Curriculum Vitae
Dr. James Cale

Associate Professor, Department of Systems Engineering
Colorado State University, Fort Collins, CO 80523
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EDUCATION

DOCTORATE IN ELECTRICAL ENGINEERING   Aug '07
Purdue University, Energy Sources and Systems
Dissertation Title: Computationally efficient magnetic modeling and material characterization methods for automated ferrimagnetic inductor design
Major Advisor: Prof. Scott Sudhoff, FIEEE

MASTER OF SCIENCE IN ELECTRICAL ENGINEERING   Dec '03
Purdue University, Energy Sources and Systems

BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING (SUMMA CUM LAUDE)   Dec '01
Missouri University of Science & Technology

APPOINTMENTS

ASSOCIATE PROFESSOR, SYSTEMS ENGINEERING DEPARTMENT   Jul '17–
Colorado State University   Fort Collins, CO

PROFESSIONAL EXPERIENCE

PRINCIPAL & LEAD, INTEGRATED DEVICES & SYSTEMS   Jun '11–Jul '17
National Renewable Energy Laboratory   Golden, CO

Led a group focusing on design and dynamic control of power electronic converters and embedded systems. Performed high-fidelity, transient modeling and simulation of complex physical systems using C/C++, MATLAB/Simulink, PSCAD, Python and LabView. Led a project on advanced remote hardware-in-the-loop for creating virtually connected energy testbeds. Performed research in machine learning and pattern classification using principle components analysis (PCA) and k-means clustering. Responsible for pursuing new funding opportunities, attracting and maintaining high-quality research staff, and building successful collaborative relationships with internal and external partners.

MEMBER OF TECHNICAL STAFF   May '10–Jun '11
Controls and Modeling Group, Advanced Energy   Fort Collins, CO

Technical lead for modeling and simulation of power inverters for detailed feasibility and optimization studies to support firmware design. Simulations were performed for validation of performance and control stability margins. Championed the use of test-driven software development and initiated a documentation procedure for firmware code, design calculations, and software interfaces. Derived state-space models for the inverter and magnetic components such as transformers and chokes for EMI reduction. Developed a hardware-in-the-loop testing platform using National Instruments PXI chassis.

LEAD ELECTRICAL ENGINEER   Jan '08–Apr '10
Research and Development, Orbital ATK   Independence, MO

Principal Investigator for Department of Defense research projects. Designed advanced magnetic sensing, data acquisition and real-time pattern recognition system using both PCA and support vector machine classification technique.

POST-DOCTORAL RESEARCH ENGINEER   Jul '07–Jan '08
Computational Magnetics Group, Purdue University   West Lafayette, IN

Simulated electromagnetic fields in C using time-domain magnetic Finite Element Analysis (FEA). Wrote PERL script for data extraction and processing from Cadence/Allegro.

PEER-REVIEWED PUBLICATIONS

[1] J. Cale, C. Lute, J. Simon, and A. Delcore, "Modeling minimally-processed transformers for shielded metal arc welders for rural minigrid applications," *IEEE Power and Energy Technology Systems Journal*, vol. 6, no. 2, pp. 95–103, Jun. 2019.

[2] J. Cale, S. Frank, D. Zimmerle, A. Santos, D. Gerber, A. Othee, and G. Duggan, "Comparison of load models for estimating electrical efficiency in dc microgrids," in *Proceedings of the 3rd IEEE International Conference on DC Microgrids, 2019*, Matsue, Japan, 2018, (accepted, to appear).

[3] R. Pirani and J. Cale, "A pattern recognition approach for enhancing lifecycle maintainability of battery systems," in *2019 International Symposium on Systems Engineering (ISSE), 2019*, Edinburgh, Scotland, 2019, pp. 1–8.

[4] C. Lute, T. Decker, J. Cale, and A. Delcore, "A method for evaluating unregulated solar irrigation pumping systems: Results and observations," in *2019 IEEE Global Humanitarian Technology Conference (GHTC), 2019*, Seattle, WA, 2019, (accepted, to appear).

[5] J. Cale, C. Lute, G. Ross, and A. Othee, "Characterization procedure for unsymmetrical split-phase capacitor-start induction machines," *IEEE Power and Energy Technology Systems Journal*, 2020, (completed, to be submitted).

[6] J. Wendell and J. Cale, "Survey on stochastic optimization for microgrid power systems," *IEEE Power Systems Journal*, 2018, (completed, to be submitted).

[7] C. Cruickshank and J. Cale, "Complexity and emergence in air combat operations," *IEEE Systems Journal*, 2020, (completed, to be submitted).

[8] J. Cale, E. Dall'Anese, B. Johnson, P. Young, G. Duggan, P. Bedge, D. Zimmerle, and L. Holton, "Mitigating communication delays in remotely connected hardware in the loop experiments," *IEEE Transactions on Industrial Electronics*, vol. 65, no. 12, pp. 9739–9748, 2018.

[9] J. Cale, "Converging on emergence: reconnoitering to optimally adapt to changes in system environment," in *Proceedings of the 4th IEEE International Symposium on Systems Engineering, 2018*, Rome, Italy, 2018, pp. 1–7.

[10] M. Brim and J. Cale, "Remote and dynamic assessment of reliability in electromechanical actuator systems," in *Proceedings of the 12th IEEE International Systems Conference, 2018*, Vancouver, Canada, 2018, pp. 1–8.

[11] B. Johnson, S. Dhople, J. Cale, A. Hamadeh, and P. Krein, "Oscillator-based inverter controls for islanded three-phase microgrids," *IEEE Journal of Photovoltaics*, vol. 4, no. 1, pp. 387–395, 2014.

[12] J. Cale, B. Palmintier, D. Narang, and K. Carroll, "Clustering distribution feeders in the Arizona Public Service territory," in *Proceedings of the 40th IEEE Photovoltaic Specialist Conference (PVSC), 2014*, Denver, Colorado (USA), 2014, pp. 2076–2081.

[13] P. Gotseff, J. Cale, M. Baggu, D. Narang, and K. Carroll, "Accurate power prediction of spatially distributed PV systems using localized irradiance measurements," in *Proceedings of the Power and Energy Systems (PES) Conference, 2014 IEEE*, Washington, DC (USA), 2014, pp. 1–5.

[14] J. Cale and D. Narang, "High-penetration PV deployment in the Arizona Public Service system, Phase 2 results and update on Phase 3," in *Proceedings of the 39th IEEE Photovoltaic Specialist Conference (PVSC), 2013*, Tampa, Florida (USA), Jun. 2013, pp. 1711–1714.

[15] M. Ropp, J. Cale, and M. Mills-Price, "A test protocol to enable comparative evaluation of maximum power point trackers," in *Proceedings of the 37th IEEE Photovoltaic Specialists Conference, 2011*, Seattle, Washington (USA), Jun. 2011, p. 4.

[16] J. Cale, S. Sudhoff, and R. Chan, "Ferrimagnetic inductor design using population-based design algorithms," *IEEE Transactions on Magnetics*, vol. 45, no. 2, pp. 726–734, Feb. 2009.

[17] ——, "A field-extrema hysteresis model for ferrimagnetic materials," *IEEE Transactions on Magnetics*, vol. 44, no. 7, pp. 1728–1736, 2008.

[18] J. Cale and S. Sudhoff, "EI core inductor designs using population-based design algorithms," in *IEEE Applied Power Electronics Conference, 2007*, Anaheim, CA (USA), March 2007, pp. 1062–1069.

[19] B. Cassimer, R. Chan, J. Cale, A. Cramer, and S. Sudhoff, "Evolutionary design of electromagnetic and electromechanical devices," in *IEEE Electric Ship Technologies Symposium, 2007*, no. 21, Arlington, Virginia (USA), May 2007, pp. 150–157.

[20] J. Cale, S. Sudhoff, and J. Turner, "An improved magnetic characterization method for highly permeable materials," *IEEE Transactions on Magnetics*, vol. 42, no. 8, pp. 1974–1981, Aug. 2006.

[21] J. Cale, S. Sudhoff, and L. Tan, "Accurately modeling EI core inductors using a high-fidelity magnetic equivalent circuit approach," *IEEE Transactions on Magnetics*, vol. 42, no. 1, pp. 40–46, Jan. 2006.

[22] S. Sudhoff, J. Cale, B. Cassimer, and M. Swinney, "Genetic algorithm based design of a permanent magnet synchronous machine," in *IEEE Electric Machines and Drives Conference, 2005*, San Antonio, Texas (USA), May 2005, pp. 1011–1019.

[23] J. Williams, J. Cale, N. Benavides, J. Wooldridge, A. Koenig, J. Tichenor, and S. Pekarek, "Versatile hardware and software tools for educating students in power electronics," *IEEE Transactions on Education*, vol. 47, no. 4, pp. 436–445, Nov. 2004.

PATENTS

[1] J. Cale, E. Dall'Anese, B. Johnson, P. Young, L. Holton, and D. Zimmerle, "Mitigating latency errors in distributed systems," U.S. Patent 2017/0 249 404 A1, Aug. 31, 2017.

[2] S. Sudhoff and J. Cale, "Methods and apparatus for characterizing magnetic properties of materials," U.S. Patent 8,633,686 B1, Jan. 21, 2014.

TEACHING EXPERIENCE

ENGR 597 - DYNAMIC OPTIMIZATION FOR SYSTEM OPERATION UNDER UNCERTAINTY.   Fall '19
Course Developer & Instructor, Colorado State University

ENGR 570 - COUPLED ELECTROMECHANICAL SYSTEMS   Fall '17–'19
Course Developer & Instructor, Colorado State University

ENGR 531 - ENGINEERING RISK ANALYSIS	Spring '17–'18

Instructor, Colorado State University

ENGR 530 - OVERVIEW OF SYSTEMS ENGINEERING PROCESSES	Spring '16–'20

Instructor, Colorado State University

ECE 566 - GRID INTEGRATION OF WIND ENERGY SYSTEMS	Fall '14

Guest Lecturer, Colorado State University

ECE 321 - ELECTROMECHANICAL MOTION DEVICES	Spring '05

Instructor, Purdue University

POWER ELECTRONIC DRIVE SYSTEMS (SHORTCOURSE)	Fall '04

Instructor, Fairfield Engineering

GRADUATE STUDENTS SUPERVISED

Major Advisor (active)	
Ph.D.	Jarrett Wendell, Rudy Pirani, Emmanuel Cao, Ricardo Castillo, Rasel Mahmud, Avpreet Othee, Michael Westerman, Raiford Smith*, Claudio de Andrade Lima*
M.S.	Scott Baron, Nickolas Roberts, Gregory Jeffrey*, Shannon Sirvaitis*
Committee Member (active)	
Ph.D.	William Akin, Jerry Li, Tim Middleton, Julieta Giraldez, Dustin Birch, Tanveer Hussain, Steve Caldwell, Ayman Qaddumi, Michael Virnelson, Vanja Vlajnic
Former Major Advisees (graduated)	
M.S.	Miles Brim, Clayton Cruickshank, Margaret Cote, Anthony Oyatayo
Former Committee Member Advisees (graduated)	
Ph.D.	James Lee, Alex Anderson, Brian Johnson (Univ. of Illinois at Urbana-Champaign)
Undergraduate Interns (current and former)	
B.S.	Garrett Ross, Shavauntay Dukes

CONFERENCE ORGANIZATION

- Led the 2019 Fort Collins International Symposium on Microgrids, held at CSU campus and Powerhouse in Aug, 2019. Responsible for leading the overall organization and planning of the event, organizing panels and selecting speakers, budgeting, and obtaining industrial and CSU sponsorships.
- Obtained over $55k in sponsorship (covering all expenses), including a $10k grant from CSU's Office of the Vice President for Research.

EDITORIAL DUTIES

- Editor for the IEEE Power and Energy Technology Systems Journal
- Reviewer for numerous scholarly journals including IEEE Transactions on Energy Conversion, IEEE Transactions on Sustainable Energy, and IEEE Transactions on Industrial Electronics, and Journal of Applied Energy.

COMMUNITY AND PROFESSIONAL SERVICE

- Served honorably for eight (8) years in the United States Army Reserves (1994–2002)
- Mentor for high school student on senior project (Loveland High School, 2018)
- Invited speaker for Poudre School District Gifted Student Program (2017)
- Member of the Industrial Advisory Board (IAB) at Colorado State University (2014–2017)

Honors & Awards

- Recipient of the NREL Chairman's Award (2014)
- Recipient of the NREL Presidents's Award (2012)
- Awarded the National Science Foundation (IGERT) Graduate Fellowship (2002–2005)
- Recipient of the Grainger Outstanding Power Engineering Student Award (2001), (2006)
- UMR Curator's Scholarship (2001)
- UMR ECE Departmental Scholarship (2001)
- Received a merit-based grant from General Motors Corporation (2000)
- Received a merit-based grant from McDonald Douglas Corporation (2000)

Professional Societies

- Tau Beta Pi—National Engineering Honor Society
- Phi Kappa Phi—National Scholastic Honor Society
- Kappa Mu Epsilon—National Mathematics Honor Society
- Eta Kappa Nu—Electrical Engineering Honor Society
- IEEE (Senior Member)—Institute of Electrical and Electronics Engineers
- Toastmaster's International (President, UMR, 2000)—Public Speaking Society
- Mensa International—Intellectual and Cultural Society

Media Appearances

(Online) Featured in CSU Source article, entitled, "Microgrids symposium this summer attracted people from 24 countries." This article was about the 2019 Fort Collins Symposium on Microgrids, which I organized and hosted at the CSU campus in Aug. 2019. (Web link)

(Online) Featured in a video posted on the *Poudre School District* website and social media page. This video included clips of a keynote address to the Defying Expectations conference (2017) for the PSD Gifted Program. The address covered suggested preparatory education for entry into the technical professions of the future workplace. (Web link)

(Magazine) Featured in an article in August 2015 in *Electrical Contractor* Magazine entitled "A Model System: Energy Modeling; Power-System Modeling Becomes More Sophisticated." The purpose of the article was to explain the value of and recent changes in power systems modeling and how modeling and simulation can be used by electrical contractors. Authored by Darlene Bremer. (Web link)

(Online) Featured in a post on the website of the *Council on Foreign Relations*, in an article entitled, "Five Things I Learned About the Future of Solar Power and the Electricity Grid." Authored by Varun Sivaram (July 15, 2015). (Web link)

(Online) Featured in an article in April 2014 in *SNL Financial* (Energy Sector) on what "smart" PV inverters are and how they could potentially help provide utilities with additional services to help alleviate the impacts of high penetrations of PV on distribution circuits. Authored by Esther Whieldon, Senior Reporter at SNL Energy. (Web link)

(Online/print) Featured in the March 2014 edition of *Lab Manager*, in an article entitled "Leadership and Staffing." The article discusses how managers at National Laboratories provide training for employees and impacts from the recent economic environment. Authored by Sara Goudarzi. (Web link)

(Newspaper) Featured in an article in the *Denver Post* (March 9th, 2013), entitled "New NREL facility will help researchers study smart grid technology." The article discusses the new Energy Systems Integration Facility (ESIF) at the National Renewable Energy Laboratory (NREL). Authored by Mark Jaffe. (Web link)