ISTB-3 Suite 121
7418 Innovation Way South
Mesa, AZ 85212

nathanjohnson@asu.edu
480-727-5271

Nathan G. Johnson

PROFESSIONAL APPOINTMENTS

Assistant Professor — 2013 – present
The Polytechnic School, Ira A. Fulton Schools of Engineering
Arizona State University

NSF/ASEE Small Business Postdoctoral Research Diversity Fellow — 2011 – 2013
HOMER Energy LLC

Engineer and Business Development Manager — 2007 – 2008
Emerging Consumer Markets
BP

EDUCATION

Ph.D.	Mechanical Engineering	Iowa State University	2012
M.S.	International Development	Iowa State University	2008
M.S.	Mechanical Engineering	Iowa State University	2005
B.S.	Mechanical Engineering	Iowa State University	2004

SUMMARY OF PROFESSIONAL ACCOMPLISHMENTS

- Published 33 peer-reviewed articles in journals, books, and conferences
- Gave 16 invited talks
- Grown research lab portfolio in first three years of professorship from $30k, to $600k, to $1.5M per annum
- Developed a 20-person academic research lab entitled the Laboratory for Energy And Power Solutions (LEAPS) that is self-sustaining
- Secured funding, designed, and deployed the first microgrid test bed at Arizona State University, a $1.2M one-acre facility
- Commercialized a containerized microgrid solution deployed by for-profit partner
- Trained 100+ US Veterans in microgrid operation and distribution network operation
- Developed three new courses with a focus on Alternative Energy, Microgrid Design and Operation, and Electric Grid Simulation and Operation
- Served as Program Chair and Technical Program Chair to IEEE Global Humanitarian Technology Conference
- Serve as Board Member or External Technical Advisor to various companies in the energy sector

RESEARCH INTERESTS

- Complex energy system dynamics
- Micro-grid modeling and optimization
- Hybrid thermal-power systems
- Designing for sustainability
- Multidisciplinary design
- Global development

RESEARCH AREAS AND RESEARCH PROJECTS

The *Laboratory for Energy And Power Solutions (LEAPS)* takes energy innovations from concept to construction with a focus on systems integration and the design of new hardware and software to confront global energy challenges. LEAPS is comprised of two computational environments and three hardware environments to facilitate the design, development, testing, and commercialization of work in micro-grids, distributed solar PV and advanced inverter control, self-organizing control of distributed energy resources, household solar systems with fast/slow response storage, district building cooling dispatch optimization, electric rate design and analysis, off-grid power systems, low-cost charge controllers and micro-grid controllers, containerized power systems, concentrating solar power systems optimization for power and hydrogen production, complex systems modeling with forecasting of intermittency renewable resources and loads, energy business value chain optimization, and an series of multi-day and semester-long interactive training sessions for interested students, non-governmental organizations, and private sector seeking to develop and implement such work in industrialized countries and emerging markets. Some specific projects follow.

Energy Systems Design – Developed integrative solutions for hybrid power-thermal energy platforms that address dynamic technical, economic, human, and environmental system factors.

- *Self-organizing control of distributed energy resources:* Created software and hardware test bed for designing, testing, and evaluating self-organization techniques for decentralized learning and control of distributed energy resources—generation, storage, use. Research focuses on systems in the range of 1 kW to 100 kW with application to buildings and households in industrialized countries and villages, clinics, and small industrial parks in emerging markets.
- *Design, implementation, and testing of advanced building energy systems:* Designed, built and tested a 5-20 kW scalable building energy system with solar PV, battery bank, capacitors, advanced inverter, thermal energy storage integrated to the cooling system, demand response capabilities, and an on-site intelligent building energy controller with automated or manual control operated. The net building load can be manipulated by a third party (utility) using demand limits or price signals; the building management system receives signals and decides what resources to dispatch. Various electricity rates—flat, tiered, time-of-use, dynamic—can be used.
- *Residential building energy control:* Developed prototype of household energy management system including a centralized control unit, end-load microcontrollers, bi-directional communication, and associated algorithms on the centralized unit and end-load devices. Energy management algorithms based upon occupancy, time of day/week, availability of renewable energy and/or energy storage, grid rate structures, indoor and outdoor temperatures, and forecasts about changing weather or building usage.

- *Open source transient analysis of distribution networks:* Demonstrated use of OpenDSS and other open source code to model real power networks for campuses, small research parks, and mining operations to explore options for deployment of micro-grids with high-penetration renewables and storage. Extended work to investigate the technical efficacy of new energy technologies and innovations in distributed energy resources.
- *Rate Reviewer software:* Developed a Java-based (desktop and web versions) of a Rate Reviewer software that allows users to comparatively evaluate the effect of solar PV, battery storage, electric vehicles, demand response, and electric rate schedules on technical and economic merits for a home-owner or other rate payer. Data can be input and simulations completed for a single rate payer, or for multiple rate payer segments (e.g., households by demographic group) in a region to examine system-wide effects on the utility such as ramp rates, peak system load, operating reserve requirements, revenue from various billing agreements, and statistics on the utilization of various distributed resources.
- *Energy systems design environment:* Developed the Energy Systems Design Environment (ESDE) for theoretical and applied research in developing sustainable approaches and technologies that address the energy challenges of the next three decades. ESDE models features of a dynamic real-world system—technical, economic, behavioral, environmental. The resulting complex system is represented by a collection of mathematical models and visualization techniques that provide an integrated experience for human-computer decision-making. This approach provides a single software utility that bridges the gaps in traditional disjointed decision processes and software tools used for conceptual design, detailed design, and operational control.
- *Concentrating solar power system design and optimization:* Completed systems design and optimization of concentrating solar power designs with capacities of 100 kW and 100 MW. Evaluated gas turbine power production vis-à-vis steam turbine, techno-economic feasibility of thermal energy storage to provide 6+ hours of power after sunset, back-up heating options including natural gas and biogas, and coupling the system to an energy value chain including production of key products including hydrogen gas.
- *Adaptive power management strategies for US military base:* Developed real-time software to forecast energy availability of a PV-battery micro-grid in the event of grid disconnect. This involved forecasting solar irradiance to calculate solar PV output, forecasting critical and non-critical loads, and forecasting the battery bank state of charge by convolving the probability distributions of renewable power output and loads.
- *Test bed for solar home system monitoring and control:* Designed 3 kW PV array with equivalent size smart inverter and custom charger controllers for household-scale solar-storage system. Installing three systems to test smart inverter functionality and interoperability with improvements underway for power quality control and energy management. Building load bank functionality with resistive, inductive, and capacitive loads to test power factor correction. Communication using 900 MHz radio mesh network and 4G Cellular connection.
- *System performance and developed control strategies for multi-building cooling systems:* Developed software models in Dymola, Matlab, Building Controls Virtual Test Bed, EnergyPlus, and custom C++ packages to describe building thermal energy requirements and performance of water-cooled systems with thermal energy storage. Collected operational data on two study sites to validate models and evaluated alternative operating scenarios to reduce energy use, reduce cost, and improve user comfort. Developed alternative dispatch strategies.
- *Integrated conceptual design and detailed design of micro-grids:* Developed theoretical and computational framework to link energy system models across time scales. Modeled micro-grids using software operating at a one-hour resolution and at a sub-second resolution. Authored plug-

and-play software for dispatch algorithms, load management strategies, demand response strategies, battery energy models, energy conversion models, and solar and wind resource simulators. Implemented programmable dispatch strategies.

- *Computational engine for the HOMER Energy micro-grid software:* Designed and implemented systems of systems computational architecture to model simple and complex power systems of any size. Software included renewable resource simulator and load simulator. Created capability to control renewable power sources, nonrenewable power sources, energy storage, and loads for off-grid and grid-connected systems. Developed dispatch logic for economic minimization, fuel minimization, and generator scheduling. Designed energy conversion and power system component sub-models to enable expansion and communication to external libraries. Improved calculation speed versus prior software versions.
- *Multimodal optimization of power system architectures:* Tailored open source derivative-free optimization algorithms for determining equipment sizes that achieve the lowest cost power system within user-defined constraints. Implemented algorithms to determine optimal component sizes for each power system configuration, and created a hybrid-optimization program to solve separate convex problems of a larger multi-modal problem space.

Complex Systems – Developed data-driven models and analysis software for exploring complex systems dynamics. Implemented tools for technical, fiscal, managerial, and policy-related decision-making.

- *Resiliency decision-making utility:* The utility entitled Resilient Infrastructure Simulation Environment (RISE) is a collection of mathematical models that describe the individual systems and interdependencies between electrical, water, and transportation infrastructures, and the dynamics of those systems in relation to consumer behavior, regular seasonal and weather patterns, and periodic and rare events from human, environmental, or technical origin. Together these features create a computational and data visualization utility that enables high-level stakeholders, operational personnel, and mathematical modelers to collaboratively define a resiliency problem space for interdependent infrastructures and evaluate decision plans for improved resiliency through simulation and exploratory analysis.
- *Modeling storm effects on renewable intermittency:* Dust storms are prevalent in arid regions of the world and can substantially and suddenly create drops in solar PV power output. Work resulted in a dust storm intensity and propagation model across the Phoenix metro and applied the resulting drop in solar insolation to region-wide solar PV according to public data on installed solar capacity by zipcode. Model was exercised to examine the effect of dust storm intensity, shape, size, velocity, time of day, and direction on system-wide peak and ramp rate requirements.
- *Data analysis and visualization tools using self-organizing maps:* Designed a toolkit for analysis of massive datasets using self-organizing maps. Created a graphical user interface that provides an interactive experience for users to engage multivariate datasets in organized topologies to identify patterns for use in stock portfolio transactions.
- *Pattern matching and prognostics of machine system data:* Created machine learning techniques for analysis and pattern matching of CAN bus data from an autonomous robot. Applied patterns for 10x improved data compression over one-step ahead compression methods such as WinZip. Applied learning techniques for prognostics of equipment state of health.
- *Pattern identification of farmland satellite images:* Created methods for segmentation of satellite images using Voronoi tessellations. Applied learning algorithms to identify baseline patterns in images and identify change in farmland use for irrigation planning.

Global Development – Worked with multi-cultural teams to design clean, safe, and affordable energy products and services for low-income families in eight developing countries.

- *Portable containerized micro-grids for disaster relief:* Designed, fabricated, and tested a 20' containerized mobile micro-grid for off-grid power and disaster relief. Container included solar PV, lithium-ion battery bank, back-up diesel generator, and necessary power electronics organized for safe shipping and quick deployment. Load management and dispatch algorithms developed for improved energy management and power quality control.
- *Outdoor air quality monitoring and modeling:* Created air quality monitoring kit to measure carbon monoxide, particulate matter (PM_{10} $PM_{2.5}$), and ozone with results communicated via GSM to central database for storage and analysis. Unit capable of operating off-grid using solar panel and lead acid battery. Low-cost design allows duplication to build a network of sensor locations that can track air quality dynamics. Measurements taken at 1-, 5-, or 15-minute intervals are being used to model air quality transients. The high spatial resolution and temporal resolution affords research of the anthropogenic and environmental factors affecting air quality.
- *Local and global impacts of rural energy use and innovation:* First completed assessment studies to identify potential factors that influence energy system dynamics, and second completed multi-factorial studies to gather data on the human, technical, and environmental factors that affect energy system dynamics and project sustainability. Analyzed quantitative and qualitative data to identify factors leading to the success, failure, and degree of success/failure of projects in rural villages in China, Mali, Vietnam, and South Africa.
- *Rural energy design evaluation:* Identified energy options with the greatest potential impact on human wellbeing and environmental health by comparing performance in simulated human, technical, and environmental systems. Used primary data and compared 60 energy options for sustainability. Implemented methods as engineering design tool.
- *Design process for product development in emerging markets:* Authored methodology to design products for emerging markets by linking the consumer to the product, and back. Designed and completed consumer studies that included ethnographic studies, focus group interviews, consumer product tests, and quantitative surveys for over 1,000 homes. Developed conceptual and computational models of household fuel consumption behaviors in Vietnam. Performed country-wide analysis of alternative cooking technologies to project product adoption and fuel consumption rates. Directed field research and business development teams.
- *Business model and strategy for biomass pellet fuel supply:* Modeled supply of biomass for use in pelletized fuels in Vietnam and South Africa. Investigated centralized and decentralized pellet production scenarios based on fuel availability, fuel quality, transport, profit potential, and risk. Directed field research teams.
- *Sustainable biofuel cooking technologies:* Designed experiments for fuel performance and emissions testing of biomass cookstoves in Mali, China, Vietnam, and the Philippines. Directed research groups in cookstove design, fabrication, and testing.
- *Safety protocols for cookstove design in developing countries:* Created ten guidelines and metrics for evaluating cookstove safety on burns, cuts, scalds, and loss of property. Directed implementation of procedures in 13 countries across four continents. Work cited as metric of performance in funding opportunities authored by the US Department of Energy and the Global Alliance for Clean Cookstoves. Work is current undergoing ISO approval and has been translated into four languages.

RESEARCH AWARDS AND FUNDING

A Holistic Water Solution for Undeserved and Refugee Host Communities in Lebanon and Jordon. *Co-PI.* Funded by US Agency for International Development. 2016. $1,700,000.

Monitoring and Managing Distributed Energy Resources through Interoperable IoT Solutions. *PI.* Funded by Verizon. 2016. $109,830.

Optimizing Residential-scale Thermal Energy Storage Systems with Precooling. *PI.* Funded by Salt River Project. 2016. $58,408.

Energy Management Systems for Residential Homes (Phase 2). *PI.* Funded by Salt River Project. 2016. $48,557.

Open Source Universal Charge Controller for Off-grid Power (Phase 1). *PI.* Funded by IEEE Smart Village, IEEE Foundation. 2016. $22,300.

Next-generation Energy Technologies and Systems for Civilian and Military Applications. *Co-PI.* Funded by Office of Naval Research, US Department of Defense. 2015. $1,499,998.

Mobile Containerized Micro-grid for Disaster Relief. *PI.* Funded by NRG Renew. 2015. $52,087.

Energy Management Systems for Residential Homes. *PI.* Funded by Salt River Project. 2015. $63,250.

Grid Simulation and Renewable Energy Integration. *PI.* Funded by IncSys. 2015. $76,515.

Collaborative Research: RIPS Type 2: Resilience Simulation for Water, Power, & Road Networks. *Co-PI.* Funded by NSF. 2014. $1,949,788.

Design and Analysis of a Concentrating Solar Power Air Brayton System. *Co-PI.* Funded by AORA Solar Ltd. 2014. $1,550,000.

High Efficiency Solar Thermochemical Reactor for Hydrogen Production. *Co-PI.* Funded by US Department of Energy. 2014. $170,000.

High Performance Reduction/Oxidation Metal Oxides for Thermochemical Energy Storage (PROMOTES). *Co-PI.* Funded by US Department of Energy. 2014. $201,857.

Techno-Economic Optimization Toolkit for Hybrid Building Power Systems. *PI.* Funded by Salt River Project. 2014. $44,990.

Residential Thermal Energy Control System With Storage. *PI.* Funded by Salt River Project. 2014. $20,000.

Distributed Energy Resource Integration and Interconnection. *Co-PI.* Funded by Verizon. 2014. $35,000.

BRIDGE in Sustainable Energy and Information and Communication Technologies. *Co-PI.* Inter-American Development Bank. 2014. $340,137.

Concept Paper and Proposal for Certification of Solar Technicians in Sub-Saharan Africa and Asia. *Co-PI.* Funded by International Renewable Energy Agency. 2014. $100,000.

Analysis of Performance of a Large Thermal Energy Storage System in Southern Arizona. *Co-PI.* Funded by Salt River Project. 2014. $45,921.

Reliability and Performance of Batteries in Our Hot/Dry Climate (Including Effects of Cycling). *Co-PI.* Funded by Salt River Project. 2013. $44,900.

TEACHING INTERESTS

- Alternative energy systems
- Designing for sustainability
- Systems thinking
- Computer-aided decision making
- NAE's Grand Challenges for Engineering
- Global engagement

TEACHING EXPERIENCE

As an educator, I am focused on training engineers and non-engineers to solve the energy needs of the next generation. Systems thinking and multi-disciplinary design are fundamental requirements to solving global energy problems. My pedagogy fosters these skills through concept-based lectures, comparative-driven lessons, real-world problems, and design projects that emphasize critical thinking and decision-making. Some of my experiences have included

- Developing course curricula that use industry-adopted energy system analysis tools.
- Creating hands-on demos of alternative energy topics in wind, solar PV, solar thermal, fuel cell, and battery technologies.
- Creating two courses on alternative energy and microgrids.
- Creating two courses on international development and sustainability.
- Planning, managing, and instructing study abroad service-learning trips.
- Leading specific cohorts and classes for US military service veterans.

EGR 494/498, Microgrid Design and Operation. Arizona State University.

Senior level and graduate student technical elective for engineering. Provides knowledge and experience for designing, modeling, integrating, operating, and maintaining micro-grids. The course couples simulation-based design with hands-on integration to provide an "all inclusive" approach to micro-grid education.

EGR 494/498, Electric Grid Simulation and Operation. Arizona State University.

Senior level and graduate student technical elective for engineering. provides students with first-hand knowledge and experience in grid operation and reinforces principles of unit commitment, economic dispatch, power flow, and contingency analysis. Real-time power system simulators are used for various network configurations and scenarios to train users in both normal operating conditions (e.g., dispatch, voltage control, balancing) and critical operating conditions (e.g., black outs, restoration, emergency response).

EGR 435/598, Alternative Energy. Arizona State University.

Senior level and graduate student technical elective for engineering. This course emphasized the basic principles, thermodynamics, and performance of alternative energy conversion technologies including photovoltaics, wind energy, biomass energy, fuel cells, and energy storage. Conventional heat and power systems are discussed as they pertain to alternative energy integration and carbon emissions. The final project includes design of a micro-grid power system with consideration for sustainability, cost, and environmental impact.

EGR 520, Engineering Systems Design and Analysis. Arizona State University.

Graduate level required course. Course topics include engineering modeling, analysis, and design of systems with deterministic and/or stochastic behaviors. Emphasis on developing mathematical descriptions—analytical or empirical—of system processes to create models of the technical system under design and broader dynamics in the surrounding environmental or human systems.

EGR 202, Use Inspired Design II. Arizona State University.

Sophomore level required course. This design course is the fourth of an eight-semester design course series required during the BS degree. The second year of courses (EGR 201 and 202) emphasize user-centered design, including identification of the design problem, concept development, and realization. Students identify and define a design project, create and evaluate concepts, and build mathematical models and physical prototypes for testing during an iterative process of user engagement.

ME 436, Heat Transfer. Iowa State University.

Senior level mechanical engineering required course. Related heat transfer concepts and equation sets to everyday life experiences and common technologies to facilitate student learning of challenging topics. The semester design project included the analysis and design of thermoelectric module for power generation; heat transfer relationships were developed theoretically and the design optimized against technical, economic, and physical constraints.

ME 389, Applied Methods in Sustainability and International Development. Iowa State University.

Junior and senior level engineering study abroad course in West Africa for a period of three weeks. Emphasized service learning projects to satisfy basic needs requirements in rural villages (water access, electricity, clean cooking energy, agro-processing). Course lessons included topics in engineering, economics, and anthropology.

ME 388, Sustainable Engineering and International Development. Iowa State University.

Junior and senior level mechanical engineering technical elective. Labs included hands-on experiments that simulate daily activities in developing countries (e.g., carrying, pulling water from a well, cooking, grain grinding) coupled with engineering study of human, natural, and built system factors. Students placed system relationships along with equations and lab data into Vensim software for dynamic systems analysis.

Engr 170, Engineering Graphics and Introductory Design. Iowa State University.

Freshman and sophomore level core course introducing the engineering design process and Computer Aided Engineering. Coursework focused on the front-end of the design process from needs assessment to technical specifications. Mid-term and final design projects included a Mars Rover and an open-ended problem on the Grand Challenges for Engineering. Course activities stressed professional skill development in written communication, verbal presentation, teamwork, project management, and collaborative problem solving.

Hon 321, The Future of International Development. Iowa State University.

Honors seminar open to all classifications and majors. Designed and introduced seminar at Iowa State University. Topics included use of multidisciplinary analysis to consider controversial topics and real-world case studies in international development and sustainability. Students selected one Target from the Millennium Development Goals in their final project. Students reviewed current progress in meeting the Target, discussed stakeholder viewpoints, assessed resources and skills available, and proposed an alternative multidisciplinary solution to meet selected Target.

ME 436, Appropriate Technology Design. Iowa State University.

Senior level mechanical engineering capstone design course. Semester project included design, fabrication, and testing of technology to meet basic needs in developing countries.

PUBLICATIONS

Journals (peer reviewed)

Janko SA, Arnold MR, Johnson NG. 2016. Implications of high-penetration renewables for ratepayers and utilities in the residential solar photovoltaic (PV) market. *Applied Energy*. 180:37–51.

Bartos M, Chester M, Johnson NG, Gorman B, Eisenberg D, Linkov I, and Bates M. 2016. Impacts of rising air temperatures on electric transmission ampacity and peak per-capita electricity load in the United States. *Environmental Research Letters*. 11(11), 114008.

Vignarooban K, Chu X, Chimatapu K, Ganeshram P, Pollat S, Razdan A, Johnson NG, Pelley DS, Kannan ANMM. 2016. State of health determination of sealed lead acid batteries under various operating conditions. *Sustainable Energy Technologies and Assessments*. 18:134–139.

Johnson NG, Bryden KM. 2015. Field-based safety guidelines for solid fuel household cookstoves in developing countries. *Energy for Sustainable Development.* 25:56–66.

Miller CA, Atlamirano-Allende C, Johnson NG, Agyemang M. 2015. The social value of mid-scale energy in Africa: Redefining value and redesigning energy to reduce poverty. *Energy Research & Social Science.* 5:67–69.

Johnson NG, Bryden KM. 2012. Energy supply and use in a rural West African village. *Energy.* 43(1):283–92.

Johnson NG, Bryden KM. 2012. Factors affecting fuelwood consumption in household cookstoves in an isolated rural West African village. *Energy.* 46(1):310–21.

Journals (editor reviewed)

Johnson NG, Bryden KM. 2013. Clearing the air over cookstoves. *DEMAND.* 1(1):8-13.

Book chapter (peer reviewed)

Shane Diekman, Dan Pope, Henry Falk, Mick Ballesteros, Mukesh Dherani, Nigel Bruce, David Meddings, Nathan Johnson, Mark Bryden. 2014. "Burns, scalds and poisoning" in "WHO Indoor Air Quality Guidelines: Household Fuel Combustion," World Health Organization.

Conference Proceedings with Accompanying Article (peer reviewed)

Saha SS, Janko S, Johnson NG, Podmore R, Riaud A, Larsen R. 2016. "A universal charge controller for integrating distributed energy resources," Proceedings of the 2016 IEEE Global Humanitarian Technology Conference. Seattle, Washington.

Lopes M, Johnson NG, Miller JE, Stechel EB. 2016. "Concentrating solar power systems with advanced thermal energy storage for emerging markets," Proceedings of the 2016 IEEE Global Humanitarian Technology Conference. Seattle, Washington.

Janko SA, Atkinson S, Johnson NG. 2016. "Design and fabrication of a containerized micro-grid for disaster relief and off-grid applications," Proceedings of the 2016 ASME International Design

Engineering and Technical Conferences and Computers and Information in Engineering Conference. Charlotte, North Carolina.

Miller JE, Ambrosini A, Al-Ansary H, Babiniec SM, Coker EN, Ho CK, Jeter SM, Johnson NG, Loutzenhiser PG, Stechel EB. 2016. "High Performance Reduction/Oxidation Metal Oxides for Thermochemical Energy Storage (PROMOTES)," Proceedings of the 2016 ASME International Conference on Energy Sustainability. Charlotte, North Carolina.

Janko SA, Gorman BT, Singh UP, Johnson NG. 2015. "High penetration residential solar photovoltaics and the effect of dust storms on system net load," Proceedings of the 2015 ASME International Design Engineering and Technical Conferences and Computers and Information in Engineering Conference. Boston, Massachusetts.

Agyemang M, Johnson NG. 2015. "Development of biomass energy technologies and business models for Southern Africa," Proceedings of the 2015 ASME International Design Engineering and Technical Conferences and Computers and Information in Engineering Conference. Boston, Massachusetts.

Gorman BT, Johnson NG, Miller JE, Stechel EB. "Thermodynamic Investigation of Concentrating Solar Power with Thermochemical Storage," Proceedings of the 2015 Power and Energy Conversion Conference. San Diego, California.

Reilly KM, Birner MT, Johnson NG. 2015. "Measuring air quality using wireless self-powered devices," Proceedings of the 2015 IEEE Global Humanitarian Technology Conference. Seattle, Washington.

McComb C, Santaeufemia PS, Johnson NG, Shimada K. 2014. "Identifying technical and economic improvements to the MoneyMaker Hip Pump through multi-objective optimization," Proceedings of the 2014 IEEE Global Humanitarian Technology Conference. San Jose, California.

Santaeufemia PS, Johnson NG, McComb C, Shimada K. 2014. "Improving irrigation in remote areas: multi-objective optimization of a treadle pump," Proceedings of the 2014 ASME International Design Engineering and Technical Conferences and Computers and Information in Engineering Conference. Buffalo, New York.

Granato M, Johnson NG. 2014. "Single cell battery charger for portable electronic devices in developing countries," Proceedings of the 2014 ASME International Design Engineering and Technical Conferences and Computers and Information in Engineering Conference. Buffalo, New York.

Carberry A, Johnson NG, Henderson M. 2014. "A practice-then-apply scaffolding approach to engineering design education," Proceedings of the 2014 Frontiers in Education Conference. Madrid, Spain.

Johnson NG, Bryden KM. 2013. "Techno-economic design of off-grid domestic lighting solutions using HOMER," Proceedings of the 2013 ASME International Design Engineering and Technical Conferences and Computers and Information in Engineering Conference. Portland, Oregon.

Johnson NG, Bryden KM. 2013. "Establishing consumer need and preference for design of village cooking stoves," Proceedings of the 2013 ASME International Design Engineering and Technical Conferences and Computers and Information in Engineering Conference. Portland, Oregon.

Johnson NG, Glassmire JW, Lilienthal PD. 2012. "Comparing power system architectures for domestic lighting in isolated rural villages with HOMER," Proceedings of the 2012 IEEE Global Humanitarian Technology Conference. Seattle, Washington.

Johnson NG, Bryden KM. 2012. "The impact of cookstove adoption and replacement on fuelwood savings," Proceedings of the 2012 IEEE Global Humanitarian Technology Conference. Seattle, Washington.

Johnson NG, Lilienthal P, Schoechle T. 2011. "Modeling distributed premises-based renewables integration using HOMER," Proceedings of the 2011 Grid-Interop Conference. Phoenix, Arizona.

Bryden KM, Johnson NG. 2011. "Understanding rural village energy needs and design constraints," Proceedings of the 2011 ASME International Design Engineering and Technical Conferences and Computers and Information in Engineering Conference. Washington, DC.

Johnson NG, Lu Y, Mazur R, Han J, Bryden KM. 2006. "Community leadership for sustainability of bio-renewable cooking technologies in rural china," Proceedings of the 3rd International Conference on Environmental Enhancement and Sustainable Development. Hohhot, Inner Mongolia, China.

Johnson NG, Hallam A, Conway S, Bryden KM. 2006. "Sustainable and market-based analyses of cooking technologies in developing countries," Proceedings of the 2006 ASME International Mechanical Engineering Congress and Exposition. Chicago, Illinois.

Ashlock DA, Bryden KM, Johnson NG. 2006. "Evolutionary Voronoi image segmentation," Proceedings of the 2006 Artificial Neural Networks in Engineering Conference. Rolla, Missouri.

Ashlock DA, Bryden KM, Johnson NG. 2006. "Evolvable threaded controllers for a multi-agent grid robot task," Proceedings of the 2006 Artificial Neural Networks in Engineering Conference. Rolla, Missouri.

Johnson NG, Karthikeyan B, Bryden KM, Ashlock DA. 2006. "AMoEBA image segmentation: Modeling of individual Voronoi tessellations," Proceedings of the IEEE 2006 Congress on Evolutionary Computation. Vancouver, British Columbia, Canada.

Johnson NG, Bryden KM, Xiao A. 2005. "Risk analysis and safety evaluation of biomass cookstoves," Proceedings of the 2005 ASME International Mechanical Engineering Congress and Exposition. Orlando, Florida.

Conference Proceedings without Accompanying Article

Johnson NG, Janko SA, Saha S, Flores J, Mobley A, Atkinson S, Brandt W. "A micro-grid boot camp for civilian and military applications," Proceedings of the 84th Military Operations Research Society Symposium. Quantico, Virginia.

Johnson NG. "Electric products and services for rural Nepal," Proceedings of the 2014 American Society of Nepalese Engineers and Computer Association of Nepal-USA. Tempe, Arizona.

Johnson NG, Bryden KM. "Energy supply and use in a rural West African village," Proceedings of the 2012 ETHOS Conference. Seattle, Washington.

Johnson NG, Bryden KM. "A multifactorial study of cooking energy use," Proceedings of the 2012 ETHOS Conference. Seattle, Washington.

Bryden KM, Johnson NG. "A longitudinal study of village energy in an isolated West African village," Proceedings of the 2012 ETHOS Conference. Seattle, Washington.

Johnson NG. 2011. "Consumer choice and stove switching: Impacts on fuel use and carbon accounting," Proceedings of the 2011 ETHOS Conference. Seattle, Washington.

Johnson NG. 2011. "Field evaluation of energy flow in a rural West-African village," Proceedings of the 2011 ETHOS Conference. Seattle, Washington.

Johnson NG. 2010. "First steps in stove design," Proceedings of the 2010 ETHOS Conference. Seattle, Washington.

Johnson NG. 2008. "Rethinking design: innovation for sustained social benefit in a culturally diverse world," Proceedings of the 2008 ETHOS Conference. Seattle, Washington.

INVITED TALKS

"Energy innovations for the unconnected," Global Connect. World Bank and IEEE. April 13, 2016.

"Energy innovations from concept to construction," IEEE Region 6 Life Member Event. Tempe, Arizona. December 15, 2015.

"Confronting global energy challenges," EWB-USA Mountain Conference. November 7, 2015.

"Energy innovations from concept to construction," Sandia National Laboratory. July 16, 2015.

"Engineering complex energy systems," Naval Postgraduate School. January 15, 2015.

"Confronting energy challenges in our global future," IEEE Rising Stars Conference. Las Vegas, Nevada. January 4, 2015.

"Engineering a pathway to global energy sustainability," ASME International Mechanical Engineering Congress and Exposition. Montreal, Canada. November 17, 2014.

"Confronting global energy challenges," ASME International Mechanical Engineering Congress and Exposition. Montreal, Canada. November 16, 2014.

"Designing for impact," Pennsylvania State University. August 21, 2014.

"Decision making in micro-grids from concept to construction," Arizona Corporation Commission. May 28, 2014.

"Evaluating village energy opportunities," University of California at Berkeley. October 24, 2013.

"Engineering energy solutions for rural Africa," Sonoma State University. October 24, 2013.

"Designing sustainable energy systems," Inaugural Forum on Groundbreaking Research in Engineering Design: Fueling Growth in Emerging Markets, 2013 ASME International Design Engineering and Technical Conference and Computers and Information in Engineering Conference. Portland, Oregon. August 6, 2013.

"Designing for sustainability of community projects," Colorado School of Mines. November 1, 2012.

"Designing for sustainability," Panel host and moderator. 2012 IEEE Global Humanitarian Technology Conference. Seattle, Washington. October 23, 2012.

"Participatory methods and intercultural intelligence," University of Colorado at Boulder. October 17, 2012.

"Safety guidelines for cooking stoves in developing countries," International Workshop on Clean and Efficient Cook Stoves, The Hague, Netherlands. February 29, 2012.

WORKSHOPS

Johnson NG, Winter A. 2014. "Designing global development engineering courses and programs," 2014. ASME International Design Engineering and Technical Conferences and Computers and Information in Engineering Conference. Buffalo, New York.

Johnson NG. 2013. "Off-grid power – analysis and practice," 2013. IEEE Global Humanitarian Technology Conference. San Jose, California.

Johnson NG. 2012. "Village energy systems: understanding the problem and comparing rural energy options," 2012 IEEE Global Humanitarian Technology Conference. Seattle, Washington.

Johnson NG, Bryden KM, LeSar RA. 2009. "First steps in confronting poverty: transforming community need into action," Engineers Without Borders-USA 2009 International Conference. Milwaukee, Michigan.

Johnson NG, Seward A. "Starting your first wood-burning cooking stoves program," Engineers Without Borders-USA 2009 Midwest Regional Workshop. Ames, Iowa.

Johnson NG, Pemberton-Pigott C, Thijssen C, Dutta K. 2009. "Stove safety strategies for small and large Producers," 2009 ETHOS conference. Seattle, Washington.

HONORS AND AWARDS

Postdoctoral Fellowship. 2012 and 2013. Awarded by the NSF/ASEE Small Business Postdoctoral Research Diversity Fellowship Program.

Teaching Excellence Award. 2011. Awarded by the Graduate College, Iowa State University.

Fellow, Preparing Future Faculty. 2010. Awarded by the Center for Excellence in Research and Teaching, Iowa State University.

PROFESSIONAL AFFILIATIONS

- American Society of Mechanical Engineers (ASME)
- Institute of Electrical and Electronic Engineers (IEEE)
- American Society of Engineering Education (ASEE)
- Engineers Without Borders-USA (EWB-USA)
- Senior Sustainability Scientist, Global Institute of Sustainability, Arizona State University
- Center for Science Policy and Outcomes, Arizona State University

PROFESSIONAL SERVICE

- Board Member, XENDEE Corporation.
- External Technical Advisor, Arizona Public Service.
- Program Chair. IEEE Global Humanitarian Technology Conference 2015.
- Technical Program Chair. IEEE Global Humanitarian Technology Conference 2014.
- Chair. ASME Engineering Global Development Conference Planning Committee.
- Session Chair. Design for the Developing World. Design Automation Conference, ASME International Design Engineering and Technical Conferences.
- Session Chair. Thermal Energy Storage. ASME International Conference on Energy Sustainability.
- Test Developer. Tests of Engineering, Aptitude Mathematics and Science (TEAMS) competition.

- Member. U.S. Technical Advisory Group to ISO/TC 285: Clean cookstoves and clean cooking solutions. Field Testing Methods Working Group.
- Innovation District, ASU Microgrid, eLab, Rocky Mountain Institute.
- Reviewer. National Science Foundation. Programs: CyberSEES, Environmental Sustainability, Partnerships for International Research and Education (PIRE).
- Reviewer. Journal of Mechanical Design.
- Reviewer. Journal of Energy for Sustainable Development.
- Reviewer. Journal of Ecological Economics.
- Reviewer. Journal of Renewable and Sustainable Energy.
- Reviewer. PLOS ONE.

RESEARCHERS MENTORED AND SUPERVISED (SINCE 2014)

Research staff (2): Shaun Atkinson, Jon Sherbeck.

Postdoctoral mentees (2): Briana Lucero, Yasser Yassaei.

Doctoral students (7): Brandon Gorman, Samantha Janko, Mariana Lopes, Evvan Morton, James Nelson, Shammya Saha.

Masters students (8): Malena Agyemang, Joseph Cardwell, Kashyap Chimatapu, Derek Hamel, Dhiwaakar Purusothaman, Kyle Reilly, Pablo Sanchez Santaeufemia, Uday Singh.

Undergraduate students (9): Mike Birner, Dan Carmody, Neil Flippin, Jennifer Flores, Mike Granato, Kyle Koski, Aaron Lajom, Alexander Mobley, Sean Scott.