Peter A. Lindahl

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Education

Doctor of Philosophy, Engineering — May 2009 – May 2013
Montana State University, Bozeman, MT, USA
Dissertation: *Electric Terminal Performance and Diagnostics of Solid Oxide Fuel Cells and Systems*
Advisor: Dr. Steven R. Shaw

Master of Science, Electrical Engineering — Aug. 2006 – May 2009
Montana State University, Bozeman, MT, USA
Thesis: *Simulation, Design, and Validation of a Solid Oxide Fuel Cell Powered Propulsion System for an Unmanned Aerial Vehicle*
Advisor: Dr. Steven R. Shaw

Bachelor of Science, Electrical Engineering
Pennsylvania State University, University Park, PA, USA — Aug. 2001 – May 2003
Syracuse University, Syracuse, NY, USA — Aug. 1999 – May 2001

Academic Appointments

Massachusetts Institute of Technology, Cambridge, MA, USA
Postdoctoral Associate, Research Laboratory of Electronics — June 2014 – Present
Mentor: Dr. Steven B. Leeb

Manage and oversee multiple research projects related to instrumentation, control, and optimization of advanced energy and electrical systems; co-advise graduate students and assist with classes.

- Led the energy monitoring research portion of a flagship MIT & Masdar Institute (UAE) collaboration developing advanced urban microclimate models, building system control schemes, and smart metering analytics. For this project, I developed methods for tracking energy utilization and cooling efficiency of centralized air conditioners from total building electricity demand analytics (e.g. harmonic content).
- Created multi-sensor condition monitoring techniques for a variety of rotational machinery including induction motors, synchronous generators, diaphragm pumps, and diesel engines.
- Installed electrical system monitors aboard two 270 ft U.S. Coastguard ships and developed analytics for detecting and identifying faults in the ships' graywater management system.
- Advised students (to date: 3 Ph.D. students, 5 M.S. students, and 1 undergraduate student) on research topics including non-intrusive sensing, microgrid energy management, electric motor and generator diagnostics, and power electronic control of distributed energy sources and loads.
- Organized laboratory assignments and taught technical workshops for three courses: a power electronics lab, a microcontroller project lab, and an introductory production & design course.

Communication Lab Advisor, Dept. of Elec. Eng. & Comp. Sci. — Oct. 2015 – Present

Mentor graduate students and postdocs on effective technical communication.

- Held one-on-one coaching sessions (approximately 80 sessions serving over 50 unique clients) with graduate students and postdocs providing them with guidance on communication pieces including journal papers, conference presentations, posters, and various components of job applications.
- Generated teaching materials and led recitation workshops for a pilot graduate-level technical communication course with 20 students.
- Co-authored and edited articles for the EECS MIT CommKit, an online collection of guides to successful scientific communication (over 1000 unique pageviews to date).
- Developed instructional material and co-organized a workshop regarding science policy and op-ed writing for the MIT International Policy Lab.
- Designed Excel-based tools for analyzing the Lab's user data in order to evaluate the Lab's programatic performance and educational effectiveness.

Academic Appointments Continued

Montana State University, Bozeman, MT, USA

Research Engineer, College of Engineering — Mar. 2014 - June 2014

Performed a technical design and performance analysis of novel capacitance-based position sensors and high-speed focus controls for micro-electro-mechanical (MEMS) deformable mirrors built in the lab of Dr. David Dickensheets.

Assistant Teaching Professor, Electrical & Computer Engineering Department — Aug. 2013 - Dec. 2013

Taught a lecture and laboratory course in applied electric power and supervised recitations for a multidisciplinary engineering design course.

- Created teaching content and laboratory assignments, delivered lectures, and supervised labs for an electrical engineering survey class of 35 construction engineering technology students.
- Provided project advice and guidance to 4 multidisciplinary design teams of 6 students each regarding the engineering design process, project management, and technical leadership.

Ph. D. Research Assistant, Electrical & Computer Engineering Department — May 2009 - May 2013

Advisor: Dr. Steven R. Shaw

Led a Boeing-funded research project studying solid oxide fuel cell and load interactions, in-situ degradation analysis, and control opportunities for fuel cell degradation mitigation.

- Designed and built a reference-based fuel cell stack simulator capable of supplying approximately 300 W for testing prototype fuel cell technologies under full-scale power electronic loads such as lighting ballasts and motor drives.
- Developed a time-domain least squares-based approach to electrochemical impedance spectroscopy for non-intrusive diagnostics of fuel cells and detecting degradation mechanisms such as anode oxidation.
- Proposed and demonstrated the novel concept of mitigating a fuel cell stack's degradation by controlling the stack load profile based on the stack's electrochemical impedance characteristics.

M. S. Research Assistant, Electrical & Computer Engineering Department — Aug. 2006 - May 2009

Advisor: Dr. Steven R. Shaw

Led an Air Force Research Laboratory-funded research project studying solid oxide fuel cells for powering the propulsion of an unmanned aerial vehicle.

- Developed a steady-state simulation model for a brushless DC electric motor and propeller propulsion system powered from a solid oxide fuel cell stack.
- Validated the simulation model by designing and constructing a testing facility to evaluate the performance of several multi-kW electrical propulsion systems powered by an emulated fuel cell source.

University of Maryland, Baltimore County, Baltimore, MD, USA

Undergraduate Researcher, Department of Physics — Summers 2000, 2002

Advisor: Dr. L. Michael Hayden

Developed and conducted experiments studying non-linear electro-optic effects in polymeric media.

Syracuse University, Syracuse, NY, USA

Calculus Tutor, Mathematics Department — Fall 2000 – Spring 2001

Tutored fellow students taking undergraduate calculus or business calculus classes.

Industry Experience

Cianbro Corporation, Baltimore, MD, USA

Assistant Project Engineer — Mar. 2006 - July 2006

Assisted in planning and implementing the installation of a new water intake and pumping system for the Milford Power Plant Water Intake Project.

- Aided project superintendent and head project engineer in preparing labor schedules.
- Procured equipment and system components dictated by the facility designs and in congruence with labor schedules and project budgets.
- Performed surveying duties to ensure proper construction of the facility.

Industry Experience Continued

Cianbro Corporation, Baltimore, MD, USA
Field Engineer & Estimator Jan. 2005 - Mar. 2006

Estimated project material and installation costs and worked alongside field electricians in planning and performing industrial-scale electrical and mechanical system installations.

- Planned and performed the installation of electrical distribution equipment as part of a project installing a new 13.8 kV distribution system on the Delaware Memorial Bridge.
- Installed motor controller equipment and an industrial relay system as part of a rehabilitation project updating the electrical and mechanical systems of the South Market Street bascule bridge in Wilmington, DE.
- Procured equipment and system components dictated by the facility designs and in congruence with labor schedules and project budgets.
- Estimated installation costs of industrial electrical systems for preparing multimillion dollar construction project bids.

Volunteer & Other Work Experience

Winter Wildlands Alliance Backcountry Film Festival, Cambridge, MA
Organizer Mar. 2016

Organized the Boston area showing of the Winter Wildlands Alliance Backcountry Film Festival, an event featuring 9 films and attended by over 200 people.

- Successfully obtained event sponsorship from the MIT Outing Club, and successfully solicited featured filmmaker, conservationist, and professional skier, Kt Miller, to host the event.
- Coordinated all aspects of event logistics including film licensing, event advertising, ticket sales, guest speaker schedule and accommodations, facility reservations, and technical production.
- Solicited in-kind donations (totaling $2,400 in value) from local and national outdoor recreation retailers for the event raffle to raise the event's profile and raise additional funds to donate to the Winter Wildlands Alliance.
- Arranged further MIT community engagements with honorariums for Ms. Miller including a social media communications workshop for MIT Communication Lab advisors, and an MIT Environmental Solutions Initiative sponsored screening of her climate change focused film, *Shifting Ice + Changing Tides*. This latter event included a talk by Ms. Miller and an audience-driven panel discussion featuring Ms. Miller and the Initiative's Executive Director, Dr. Amanda Graham.

Sweet Pea Festival of the Arts, Bozeman, MT
Board Member / Performing Arts Coordinator / Music Committee Head Nov. 2008 – Nov. 2010

Oversaw the planning and execution of the performance art (music, dance, theatre, and family entertainment) at the Sweet Pea Festival in Bozeman, MT, an annual arts festival held every August and attended by 16,000 to 18,000 people each year.

- Worked with each performing arts division head to book local, regional, and international artists and groups within specified budgets, schedule their performances at the festival, and coordinate with the technical (sound and lighting) and artist hospitality teams to provide high-quality performance entertainment for the festival attendees.
- Managed a $30,000 annual budget to book approximately 10 local, regional, and international touring musicians and groups for each festival.

Black Box Design, RMR Productions, Sasquatch Music Festival, USA
Production & Technical Assistant June 2008 - Jan. 2014

Performed production and technical duties including stage management, sound and lighting equipment operation, and equipment rigging for several large-scale musical, theatrical, and festival events.

"Vacuity" Film Crew, Bozeman, MT, USA
Electrical Engineer Spring 2012

Designed and constructed electrical props for the set of the science-fiction short film.

Affiliations

Member, Institute of Electrical and Electronics Engineers (IEEE)
Member, Tau Beta Pi Engineering Honors Society

Leadership & Service

Technical Session Chair, *2017 IEEE Sensors Application Symposium*	March 13-15, 2017
Reviewer, *IEEE Transaction on Energy Conversion*	2009 – Present
Reviewer, *IEEE Transaction on Instrumentation & Measurement*	2010 – Present
Reviewer, *Energy Efficiency*	Oct. 2015 – Present
Reviewer, *IEEE Sensors Journal*	Jan. 2016 – Present
Treasurer & Committee Member, Postdoc Initiative Grant Committee, *MIT*	April 2015 – Oct. 2015
Steering Committee Board Member, *Bozeman Climate Alliance*, Bozeman, MT	June 2012 – Jan. 2013

Honors

Benjamin Ph.D. Fellowship, Montana State University
Dean's Scholar, Syracuse University
Dean's List, Syracuse University
Athletic Director's Honor Roll, Syracuse University
Men's Varsity Soccer, Syracuse University
Association of Old Crows Educational Foundation Chesapeake Bay Roost Scholar

Journal Publications

[Under review] **P. Lindahl**, M. T. Ali, P. Armstrong, A. Aboulian, P. Marpu, J. Donnal, L. Norford, S. B. Leeb. "Smart Meter Monitoring of Variable Speed Drive Cooling Systems". Submitted to *IEEE Transactions on Smart Grid*.

[Under review] M. Gutierrez, **P. Lindahl**, A. Banerjee, S. Leeb. "An Energy Buffer Power Converter for Stability of Constant Power Loads". Submitted to *IEEE Transactions on Industrial Applications*.

[Under review] **P. Lindahl**, D. Green, G. Bredariol, A. Aboulian, J. Donnal, J. Nation, S. Leeb. "Non-intrusive Load Monitoring for Shipboard Fault Detection: A Case Study". Submitted to *IEEE Sensors Journal*.

A. Aboulian, D. Green, J. Switzer, T. Kane, G. Bredariol, **P. Lindahl**, J. Donnal, S. Leeb. "NILM Dashboard: A Power System Monitor for Electromechanical Equipment Diagnostics". *IEEE Transactions on Industrial Informatics*. Available early access. 2018.

P. Lindahl, S. Leeb, S. Shaw. "Fuel Cell Stack Emulation for Cell and Hardware-in-the-Loop Studies". *IEEE Transactions on Instrumentation & Measurement*. Available early access. 2018.

P. Lindahl, G. Bredariol, J. Donnal, S. Leeb. "Noncontact Electrical System Monitoring on a US Coast Guard Cutter". *IEEE Instrumentation & Measurement Magazine*. Vol. 20, no. 4, pp. 11-20, Aug. 2017.

J. Donnal, **P. Lindahl**, D. Lawrence, R. Zachar, S. Leeb. "Untangling Non-Contact Power Monitoring Puzzles". *IEEE Sensors Journal*. Vol. 17, no. 11, pp. 3542-3550, June 2017.

P. Lindahl, A. Avestruz, W. Thompson, E. George, B. Sennett, S. Leeb. "A Transmitter-Receiver System for Long-Range Capacitive Sensing Applications". *IEEE Transactions on Instrumentation and Measurement*. Vol. 65, no. 10, pp. 2412-2423, Oct. 2016.

R. Zachar, **P. Lindahl**, J. Donnal, W. Cotta, C. Schantz, S. Leeb. "Utilizing Spin-down Transients for Vibration-Based Diagnostics of Resiliently Mounted Machines". *IEEE Transactions on Instrumentation and Measurement*. Vol. 65, no. 7, pp. 1641-1650. July 2016.

J. Cooley, **P. Lindahl**, C.L. Zimmerman, M. Cornachione, G. Jordan, S. R. Shaw, S. B. Leeb. "Multiconverter System Design for Fuel Cell Buffering and Diagnostics under UAV Load Profiles". *IEEE Transactions on Power Electronics*. Vol. 29, no. 6, pp. 3232-3244. June 2014.

Journal Publications Continued

P. Lindahl, M. Cornachione, S. R. Shaw. "A Time-Domain Least Squares Approach to Electrochemical Impedance Spectroscopy". *IEEE Transactions on Instrumentation and Measurement*. Vol. 61, no. 12, pp. 3303-3311. Dec. 2012.

P. Lindahl, E. Moog, S. R. Shaw. "Simulation, Design and Validation of a UAV SOFC Propulsion System". *IEEE Transactions on Aerospace and Electronic Systems*. Vol. 48, no. 3, pp. 2582-2593. July 2012.

L. M. Hayden, A. M. Sinyukov, M. R. Leahy, **P. Lindahl**, J. French, W. Herman, M. He, R. Twieg. "New Materials for Optical Rectification and Electro-optic Sampling of Ultra-short Pulses in the THz Regime". *Journal of Polymer Science Part B: Polymer Physics*. Vol. 41, pp. 2492-2500. Nov. 2003.

Conference Publications

[Under review] S. Shabshab*, J. Nowocin, **P. Lindahl**, S. Leeb. "Opportunity for Military Microgrid Fuel Savings Through Centralized Load Control". Submitted to *The 44th Annual Conference of the IEEE Industrial Electronics Society*. Oct. 2018.

T. Kane*, D. Green, A. Aboulian, G. Bredariol, J. Donnal, **P. Lindahl**, S. Leeb. "NILM: Smarter Shipboard Monitoring for the Modern Fleet". *American Society of Naval Engineers Advanced Machinery Technology Symposium 2018*. Mar. 2018.

M. Gutierrez*, **P. Lindahl**, A. Banerjee, S. Leeb. "Controlling the Input Impedance of Constant Power Loads". *IEEE Applied Power Electronics Conference*. Mar. 2018.

A. Hanson*, **P. Lindahl**, S. Strasser, A. Takemura, D. Englund, J. Goldstein. "Technical Communication Instruction for Graduate Students: The Communication Lab vs. A Course". *American Society for Engineering Education Annual Conference & Exposition*. June 2017.

J. Nation, G. Bredariol, A. Aboulian, D. Green, K. Stevens, J. Donnal, **P. Lindahl***, S. Leeb. "Nonintrusive Monitoring for Shipboard Fault Detection". *2017 IEEE Sensors Applications Symposium*. March 2017.

S. Leeb, J. Donnal, C. Schantz, J. Moon, **P. Lindahl***. "Stethoscopes for Nonintrusive Monitoring". *2017 IEEE Sensors Applications Symposium*. Mar. 2017.

G. Bredariol*, K. Stevens, J. Nation, A. Aboulian, **P. Lindahl**, S. Leeb. "NILM: A Smarter Tactical Decision Aid". *American Society of Naval Engineers Technology, Systems & Ships Day 2017*. Feb. 2017.

P. Lindahl*, G. Bredariol, J. Donnal, S. Leeb. "Non-contact Sensors and Nonintrusive Load Monitoring (NILM) Aboard the USCGC SPENCER". *IEEE AUTOTESTCON 2016*. Sept. 2016.

J. Moon, **P. Lindahl***, J. Donnal, R. Zachar, C. Schantz, W. Cotta, S. Leeb. "A Nonintrusive Magnetically Self-powered Vibration Sensor for Automated Condition Monitoring of Electromechanical Machines". *IEEE AUTOTESTCON 2016*. Sept. 2016.

G. Bredariol*, J. Donnal, **P. Lindahl**, S. B. Leeb, "Automatic Watchstander Through NILM Monitoring". *ASNE Day 2016*. Mar. 2016.

P. Lindahl*, M. Cornachione, J. Wold, X. Hu, S. R. Shaw. "Solid Oxide Fuel Cell Degradation, Recovery, and Control Via the Electrical Terminals". *ASME Fuel Cell Science, Engineering, and Technology Conference*. June 2014.

P. Lindahl*, M. Cornachione, S. R. Shaw. "A Reference Based Fuel Cell Stack Simulator". *ASME Fuel Cell Science, Engineering, and Technology Conference.* July 2010.

P. Lindahl*, E. Moog, S. R. Shaw. "Simulation, Design, and Validation of a UAV SOFC Propulsion System". *IEEE Aerospace Conference*. Mar. 2009.

** Denotes conference presenter*

Project Reports

S. Sofie, S. Shaw, **P. Lindahl**, L. Spangler. "Propulsion and Power Rapid Response R&D Support. Deliver Order 0002: Power-Dense, Solid Oxide Fuel Cell Systems: High-Performance, High-Power-Density Solid Oxide Fuel Cells - Materials and Load Control". *Air Force Research Laboratory Propulsion Directorate*. April 2010.

S. Sofie, S. Shaw, **P. Lindahl**, L. Spangler. "Propulsion and Power Rapid Response R&D Support Delivery Order 0041: Power Dense Solid Oxide Fuel Cell Systems: High Performance, High Power Density Solid Oxide Fuel Cells - Materials and Load Control". *Air Force Research Laboratory Propulsion Directorate*. Dec. 2008.

Unrefereed Publications

Contributing author to the *MIT EECS Communication Lab Comm Kit*, a collection of guides to successful scientific communication, written by EECS Comm Lab advisors. October, 2016.
Published Online: http://mitcommlab.mit.edu/eecs/use-the-commkit

Co-Supervised Students

LT Thomas Kane. M.S. Candidate, Mechanical Engineering — May. 2017 – Present
Project topic: *Automated electrical testing aboard USCG vessels*
Co-Advisor: Dr. Steven B. Leeb

Lukasz Huchel. Ph.D. Candidate, Electrical Engineering — May. 2017 – Present
Project topic: *Electrical and vibrational-based diagnostics of electromechanical systems*
Co-Advisor: Dr. Steven B. Leeb

Daisy Green. Ph.D. Candidate, Electrical Engineering — Sept. 2016 – Present
Project topic: *Nonintrusive electrical and magnetic sensing for sustainability applications*
Co-Advisor: Dr. Steven B. Leeb

Manuel Gutierrez, Ph.D. Candidate, Electrical Engineering — July 2015 – Present
Project topic: *Multi-source converters for stability of grid-connected constant-power loads*
Co-Advisor: Dr. Steven B. Leeb, Dr. Arijit Banerjee

LT Spencer Shabshab, M.S. Mechanical Engineering — July 2016 – May 2018
Project topic: *Improving microgrid efficiencies through coordinated HVAC control*
Co-Advisor: Dr. Steven B. Leeb

LT Greg Bredariol, M.S. Mechanical Engineering — July 2015 – May 2017
Project topic: *Automated energy management using nonintrusive load monitors*
Co-Advisors: Dr. Steven B. Leeb, Dr. John Donnal

Grant Gunnison, Undergraduate Researcher, Electrical Engineering — Aug. 2015 – May 2016
Project topic: *Utilizing heat capacity of U.S. Army tent structures for short-term energy storage*
Co-Advisors: Dr. Steven B. Leeb, Dr. John Donnal

LT Ryan Zachar, Naval Engineer, M.S. Engineering & Management — July 2014 – June 2015
Thesis: *Naval applications of enhanced temperature, vibration and power monitoring*
Co-Advisors: Dr. Steven B. Leeb, Dr. John Donnal

LT William Cotta, M.S. Mechanical Engineering — July 2014 – June 2015
Thesis: *Machinery diagnostics and characterization through electrical sensing*
Co-Advisors: Dr. Steven B. Leeb, Dr. John Donnal