ACEP

Alaska Center for Energy and Power

BALANCING THE ENERGY SCALES FOR RURAL COMMUNITIES

RESEARCHER SHOWCASE

Marc Mueller-Stoffels

BACKGROUND

Dr. Marc Mueller-Stoffels is the lead researcher for the Power Systems Integration (PSI) Program at the Alaska Center for Energy and Power (ACEP). Marc moved to Alaska in 2007 to pursue a PhD in Nonlinear Physics at UAF. His dissertation was focused on the development of a regional scale climate model to better understand the stable states of the Arctic sea ice cover. Prior, Marc had completed a MS degree in physics from Otago University in Dunedin, New Zealand, with research focused on the crystallography of fresh water ice. In parallel to his graduate career Marc was co-owner and chairman of a software company based in the UK providing solutions to optimization problems.

Marc and his wife, Megan, live in a self-built timber frame cabin in the hills north of Fairbanks. Their property is off the grid and they produce 60% of their electricity needs from PV panels and heat their home entirely with locally sourced wood.

RESEARCH

Marc's research focuses on the integration of variable generation sources into isolated micro grids. Most recently he has lead the testing of an inverter-battery system to enable diesel-off mode in high contribution wind scenarios.

As the lead researcher for the Power Systems Integration Program Marc collaborates with state and federal agencies, communities, national laboratories, product developers and other stakeholders to develop novel control approaches, energy storage systems and managed loads. Research approaches range from data analysis, through modeling, to the test of full-scale components in the Power Systems Integration Laboratory.

RECENT ENERGY PROJECTS

- Power Systems Integration Program
- Nome Power Integration Options
- Galena Solar Power Integration
- BlackBox Data Collection System: A Prototype for Efficient Collection of High Resolution, High-Quality Data in Rural Alaska
- Cordova Hydropower Utilization Study
- Remote Community Renewable Energy Project
- High-Fidelity Diesel Generator Models
- Battery management system for VRLA batteries

RELEVANT PUBLICATIONS

M. Mueller-Stoffels. Adding PV Capacity Initial Assessment and Recommendations for Galena, Alaska. 2014.

R. Wies, M. Mueller-Stoffels. Improved Frequency Regulation in Mini-Grids With High Wind Contribution Using Online Genetic Algorithm for PID Turning. 2013.

M. Mueller-Stoffels, D. Light, G. Holdmann, B. Sheets. Gridform Inverter Tests and Assessment. 2013.

J. Vandermeer, M. Mueller-Stoffels. Wind-Geothermal-Diesel Hybrid Microgrid Development: A Technical Assessment for Nome, AK. 2014.

EDUCATION

- PhD Physics. University of Alaska Fairbanks, 2012
- M.S. Physics with Distinction. Otago University, Dunedin, New Zealand, 2006
- Vordiplom Physics. University of Konstanz, Germany, 2002

ACEP Alaska Center for Energy and Power

Fostering development of innovative solutions to Alaska's energy challenges through applied energy research at the University of Alaska.

The Alaska Center for Energy and Power (ACEP) is an applied energy research program based at the University of Alaska Fairbanks. ACEP provides leadership in developing energy systems for islanded, non-integrated electric grids and their associated oil-based heating systems. Integration is a central feature of our program. Because many of the issues related to implementing innovative energy solutions are complex, our program must not only address the technical integration of renewables with these small isolated diesel-based energy systems, but must also look at integration from a broader perspective: integration of solutions into the social realities of a community, integration of the cultural fabric into sustainable energy solutions, integration of university researchers across disciplines and with community partners; and integration of our facilities and resources with those of our national partners.

Our Mission: Develop and disseminate practical, cost-effective, and innovative energy solutions for Alaska and beyond.

Our Vision: Alaska leading the way in innovative production, distribution, and management of energy.

ACEP is a gateway for energy related activity at the University of Alaska. Working across campuses and pulling from the University's extensive resources and expertise, ACEP is interdisciplinary, needs-driven, and agile.

ACEP has also developed a wide range of partnerships outside the University at the local, state, national and international level to ensure research conducted through ACEP will be relevant, current and world class.

ACEP's POWER SYSTEMS INTEGRATION PROGRAM

POWER SYSTEMS INTEGRATION- WHY IS IT IMPORTANT?

The Power Systems Integration Program works to optimize diesel-renewable hybrid energy systems for islanded electric microgrids. Alaska has invested significant funding and effort to bring renewable energy options to communities to offset the high reliance on diesel generation. The majority of Alaska's rural communities are powered through diesel generation infrastructure, in order for renewable energy to be a solution, it must integrate with existing systems to ensure reliability, power quality and economic viability. In assessing the performance of these renewable-diesel hybrid systems, the state has identified significant opportunities to improve performance through the development of systems and protocols focused on the integration of various power sources into microgrids, specifically fluctuating, un-firm power sources like wind and solar.

THE ROLE OF THE POWER SYSTEMS INTEGRATION PROGRAM

Researchers from ACEP's Power Systems Integration program collaborate with state and federal agencies, communities, national laboratories, product developers and other stakeholders to develop novel control approaches, energy storage systems and managed loads. Research approaches range from data analysis, through modeling, to the test of full-scale components in the Power Systems Integration Laboratory. The program goal is to develop and test energy technology, disseminate lessons learned and provide guidelines for the adoption of novel approaches to power systems integration in microgrids that can withstand the requirements of long-term reliable power generation. The program aspires to provide technically and economically feasible solutions to renewable energy integration to allow to operate microgrids solely on intermittent renewable energy.

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