities and Energy Committee, Joint Hearing with Select Committee on Electric Vehicles and Charging Infrastructure, "Grid Impacts from Transportation Electrification," August 23, 2023

IEEE Power and Energy Society General Meeting, "Equity and DER Access," July 19, 2023

Electricity Camp in the Rockies, Banff, Alberta, "Distribution System Impacts from Electrification," May 25, 2023

Center for Climate and Energy Decision Making, Carnegie Mellon University, "Mitigating and adapting to climate change with grid infrastructure," October 12, 2022

World Resources Institute, "Examining the Electrification Potential of PG&E's Distribution System," August 31, 2022

California Public Utilities Commission, "Examining the Electrification Potential of PG&E's Distribution System," June 3, 2022

Electric Power Research Institute, "Scientific Machine Learning for Simulation and Control in Large Scale Power Systems," February 24, 2022

MIT Laboratory for Information & Decision Systems, "Exploring Future Power System Stability," October 27, 2021

2021 IEEE PES General Meeting, "CAREER: Aggregation, estimation and control of distributed energy resources," July 26, 2021

North American Power Symposium (Keynote address), "Exploring Future Power System Stability," April 14, 2021

University of Washington EECS Colloquium, "Exploring Future Power System Stability," March 2, 2021

Los Alamos National Lab Grid Science Winter School, "Examining Large-Scale Low Inertia Power System Stability," January 14, 2021

Power Systems Engineering Research Center public webinar, "Modeling Challenges and Opportunities in Transient Simulations for Power Systems with Large Penetration of Converter-Interfaced Generation," November 24, 2020.

2020 IEEE PES General Meeting, "Measurement-based power flow constraints for DER control," July 15, 2020.

7th IAEE Asia-Oceania Conference, Auckland, New Zealand (Keynote address), "Will decentralization make a dent? Exploring the future of standalone electricity infrastructure," February 12-15, 2020.

University of Washington Workshop on Low Inertia Grids, "Understanding Stability in Low Inertia Power Systems," April 30, 2019.

University of Toronto ECE (Distinguished Speaker Series), "Electricity Network Design and Operation in an Era of Solar and Storage" March 14 2019.

MIT Energy Initiative, "Electricity Network Design and Operation in an Era of Solar and Storage" January 16 2019.

Zanzibar Electric Corporation, "Reliability in Unjuga" July 12, 2018.

Power Systems Laboratory, ETH Zürich, "Decentralization in Energy Systems: Absorbing Solar and Storage into Grids." May 16, 2018.

Oxford University Control Group, "Model free control and optimization in electric distribution systems." April 30, 2018.

UC Louvain (Belgium), "Model free control and optimization in electric distribution systems." March 20 2018.

Institute for Automation, ETH Zürich, "Model free control and optimization in electric distribution systems." March 8 2018.

Western Interstate Energy Board, "Locational Value of Distributed Solar: Engineering and Economic Considerations", October 26 2017.

National Resources Defense Council San Francisco office, "Electrifying Loads in California," June 19, 2017.

More than Smart Initiative, Oakland. "Electrifying Loads in California," June 19, 2017.

MIT Laboratory for Information and Decision Systems, "Distributed Energy Resource Control and Network Optimization," February 28, 2017.

MIT Energy Initiative Grad Lunch "Quantifying and Mitigating the Impacts of PV in Distribution Systems," February 28, 2017.

KU Leuven (Belgium) – Energyville, "Distributed Energy Resource Control and Network Optimization," December 7, 2016.

Pontificia Universidad Catolica de Chile, Santiago, "Distributed Energy Resource Control and Network Optimization," November 21, 2016.

Princeton University, Vincent Poor Research Group, "Integrating Distributed Solar into Electric Power Systems," November 18, 2015.

Stanford Energy Resources Engineering, "Integrating Distributed Solar into Electric Power Systems," October 12, 2015.

UC Berkeley Electrical Engineering and Computer Science, "Integrating Distributed Solar into Electric Power Systems," October 8, 2015.

California Energy Commission, "Resource and Revenue Potential of California Residential Load Participation in Ancillary Services," at the IEPR Commissioner Workshop on the State of the Science on Scenarios to Deeply Reduce Greenhouse Gas Emissions from California's Energy System, July 24, 2015.

UC San Diego Mechanical and Aerospace Engineering, "Forecasting the reserve requirements of power systems with high PV penetrations: does PV plant location matter?" May 13, 2015.

Los Alamos National Lab Grid Science Winter School, "Stochastic Models of Load and Renewables," January 14, 2015.

Keynote speaker at SinBerBEST Annual Symposium, National University of Singapore, "Coupling building systems with electric power system operations," January 6, 2015.

Cornell Center for Applied Math, "Models, Contracts and Control That Help Electricity Consumers to Help the Grid," November 21, 2014.

Power Systems Engineering Research Center public webinar, "Quantifying and Mitigating the Impacts of PV in Distribution Systems," November 18, 2014.

2014 Allerton Conference, "Risk-Limiting Dynamic Contracts for Direct Load Control," October 1, 2014

2014 IEEE PES General Meeting "Demand Response for Ancillary Services." July 28, 2014.

State of California Assembly Staff Seminar Series, "Physical and Economic Effects of Distributed PV Generation on California's Distribution System," (with student Michael Cohen), May 9, 2014.

Humboldt State University Schatz Energy Research Center, "Leveraging large data sets and control to enable low carbon power systems," April 10, 2014.

2014 EI@Haas POWER Conference, "Physical and Economic Effects of Distributed PV Generation on California's Distribution System," (with student Michael Cohen), March 21, 2014.

2014 Information Theory and Applications Workshop, "Leveraging large data sets and control to enable low carbon power systems," February 13, 2014.

Columbia University Mechanical Engineering, "Leveraging large data sets and control to enable low carbon power systems," December 6, 2013.

Carnegie Mellon University Electrical and Computer Engineering, "Leveraging large data sets and control to enable low carbon power systems," December 4, 2013.

University of Texas at Austin Energy Symposium, "Leveraging large data sets: demand side models and control in low carbon power systems," November 7, 2013.

Texas A&M Electrical and Computer Engineering, "Quantifying and managing the impacts of large scale solar electricity generation," September 11, 2013.

Semi-plenary speaker on Energy Systems, European Control Conference, "Demand-side modeling, estimation and control in electric power systems," July 18, 2013.

European Control Conference Tutorial Session on Control in Electric Power Systems, "Demand Response for Enhanced Control of Electric Power Systems." July 18, 2013.

Stanford Atmosphere and Energy Seminar Series, "Large-scale penetration of photovoltaics: impacts distribution systems and ancillary services," May 21, 2013.

University of Michigan Electrical and Computer Engineering, "Large-scale penetration of photovoltaics: impacts distribution systems and ancillary services," May 3, 2013.

University of California, Los Angeles Smart Energy Research Center, "Responsive Load and Distributed Storage," Training workshop, March 19, 2013

Energy and Environmental Economics, Inc, "Quantifying and lowering the cost of fast demand response resources for renewables integration," Lunch Seminar, Nov 2, 2013.

Carnegie Mellon University Electrical and Computer Engineering Department, "Quantifying and lowering the cost of fast demand response resources for renewables integration," October 5, 2012.

Arizona State University Electrical, Computer and Energy Engineering Department, "Quantifying and lowering the cost of fast demand response resources for renewables integration" August 24, 2012.

American Control Conference Workshop on Green Buildings (Montreal), "Building-to-Grid Fundamentals," June 26, 2012.

32nd Center for Nonlinear Studies Annual Conference (Los Alamos), "Distributed coordination for demand response," May 24, 2012.

UC Berkeley Center for Built Environment Industry Advisory Board Conference, "Feedback control in grid responsive buildings," April 12, 2012.

Massachusetts Institute of Technology, Laboratory for Information and Decision Systems Special Seminar, "Distributed computation in complex energy networks" April 12, 2012.

University of Illinois at Urbana Champaign, ECE Colloquium, "Mining for demand response resources: lowering extraction costs and examining the resource potential for non-disruptive load control" February 23, 2012.

ETH Zürich, EEH Colloquium, "Aggregation models and feedback control for demand side flexibility in power systems" November 29, 2011.

Forty-Ninth Annual Allerton Conference on Communication, Control, and Computing, "Decentralized electric vehicle charge coordination with constrained communications," September 29, 2011.

American Control Conference Workshop on Control, Modeling and Optimization Challenges in the Smart Grid (San Francisco), "Responsive Load and Distributed Storage," June 28, 2011.

SIAM Conference on Dynamical Systems (Snowbird, Utah), "Engaging the Demand Side in Renewables Integration," May 25, 2011.

Connectivity Week Conference (San Jose CA), "Addressing Fast DR Metering and Control Challenges," May 23, 2011.

Beijing Institute of Technology, School of Automation, "The Role of the Demand Side in Renewables Integration," March 4, 2011.

National Science Foundation Pre-conference on Dynamical Systems: New Directions in Dynamical Systems, "Dynamics, Electric Power, and the Smart Grid," January 4, 2011.

UC Berkeley, i4energy Seminar Series, "The Role of Demand Response in Renewables Integration" November 12, 2010.

National Academy of Engineering German-American Frontiers of Engineering Symposium, "Coupling systems with electric vehicles for sustainability, security and grid reliability," April 23-25 2010.

Los Alamos National Laboratory, Center for Nonlinear Studies, "Aggregated Electricity Load Modeling & Control for Fast Ancillary Services" April 6, 2010.

Power Systems Engineering Research Center public webinar, "Aggregated Electricity Load Modeling & Control for Regulation and Load Following Ancillary Services." November 3 2009.

20^{th} International Symposium on Mathematical Programming "Aggregated Electricity Load Modeling & Control for Regulation and Load Following Ancillary Services" August 26, 2009.

University of California, Berkeley Energy and Resources Group Colloquium, "Examining energy storage and its alternatives in sustainable energy systems." February 11 2009.

Group for Research in Decision Analysis (GERAD, a multi-university research center), Montreal. "Statistical mechanical representations of distributed energy storage devices to facilitate sustainable energy production," January 16, 2009.

Western Electricity Coordinating Council, Modeling Coincident Energies to produce Coincident Dispatch Seminar, "Wind Forecasting for System Reliability and Emissions Reduction from Wind Energy," November 6, 2008.

University of California, Berkeley: Renewable and Appropriate Energy Laboratory, Energy and Resources Group, "Greenhouse Gas Emissions Reductions from Wind Energy: Location, Location, Location?" October 29, 2008.

University of California, Berkeley: Berkeley Manufacturing Institute, Department of Mechanical Engineering, "Tapping the energy storage potential in electric loads with PCTs" September 22, 2008.

University of Michigan, CARSS / MMPEI Workshop on Energy and Social Science: Challenges and Opportunities, "Greenhouse Gas Emissions Reductions and Wind Energy Deployment" May 6, 2008.

University of Michigan Systems Science Seminar, "Reliability and Storage in Sustainable Energy Systems," February 2, 2008.

Cornell University Sibley School of Mechanical and Aerospace Engineering, "Engineering Sustainable Energy Systems," February 21, 2006.

University of Wisconsin, Madison: Energy Institute, "Engineering Sustainable Energy Systems," February 20 2006.

University of California, Davis, Dept of Mechanical and Aeronautical Engineering, "Engineering Sustainable Energy Systems," February, 2006.

Building Industry Research Alliance Annual Review, "Cutting Edge Heating and Cooling: OASys & NightBreeze," July 28, 2005.

Sacramento Municipal Utilities District Innovative Speaker Series, "Market Rate Zero Energy Homes." May, 2005.

Canadian Net Zero Energy Home Coalition Workshop. "Market Rate Zero Energy Homes" January 19th, 2005.

SIAM Conference on Dynamical Systems, "Random growing graphs." May 20-25, 2001

Princeton University: Levin-Pacala Labtea, "A simple epidemic model," June 18, 2000.

7th Annual International Discussion Meeting on HIV Dynamics and Evolution, "Intermittent viremia in HIV infection," April 30, 2000

Nonlinear Sciences Informal Seminar, Cornell University. "HIV phenotype switching." October 18, 2000.

Mathematical Biology Group Seminar, Department of Zoology, Oxford University, "HIV phenotype switching." October, 1998.

Mathematical Association of America, Seaway Section semi-annual meeting, "Mathematics in medicine." April, 1999

Teaching

Michigan

NRE 580: Environmental Integrated Assessment (co-taught), Winter 2009

Berkeley

Buildings

ER290, Energy Efficiency Technology in Buildings, Fa2010, Sp2012.

ER290, Assessing Building Energy Use and Indoor Environmental Quality (co-taught with Stefano Schiavon, Architecture). Fa2013, Fa2014, Fa2015

Power systems

ER254, Electric Power Systems. Fa2009, Fa2011, Fa2012, Fa2013, Fa2014, Fa2015, Sp2017, Sp2019, Sp2020, Sp2021, Sp2023

ER290, Microgrids and Decentalized Renewables for Energy Access (co-taught with Jalel Sager, ERG), Sp2016

EECS290 21st Century Electric Power System Dynamics. Sp2019, Fa2021.

EECS194 Power Systems Engineering (co-taught with Kameshwar Poolla in Electrical Engineering). Fa2010.

Data

ER290 Statistical Learning Applied to Energy and Environmental Justice. Fa2017

ER131 Data, Environment and Society. Fa2018, Fa2019, Fa2020, Fa2021, Fa2022, Fa2023

Other

ER100 Energy and Society, Fa2016

ER291 Energy Analysis Classics, Sp2012

ER292a Tools of the Trade, Fa2017

ER292b Second semester ERG Master's Seminar. Sp2012, Sp2014, Sp2015, Sp2019, Sp2020, Sp2021

ER292c Third Semester ERG Master's Seminar. Fa2011, Fa2013, Fa2014, Fa2015, Fa2016, Fa2019

ER292d Fourth Semester ERG Master's Seminar. Sp2014, Sp2015, Sp2016, Sp2017

Service

Journal referee: Applied Energy, Energies, Energy, Energy Conversion and Management, Energy Economics, Energy Policy, Environmental Research: Infrastructure and Sustainability Environmental Research Letters, Energy Research & Social Science, IEEE Power Engineering Letters, IEEE Systems Journal, IEEE Transactions on Control of Networked Systems, IEEE Transactions on Control Systems Technology, IEEE Transactions on Energy Conversion, IEEE Transactions on Power Electronics, IEEE Transactions on Power Systems, IEEE Transactions on Smart Grid, IEEE Transactions on Sustainable Energy, Nature Climate Change, Nature Energy, Physical Review E, Physical Review Letters, Physics Letters A, Proceedings of the National Academy of Sciences, Proceedings of the Royal Society of London Series B, Solar Energy, Utilities Policy

Conference referee: American Control Conference, Conference on Decision and Control, European Control Conference, Hawaii International Conference on Systems Science, IEEE Power and Energy Society General Meeting, IEEE

SmartGridComm, IEEE Vehicle Power and Propulsion Conference, IFAC World Congress, Power Systems Computation Conference, PowerAfrica

Proposal referee: ARPA-e Cal Energy Corps, CITRIS Big Ideas, France-Berkeley Fund, Natural Sciences and Engineering Research Council of Canada, Power Systems Engineering Research Center, Research Grants Council of Hong Kong, Siebel Energy Institute, Sloan Foundation, Swiss National Science Foundation, US National Science Foundation,

White paper referee: Lawrence Berkeley National Laboratory, Union of Concerned Scientists

Departmental Service:

Chair, ERG (2022-present)
Acting Chair, ERG (2021)
Head Graduate Adviser, ERG (2021)
Member, ERG Faculty Search Committee, (2012-2013, 2015-2016, 2020-2021).
Member, ERG GSAO Search Committee, (2021).
Admissions Chair, UC Berkeley Energy and Resources Group (2013-2017).
Departmental Colloquium Organizer, UC Berkeley Energy and Resources Group (2013-2017).

Campus Service

UC Berkeley:

Member, Committee on Academic Planning and Resource Allocation (2023-present)
Member, Academic Senate Taskforce on online education and remote instruction (2021)
Elected Member, Academic Senate Divisional Council (DIVCO), (2020-2021)
Chair, College of Natural Resources Executive Committee (2018-2019)
Member, College of Natural Resources Executive Committee (2017-2020)
Chair, College of Natural Resources Student Faculty Relations Committee (2016-2017)
Member, College of Natural Resources Student Faculty Relations Committee (2015-2017, 2020-2021)
Member, Graduate Division Fellowships Selection Committee (2017)
Faculty Liaison, The Green Initiative Fund (2015-2017)
Member, Chancellor's Advisory Committee on Dependent Care. (2010-2011)
Faculty Investigator, Center for Information Technology Research in the Interests of Society, UC Berkeley, (2010-present)
Member, Scientific Advisory Board, i4Energy Center, UC Berkeley Center for Information Technology Research in the Interests of Society (2009-2012).

Michigan:

Faculty Adviser, University of Michigan MSA Environmental Issues Committee, (2006-2008)
Faculty Fellow, Michigan Memorial Phoenix Energy Institute, (2007-2009)
Affiliate, Michigan Climate Action Council and Michigan Climate Action Technical Working Group on Cross-cutting Issues (2008).

Community Service

Co-chair, C3.ai Workshop on Machine Learning for a Resilient, Secure, Carbon-Free Electricity Supply, with Alejandro Dominguez-Garcia (UIUC) and Marija

Ilic (MIT), (2021)

Board of editors, Energy Findings (2021-present)

Editor in Chief, Current Sustainable/Renewable Energy Reports (2018-present)

Board of Editors, Energy Informatics (2017-present)

Member, Technical Committee on Smart Grids, IEEE Control Systems Society (2014-2018)

Science Adviser for K-8 curriculum on energy, Learning Design Group at the Lawrence Hall of Science (2014-2015)

Co-chair, Working Group on Dynamic Performance of Cyber-Physical Energy Systems, IEEE Power and Energy Society (2013-2017).

Guest Editor, IEEE Transactions on Smart Grid, special edition on Control Systems (2013).

Symposium Chair, "Demand Side Management, Demand Response, Dynamic Pricing," 2013 IEEE SmartGridComm (2012-2013).

Guest Editor, Annual Review of Environment and Resources (2012 edition).

Funding

29. "Universal Interoperability for Grid-Forming Inverters (UNIFI) Consortium"

    Sponsor: Solar Energy Technologies Office, US Department of Energy

    PI: Ben Kropowski (NREL) (Callaway as co-PI)

    Period: 2021-2026

    Amount: $25M plus $10M cost share ($750k to Berkeley plus $500k to LBNL)

28. "Scientific Machine Learning for Simulation and Control in Large Scale Power Systems"

    Sponsor: Office of Electricity, US Department of Energy

    PI: Duncan Callaway (as LBNL Faculty Scientist)

    Co-PIs: Bri-Matthias Hodge (NREL and CU Boulder), Alan Edelman (MIT)

    Period: 04/2021-03/20222

    Amount: $650k ($387k to Berkeley and LBNL)

27. "Scalable Data-Driven Voltage Control of Ultra-Large-Scale Power Networks"

    Sponsor: C3.ai Digital Transformation Institute,

    PI: Alejandro Dominguez-Garcia (Callaway as co-PI)

    Period: 09/2021-08/2022

    Amount: $210k ($104k to Berkeley)

26. "Operations and Forecasting in Energy Constrained Microgrids"

    Sponsor: Enphase Energy, Inc

    PI: Duncan Callaway

    Period: 2021

    Amount: $206k

25. "Overcoming the Technical Challenges of Coordinating Distributed Load Resources at Scale"

    Sponsor: ARPA-e

    PI: Johanna Mathieu (Michigan) (Callaway as co-PI)

    Co-PIs: Ian Hiskens (Michigan)

    Period: 2019-2022

    Amount: $2.9M ($360k to Berkeley)

24. "Deep Electrification of Transport in India"

    Sponsor: John D and Catherine T MacArthur Foundation

    PI: Duncan Callaway (as administrative director)

    Co-PIs: Amol Phadke, LBNL (research director)

    Period: 11/2017-10/2020

    Amount: $900,000

23. "Empirical Assessment of Distributed Energy Resources Impacts on California Utility Distribution Systems"

    Sponsor: Sloan Foundation

    PI: Jim Bushnell (UC Davis) (Callaway as sub-contractor)

    Period: 8/2017-10/2020

    Amount: $159,804 (subcontract amount)

22. "CPS: Synergy: Collaborative Research: The Sharing Economy for Electricity Services in Connected Communities"

    Sponsor: National Science Foundation

    PI: Kameshwar Poolla (Callaway as co-PI)

    other Co-PIs: Michael Jordan

    Period: 08/2016-07/2019

    Amount: $900,000

21. "Community Control of Distributed Resources"

    Sponsor: Department of Energy Office of Electricity

    PI: Duncan Callaway (as LBNL Faculty Scientist)

    Co-PIs: Yashen Lin (NREL), Jay Johnson (Sandia)

    Period: 04/2016-04/2019

    Amount: $3,000,000

20. "An Open-source Open-architecture Software Platform for Plug-in Electric Vehicle Smart Charging in California Residential and Small Commercial Settings."

    Sponsor: California Energy Commission

PI: Tim Lipmann (Callaway as co-PI)

Period: 04/2016-01/2019

Amount: $1,500,000

19. "CyberSEES Type 2: Achieving Clean Power System Flexibility: Sensing, Modeling, and Optimal Control"

    Sponsor: National Science Foundation

    PI: Duncan Callaway

    Co-PIs: Daniel Kammen and Eric Brewer, UC Berkeley

    Period: 09/2015-08/2019

    Amount: $1,199,914

18. "FEW: Developing Intelligent Food, Energy,and Water Systems (DIFEWS)"

    Sponsor: National Science Foundation

    PI: Matthew Potts, UC Berkeley

    Period: 09/2015-09/2016

    Amount: $49,863

17. "Smart Charging of Plug-in Vehicles and Driver Engagement for Demand Management and Participation in Electricity Markets"

    Sponsor: California Energy Commission Electric Program Investment Charge

    PI: Doug Black, LBNL

    Period: 07/2015-06/2018

    Amount: $1,993,355

16. "End-to-end Testing of Commercial Building End-Uses for Regulation"

    Sponsor: Consortium for Electric Reliability Technology Solutions (CERTS)

    PI: Duncan Callaway

    Period: 07/2014-06/2016

    Amount: $385,000

15. "CAREER: Aggregation, estimation and control of distributed energy resources"

    Sponsor: National Science Foundation

    PI: Duncan Callaway

    Period: 06/2014-05/2019

    Amount: $400,000

14. "Exploiting Renewable Energies for a Sustainable Power Grid: A generalized aggregate modeling and control architecture for distributed energy resources"

    Sponsor: Tsinghua-Berkeley Fund

    PIs: Duncan Callaway and Qinglai Guo

Co-PIs: Hongbin Sun and He Hao

Period: 5/2014-5/2015

Amount: $50,000 ($25k to Berkeley)

13. "Coordinated Resource Management of Cyber-Physical-Social Power Systems"

    Sponsor: National Science Foundation, Cyber-Physical Systems Program

    PI: Duncan Callaway

    Co-PIs: Eilyan Bitar, Pramod Khargonekar, Kameshwar Poolla, Pravin Varaiya

    Period: 11/2012-10/2015

    Amount: $1,121,717 ($560k to Berkeley)

12. "Coordinated aggregation of distributed resources for the smart grid"

    Sponsor: Bosch Energy Network Research Grant Program

    PI: Kameshwar Poolla

    Co-PI: Pravin Varaiya

    Period: 01/2012-12/2013

    Amount: $200,000 with $200,000 match from UC Berkeley Vice Chancellor for Research

11. "How big is the efficiency resource? Scalable evaluation of building energy efficiency potential and performance."

    Sponsor: UC Berkeley Hellman Faculty Fund

    PI: Duncan Callaway

    Period: 07/2011-06/2012

    Amount: $50,000

10. "Using Existing Metering to Identify Energy Waste in Buildings."

    Sponsor: Center for Information Technology Research in the Interests of Society

    PIs: Ram Akella and Duncan Callaway

    Period: 07/2011-06/2012

    Amount: $75,000

9. "Mitigating renewables intermittency through nondisruptive distributed load control"

    Sponsor: Power Systems Engineering Research Center FutureGrid Initiative

    PI: Duncan Callaway

    Period: 01/2011-12/2012

    Amount: $110,000

8. "Advanced Grid-Interactive Distributed PV and Storage"

   Sponsor: California Solar Initiative (California Public Utilities Commission)

   Joint proposal with SolarCity (lead), Tesla Motors and UC Berkeley

   Berkeley PI: Duncan Callaway,

   Co-PI: Daniel Kammen

   Period: 01/2011-12/2013

   Amount: $1.8M (total), $378,800 (to UC Berkeley)

7. "Modeling of Load Control Strategies to Augment Aggregated Wind Resources."

   Sponsor: California Energy Commission

   PIs: David Auslander and Duncan Callaway

   Period: 10/2010-12/2011

   Amount: $96,000

6. "Modeling of Load Control Strategies to Augment Aggregated Wind Resources."

   Sponsor: California Energy Commission

   PIs: David Auslander and Duncan Callaway

   Period: 08/2009-06/2010

   Amount: $200,000

5. "EFRI-RESIN: A Multi-Scale Design and Control Framework for Dynamically Coupled Sustainable and Resilient Infrastructures, with Application to Vehicle-to-Grid Integration."

   Sponsor: National Science Foundation

   PI: Jeff Stein (Callaway as participating investigator)

   Period: 09/2008-08/2012

   Amount: $2,000,000 (approximately $350,000 to Callaway)

4. "PHEV Pilot Proposal," with DTE Energy and General Motors.

   Sponsor: Michigan Public Service Commission

   U-M PI: Ian Hiskens (Callaway as participating investigator)

   Period: 09/2008-08/2010

   Amount: $5,000,000 ($278,140 subcontract to Callaway)

3. "A Design Science Framework for Measuring Future GHG Emissions in the Energy Sector."

   Sponsor: Michigan Memorial Phoenix Energy Institute

   PI: Steven Skerlos (Callaway as Co-PI)

   Period: 09/2008-08/2009

   Amount: $298,692 ($7,583 to Callaway)

2. "Wind Energy Resource Utilization: An Interdisciplinary Investigation of the Interaction Between Atmosphere and Technology."

   Sponsor: Gilbert Whitaker Fund for the Improvement of Teaching

   PIs: Gerald Keeler and Duncan Callaway

   Period: 05/2008 - 05/2009

   Amount: $10,000

1. "Integrating Resource Assessment, Economics and Public Policy to Optimize Renewable Electricity Generation."

   Sponsor: Michigan Memorial Phoenix Energy Institute

   PI: Duncan Callaway

   Co-PIs: Meredith Fowlie, Greg Keoleian, Tom Lyon, Michael Moore

   Period: 02/2007-05/2009

   Amount: $266,550