

iSTORAGE

DOE/OE PEER REVIEW 2016

September 25-28, 2016 | Washington DC



U.S. DEPARTMENT OF
ENERGY

**Office of Electricity Delivery and
Energy Reliability**

Annual Energy Storage Peer Review
Event Program

DuPont Circle Renaissance Hotel
1143 New Hampshire Avenue, NW
Washington, D.C. 20037 (USA)
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Contributors

Event Facilitator



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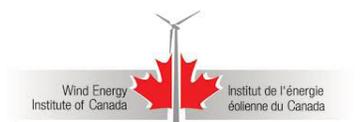
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SandersGroup



Peer Reviewer Affiliations



Longitude 122
West, Inc.



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- Session 2 – Applied Materials
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8-11

TUESDAY

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- Session 7 – Power Electronics
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12 - 16

WEDNESDAY

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ISTORAGE
DOE/OE PEER REVIEW 2016

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iStorage is the collaboration of the U.S. Department of Energy, national laboratories, universities, and industry to advance the future of energy storage technologies through imaginative, imminent, impactful, informative, influential, ingenious, international, independent, integrated, and intelligent means.

Imagine – Session 1: Program Overview and Mission
Imminent – Session 2: Advanced Materials
Impact – Session 3: Regulatory Environment/Strategic Outreach
Innovative – Session 4: Advanced Materials
Informative – Session 5: Validated Safety and Reliability
Influential – Session 6: Demonstrations & Analysis
Ingenious – Session 7: Power Electronics
International & Independent – Session 8: Poster Exhibitors
Industry – Session 9: ESS and Industry Opportunities and Challenges
Integrated – Session 10: Integrated Grid
Intelligent – Closing: Call to Action



U.S. DEPARTMENT OF **ENERGY**

The Office of Electricity Delivery and Energy Reliability (OE) provides national leadership to ensure that the nation’s energy delivery system is secure, resilient and reliable. OE works to develop new technologies to improve the infrastructure that brings electricity into homes, offices, and factories, and the federal and state electricity policies and programs that shape electricity system planning and market operations. OE also works to bolster the resiliency of the electric grid and assists with restoration when major energy supply interruptions occur.

MISSION

OE drives electric grid modernization and resiliency in the energy infrastructure, leading the U.S. Department of Energy’s (USDOE) efforts to ensure a resilient, reliable, and flexible electricity system. It accomplishes this mission through research, partnerships, facilitation, modeling and analytics, and emergency preparedness.

VISION

In OE’s aspirations for the future, OE recognizes that our nation’s sustained economic prosperity, quality of life, and global competitiveness depend on access to an abundance of secure, reliable, and affordable energy resources. Through a mix of technology and policy solutions, OE addresses the changing dynamics and uncertainties in which the electric system will operate. OE leverages effective partnerships, solid research, and best practices to address diverse interests in achieving economic, societal, and environmental objectives.

SEPTEMBER 25, 2016

The United States Department of Energy (U.S. DOE) is pleased to welcome you to the annual Office of Electricity Delivery and Energy Reliability (OE) Energy Storage Program Peer Review.



At this event, a distinguished panel of experts will review and provide critical feedback on the DOE-funded projects at the national laboratories, academia, and industry partners. The criteria of the assessments are based on:

- **Completion of basic and applied research**
 - Project progress
 - Value of the results
 - Innovations
- **Appropriateness of approaches and methods**
 - Logic
 - Feasibility
 - Soundness of how proposed and executed research is conducted
- **Competency of research personnel**
 - Subject matter expertise
 - Performance of investigations
 - Teaming
- **Adequacy of resources**
 - Suitability of research environment
 - Facilities - Selection and Capabilities

The 2016 DOE OE Energy Storage Program Annual Peer Review addresses progress across a range of projects that are geared to make energy storage cost effective. These include projects on the development of new battery materials, improvements to make existing battery chemistries robust and cost effective, advances in power electronics and conversion, research on improving the safety and reliability of energy storage systems, systems analysis and assessments to support large scale storage deployment, and support for project development across the country. The program places significant emphasis in education and outreach. The two-day review has nine sessions of oral presentations and panels and one poster session. Conference materials will be available online after the conclusion of this Peer Review at: <http://www.sandia.gov/ess/publication/>.

We're grateful for your presence and encourage you to share your expertise through formal and informal discussion and interactions with your peers.

Dr. Imre Gyuk, Manager
Energy Storage Program
U.S. Department of Energy

DOE/OE ENERGY STORAGE PROGRAM'S NATIONAL LABORATORIES COLLABORATIVE

SANDIA NATIONAL LABS



For more than 60 years, Sandia has delivered essential science and technology to resolve the nation's most challenging security issues. Sandia National Laboratories is operated and managed by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation. Sandia Corporation operates Sandia National Laboratories as a contractor for the U.S. Department of Energy's National Nuclear Security Administration (NNSA) and supports numerous federal, state, and local government agencies, companies, and organizations. As a Federally Funded Research and Development Center (FFRDC), Sandia may perform work for industry responding to certain types of federal government solicitations.

A strong science, technology, and engineering foundation enables Sandia's mission of national security through a capable research staff working at the forefront of innovation, collaborative research with universities and companies, and discretionary research projects with significant potential impact. Sandia's employees are recognized by their professional peers for their outstanding contributions.

Although most of Sandia's approximately 10,000 employees work at Sandia's headquarters in Albuquerque, New Mexico, or at its second principal laboratory in Livermore, California, others are working at various sites in the U.S. and abroad to deliver innovative and reliable solutions in a changing world.

PACIFIC NORTHWEST NATIONAL LABORATORY



Discovery in action. These words describe what we do at PNNL, which has been operated by Battelle and its predecessors since our inception in 1965. For more than 50 years, we've advanced the frontiers of science and engineering in the service of our nation and the world. We make fundamental scientific discoveries that illuminate the mysteries of our planet and the universe. We apply our scientific expertise to tackle some of the most challenging problems in energy, the environment, and national security.

Research is our business. With an unwavering focus on our missions, scientists, and engineers at PNNL deliver science and technology. We conduct basic research that advances the frontiers of science. We translate discoveries into tools and technologies in science, energy, the environment and national security.

For more than four decades, our experts have teamed with government, industry, and academia to tackle some of the toughest problems facing our nation. The result: We're delivering the science, technology, and leadership our customers need to succeed.

OAK RIDGE NATIONAL LABORATORY



The Oak Ridge National Laboratory (ORNL) is the nation's largest multi-program science and technology laboratory. ORNL's mission is to deliver scientific discoveries and technical breakthroughs that will accelerate the development and deployment of solutions in clean energy and global security. Today, ORNL pioneers the development of new energy sources, technologies, and materials and the advancement of knowledge in the biological, chemical, computational, engineering, environmental, physical, and social sciences.

Originally known as Clinton Laboratories, ORNL was established in 1943 to carry out a single, well-defined mission: the pilot-scale production and separation of plutonium for the World War II Manhattan Project. The laboratory was also highly involved in isotope research and production. From this foundation, ORNL has evolved into a unique resource for addressing important national and global energy and environmental issues.

The EM program has numerous missions and responsibilities at the ORNL campus, and our employees are focused on removing past legacies and improving environmental health and employee safety—allowing modernization of one of DOE's greatest assets. The main ORNL site occupies approximately 4,470 acres and includes facilities in two valleys: Bethel Valley and Melton Valley.

AGENDA AT A GLANCE

Sunday, 25 September 2016

3:00 PM - 7:00 PM	Registration
5:30 PM - 7:30 PM	Meet And Greet Reception

Monday, 26 September 2016

7:00 AM - 3:00 PM	Registration (All Day) Continental Breakfast
7:00 AM - 8:00 AM	Briefing for Peer Reviewers
8:00 AM - 9:10 AM	Session 1: Welcome Address National Laboratories' Program Overview
9:30 AM - 11:30 AM	Session 2: Energy Storage and Applied Materials Keynote Speaker
11:30 AM - 1:00 PM	Lunch on your own
1:00 PM - 2:45 PM	Session 3: ES Policy, Equitable Regulatory Environment, Strategic Outreach
3:00 PM - 5:00 PM	Session 4: Energy Storage - Advanced Materials
6:00 PM	Networking Dinner Meeting

Tuesday, 27 September 2016

7:00 AM - 3:00 PM	Registration (All Day) Continental Breakfast
7:00 AM - 8:00 AM	Briefing for Peer Reviewers
8:00 AM - 9:35 AM	Session 5: Energy Storage and Validated Safety and Reliability
9:50 AM - 11:30 AM	Session 6: Energy Storage Systems Demonstration Projects & Analysis Keynote Speaker
11:30 AM - 1:00 PM	Lunch on your own
1:00 PM - 2:15 PM	Session 7: Power Electronics
2:45 PM	Session 8: Poster Exhibitors

Wednesday, 28 September 2016

7:00 AM - 11:00 AM	Registration (All Day) Continental Breakfast
8:00 AM - 8:45 AM	Session 9: Industry Partnerships, Opportunities
8:45 AM - 9:15 AM	Session 10: Energy Storage and Grid Integration
9:15 AM	Closing Remarks



DOE/OE PEER REVIEW AGENDA

Monday, 26 September 2016

7:00 AM	3:00 PM	Registration (All Day)		
7:30 AM	7:45 AM	Peer Review Meetings		
8:00 AM	9:10 AM	Session I: Welcome/Opening Session		
8:00 AM	8:05 AM	Welcome	James Greenberger	NAATBatt (Event Coordinator)
8:05 AM	8:30 AM	Welcome and DOE Perspective DOE/OE Program Overview	Dr. Imre Gyuk	US Department of Energy/ Office of Electricity Delivery and Energy Reliability
8:30 AM	8:40 AM	DOE/ARPA-E Program Overview	Dr. Paul Albertus	US Department of Energy/ Advanced Research Projects Agency–Energy
8:40 AM	8:50 AM	DOE/OE/SNL Program Overview	Dr. Babu Chalamala	Sandia National Laboratories
8:50 AM	9:00 AM	DOE/OE/PNNL Program Overview	Dr. Vincent Sprenkle	Pacific Northwest National Laboratory
9:00 AM	9:10 AM	DOE/OE/ORNL Program Overview	Michael Starke	Oak Ridge National Laboratory
9:10 AM	9:30 AM	Break		

APPLIED MATERIALS

Sandia's energy storage program addresses a range of topics in materials and systems as well as power electronics related to energy storage. Sandia researchers have addressed the high cost of membranes—a critical bottleneck in flow battery commercialization—by developing a new class of polymeric membranes with superior electrochemical properties and lower cost starting materials. Along with conducting extensive research in battery technologies, including lower temperature Na batteries and rechargeable alkaline batteries, Sandia has also developed lightweight nanocomposite materials for flywheels with increased rotational speeds.

Monday, 26 September 2016 (continued)

9:30 AM	11:30 AM	Session 2: Applied Materials: Travis Anderson		
9:30 AM	9:50 AM	Advanced Membranes for Vanadium Redox Flow Batteries	Cy Fujimoto	Sandia National Laboratories
9:50 AM	10:05 AM	Sodium Based Battery Development	Erik Spoerke	Sandia National Laboratories
10:05 AM	10:20 AM	Advanced Materials for Multi-electron Redox Flow Batteries	Travis Anderson	Sandia National Laboratories
10:20 AM	10:35 AM	Paths to Improved Cell Performance in RFBs	Thomas Zawodzinski	University of Tennessee - Knoxville
10:35 AM	10:50 AM	Improved Materials for Flywheel ES Application	Tim Boyle	Sandia National Laboratories
10:50 AM	11:05 AM	Organic Aqueous Flow Batteries for Massive Electrical Energy Storage	Michael Aziz	Harvard University
11:05 AM	11:20 AM	New Frontiers and Energy Storage Challenges – ACEP Study: Cordova Electric Run of the River	Gwen Holdmann	Alaska Center for Energy and Power
11:30 AM	1:00 PM	Lunch		

REGULATORY ENVIRONMENT

Sandia supports research to enhance the regulatory environment for energy storage through a range of activities. These include estimating the value of energy storage for different applications and scenarios; developing control strategies that maximize revenue or benefit to the grid; identifying new control strategies and applications for energy storage; assessing public policy to identify and mitigate barriers for energy storage; developing standards; and evaluating projects.

STRATEGIC OUTREACH

Sandia collects key information on current and future storage technologies and acts as a clearinghouse for the information so that it can be effectively disseminated among key stakeholders and the community. Outreach activities include conducting strategic communication initiatives, managing the Energy Storage Systems website, improving the DOE Global Energy Storage Database, updating the DOE/EPRI Energy Storage Handbook, and organizing the Peer Review meeting and the Electrical Energy Storage Applications and Technologies Conference.

Monday, 26 September 2016 (continued)

1:00 PM	3:00 PM	Session 3: Energy Storage and Equitable Regulatory Environment/ Strategic Outreach: Ray Byrne & Jacquelynne Hernandez		
1:00 PM	1:15 PM	Regulatory Engagement and Program Design	Rebecca O'Neil	Pacific Northwest National Laboratory
1:15 PM	1:30 PM	Estimating Potential Revenue from Electrical Energy Storage in PJM	Ray Byrne	Sandia National Laboratories
1:30 PM	1:45 PM	BPA Project	David Schoenwald	Sandia National Laboratories
1:45 PM	2:00 PM	SNL-ESS Strategic Outreach Panel Change and Introduction	Jacquelynne Hernandez	Sandia National Laboratories
2:00 PM	2:15 PM	Global Energy Storage Database	Cedric Christensen	Strategen
2:15 PM	2:30 PM	New Mexico Energy Office: Energy Storage Perspective	Daren Zigich	New Mexico Energy Office
2:30 PM	2:45 PM	NM, Energy Storage and Rural Electric Cooperatives	Andrew Rodke	CESA/Santa Fe Community College
2:45 PM	3:00 PM	Break		

PACIFIC NORTHWEST NATIONAL LABORATORY ELECTROCHEMICAL MATERIALS AND SYSTEMS GROUP

The Electrochemical Materials and Systems group comprises materials scientists, ceramists, metallurgists, and mechanical engineers engaged in research and formulation of advanced cost-effective lightweight materials, power generation sources, engine exhaust remediation, advanced manufacturing processes, prototype devices, and pilot-scale process development. As a joint leader of DOE's Solid-State Energy Conversion Alliance (SECA), a major element of the group's work is the development of solid-oxide fuel cell (SOFC) materials, SOFC materials processing techniques, and SOFC stacks. Additional applications include other electrochemical devices and sensors, as well as lightweight structures for ground, air, and space transportation.

ENERGY STORAGE PROGRAM

Pacific Northwest National Laboratory's Energy Storage Program is funded through the U.S. DOE OE. Begun in 2009, the project aims to develop and demonstrate novel energy storage technologies that can meet economic and performance targets for broad market penetration. Research areas include emissions, fuel cells, high-temperature electrochemistry center, transportation materials, and vehicle and transportation technologies.

Monday, 26 September 2016 (continued)

3:00 PM	5:00 PM	Session 4: Pacific Northwest National Laboratory Advanced Materials: Vincent Sprenkle		
3:00 PM	3:15 PM	Overview of PNNL Stationary Energy Storage Efforts	Vincent Sprenkle	Pacific Northwest National Laboratory (PNNL)
3:15 PM	3:30 PM	Recent Progress in Intermediate Temperature Na-metal Halide Battery Technology for Stationary Energy Storage Applications	Guoshen Li	Pacific Northwest National Laboratory
3:30 PM	3:45 PM	Recent Developments in Aqueous Soluble Organic Flow Battery Systems	Wei Wang	Pacific Northwest National Laboratory
3:45 PM	4:00 PM	VRFB Stack Development	David Reed	Pacific Northwest National Laboratory
4:00 PM	4:15 PM	Enabling High Coulombic Efficiency and Low Temperature Performance Na-ion Battery Hard Carbon Anodes with Advanced Electrolyte	Xiaolin Li	Pacific Northwest National Laboratory
4:15 PM	4:30 PM	Energy Storage Reliability Workshop: Outcomes and Direction	Scott Whalen	Pacific Northwest National Laboratory
4:45 PM	5:00 PM	EESAT 2017 Plans and Preparations	David Schoenwald	Sandia National Laboratories
6:00 PM	Dinner Meeting			



DOE/OE PEER REVIEW AGENDA

VALIDATED RELIABILITY AND SAFETY

Sandia has a significant focus on safety and reliability of grid energy storage systems. This effort includes coordinating DOE Energy Storage Systems (ESS) Safety Working Groups which bring together over 150 stakeholders from industries that range from national laboratories, electric utilities, standards organizations, and manufacturing companies. The working groups are exploring gaps in safety R&D; enabling the development of codes, standards, and regulations (CSR); and educating first responders on storage system safety. Sandia also provides workshops and organizes technical conferences, including the Energy Storage Safety Forum which is slated to become an annual technical meeting for the worldwide research community.

Tuesday, 27 September 2016

8:00 AM	9:35 AM	Session 5: Energy Storage Validated Safety and Reliability: Summer Ferreira		
8:00 AM	8:05 AM	Welcome	James Greenberger	NAATBatt (Event Coordinator)
8:05 AM	8:20 AM	Energy Storage System Safety Working Group Activities: Achievements and Next Steps	Summer Ferreira	Sandia National Laboratories
8:20 AM	8:35 AM	Documenting and Verifying ESS Safety with Codes and Standards	David Conover, Pam Cole	Pacific Northwest National Laboratory
8:35 AM	8:50 AM	Developing Battery Safety and Abuse Testing for Stationary Battery Applications	Josh Lamb	Sandia National Laboratories
8:50 AM	9:05 AM	Predictive Modeling for Energy-Storage Safety in Abnormal Thermal Scenarios	John Hewson	Sandia National Laboratories
9:05 AM	9:20 AM	Thermal Runaway Propagation Suppression in Lithium-ion Battery Systems	David Rosewater	Sandia National Laboratories
9:20 AM	9:35 AM	Energy Storage Technologies: Assessing Reliability and Safety	Summer Ferreira	Sandia National Laboratories
9:35 AM	9:50 AM	Break		

FACILITIES

Sandia offers a network of interconnected laboratory facilities providing capabilities for real-world R&D for a variety of advanced grid technologies. The Energy Storage Systems Analysis Laboratory and its MW-scale Energy Storage Test Pad are user facilities enabling experimentation on battery cells, modules, and systems to improve performance, safety, and reliability. The Battery Abuse Testing Lab is a national center of excellence in energy storage system safety analysis. Research at this center includes studies on failure propagation phenomena, development of fire suppression methods to improve safety, and the development of high fidelity models. These facilities enable Sandia to partner with industry to remove barriers to for the large scale deployment of energy storage in the grid.

Tuesday, 27 September 2016 (continued)

9:50 AM	11:30 AM	Session 6: ESS Demonstrations and Analysis: Dan Borneo		
9:50 AM	10:05 AM	Industry Acceptance- ES projects Overview Applications	Dan Borneo	Sandia National Laboratories
10:05 AM	10:20 AM	Grid Modernization Laboratory Consortium	Ray Byrne	Sandia National Laboratories
10:20 AM	10:35 AM	CESA State Projects and Policy Development	Todd Olinsky-Paul	Clean Energy States Alliance
10:35 AM	10:50 AM	Measuring and Expressing ESS Performance	Vilayanur Viswanathan, David Conover, David Schoenwald	Pacific Northwest National Laboratory and Sandia National Laboratories
10:50 AM	11:05 AM	ES Analysis Using BESS Tool	Patrick Balducci	Pacific Northwest National Laboratory
11:05 AM	11:20 AM	Wind Integration in West Texas Using Energy Storage	Elizabeth Endler	Shell
11:05 AM	11:30 AM	Keynote Address		
11:30 AM	1:00 PM	Lunch		

POWER ELECTRONICS

Sandia is advancing power conversion systems (PCS) for grid-tied and off-grid applications. This is driven by the development of new semiconductor switching circuits, as they determine the overall cost, reliability, and performance of the converter. Next generation PCS use advanced semiconductor materials known as wide band gap semiconductors (i.e. Silicon Carbide and Gallium Nitride) that allow for faster switching frequencies, improved voltage breakdown characteristics, and higher operating temperatures. These high voltage switches, in conjunction with advances in ceramic capacitors, controls, magnetics, and packaging, lead significant improvements in system performance through increased power density and efficiency compared to PCS systems using silicon devices.

Tuesday, 27 September 2016

1:00 PM	2:15 PM	Session 7: Power Electronics: Stan Atcitty		
1:00 PM	1:15 PM	High Frequency Link Converters using Advanced Magnetics	Todd Monson	Sandia National Laboratories
1:15 PM	1:30 PM	A Power Densd Advanced Power Inverter (API) for Grid Tied Energy Supplies	Bruce Pilvelait	Creare, LLC
1:30 PM	1:45 PM	Smart GaN-Based Inverter for Grid-tied Energy Storage Systems	Mehdi Ferdowsi	InnoCit, LLC
1:45 PM	2:00 PM	All-SiC Power Module for Grid-tied Energy Storage	Ranbir Singh	GeneSic Semiconductor, Inc.
2:00 PM	2:15 PM	Reliability Characterization of Wide-Band Gap Semiconductor Switches	Jack Flicker	Sandia National Laboratories
2:15 PM	2:45 PM	Break		

2:45 PM Session 8: Posters

1	Monolithic SiC Semiconductor Sitch Development	Ranbir Singh	GeneSiC Semiconductor Inc.
2	Reliable High-Performance Gate Oxides	Jon Ihlefeld	Sandia National Laboratories
3	Gate Oxide Capacitance Characterization for Wide Band Gap Devices	Adam Morgan	North Carolina State University
4	High Temperature Capacitors Incorporating Novel Dielectric Materials	Rashmi Dixit	DRS Research
5	Novel High Temperature Dielectrics	Harlan Brown-Shaklee	Sandia National Laboratories
6	Benefits of ES on a Municipal Grid in Massachusetts	Sean Hamilton, Ray Byrne	Sterling Municipal Light Department/ Sandia National Laboratories
7	Helix New Flywheel Technology	Matt Lazarewicz	Helix Power
8	EMA CRADA ES in Singapore	EMA Rep, Ray Byrne	Energy Market Authority / Sandia National Laboratories
9	Canada WEICAN ES in Wind Application Study	Ben Schenkman	WEICAN / Sandia National Laboratories
10	HECO: The benefits of Grid Scale Storage on Oahu	Ray Byrne	Sandia National Laboratories
11	Low-cost Sodium Battery for Grid Scale ES	Sai Bhavaraji	Ceramatec Inc.
12	Electroless Process for Depositing Tungsten Metal for Sodium Battery Electrode	Leo Small	Sandia National Laboratories
13	Aqueous Na-ion Redox Flow Battery with Ceramic NaSICON Membrane	Eric Allcorn	Sandia National Laboratories
14	Accurate Simulation of Energy Storage Systems and the Future of the ESTP	David Rosewater	Sandia National Laboratories
15	Energy storage and market benefits – 3RG	James Eyes, Michelle Ellison	E&I Consulting
16	Advanced Zinc-Maganese Oxide Batteries	Tim Lambert	Sandia National Laboratories

2:45 PM Session 8: Posters (continued)

17	Understanding the limits of thermal runaway in lithium-ion battery systems	Randy Shurtz, John Hewson	Sandia National Laboratories
18	Baseline Performance of Commercial 18650-type-Li-ion Under Non-Abuse Conditions	Heather Barkholtz, Summer Ferreira	Sandia National Laboratories
19	High Temperature Capacitors Incorporating Novel Dielectric Materials	Rashmi Dixit	DRS Research
20	Electrode Modifications for Redox Flow Batteries	Bin Li	Pacific Northwest National Laboratory
21	Fabrication of Flexible, Thin-Film Beta-Alumina/Polymer Composite Membrane for Sodium Battery Applications	Xiaochun Lu	Pacific Northwest National Laboratory
22	Organic Flow Battery Systems	Xiaoliang Wei	Pacific Northwest National Laboratory
23	Safe, Cost Effective and Long Cycle Life Hybrid Battery Technology for Stationary Energy Storage Applications	Guosheng Li	Pacific Northwest National Laboratory
24	Electrolyte Design Formulations for Vanadium Redox Flow Batteries	Vilayanur Viswanathan	Pacific Northwest National Laboratory
25	ORNL GMLC Project	Michael Starke	Oak Ridge National Laboratory
26	Magnetic Composites for Energy Storage flywheels	James Martin	Sandia National Laboratories
27	Power Dense Converter Electronics for Grid Tie Energy Storage Containers	Bruce Pilvelait	Creare, LLC
28	Eugene Water Electric Board (EWEB) Grid Storage Demo Project	Matthew Ibaraki	EWEB
29	Regional Resilience in Northern New Mexico	Andrew Rodke	CESA/Sante Fe Community College
30	Consequence of Molecular Design in Redox Flow Battery Electrolyte Performance	Mitchell Anstey	Davidson College
31	DOE & SNL ESS Strategic Outreach 2016	Tia Lanette/J. Hernandez	Sandia National Laboratories



DOE/OE PEER REVIEW AGENDA

PARTNERING

Sandia's energy storage research program relies on collaboration and partnerships with a range of stakeholders, including other national laboratories, universities, electric utilities, industry, federal and state agencies, and international consortia. These partnerships help enable the rapid adaption of new design and simulation capabilities, soft-ware tools, and provide guidance for developing appropriate policy and regulatory framework.

Wednesday, 28 September 2016

8:00 AM	8:45 AM	Session 9: Industry and Energy Storage: Abbas Akil		
8:00 AM	8:05 AM	Welcome	James Greenberger	NAATBatt (Event Coordinator)
8:05 AM	8:15 AM	ESSAT 2017	David Schoenwald	Sandia National Laboratories
8:15 AM	8:45 AM	Panel Discussion	Abbas Akil	REUTX
8:45 AM	9:15 AM	Session 10: Grid Integration		
8:45 AM	9:00 AM	ESS Safety	Dr. Wei-Jen Lee	UTA
9:00 AM	9:15 AM	ESS & Wind	Dave Minster	Sandia National Laboratories
9:15 AM		Closing Remarks	Dr. Imre Gyuk	US Department of Energy/ Office of electricity Delivery and Energy Reliability
11:00 AM		End of 2016 Peer Review		



PEER REVIEWER

REINALDO TONKOSKI

Reinaldo Tonkoski (S'04, M'11) received his B.A.Sc. degree in Control and Automation Engineering, in 2004, his M.Sc. in Electrical Engineering in 2006 from PUC-RS (Pontifícia Universidade Católica do RS), Brazil, and his Ph.D. in 2011 from Concordia University, Canada. He was with CanmetENERGY, Natural Resources Canada, from January 2009 to January 2010 where he worked on projects related to the grid integration of renewable energy sources.

Presently, he is an Assistant Professor in the Electrical Engineering and Computer Science Department, South Dakota State University, Brookings, US. Dr. Tonkoski has authored over 60 technical publications and is a Member of the IEEE. His research interests include grid integration of renewable energy systems, distributed generation, power quality, and power electronics.

DR. SUSAN SCHOENUNG

Dr. Schoenung is President of Longitude 122 West, Inc., a technology consulting firm in Menlo Park, California. Dr. Schoenung has over 25 years experience in technical and economic assessment of advanced technologies, including energy storage, alternative fuels, and environmental monitoring and assessment. Current and previous clients include the US Department of Energy; US Department of Defense; EPRI; Sandia; NREL, and Oak Ridge National Laboratories, NASA, Distributed Utility Associates, in addition to private clients. Longitude 122 West is a long-time member of the Energy Storage Association and also a current member of the California Hydrogen Business Council and Sustainable Silicon Valley. Previous employment includes Bechtel Research and Development, Chevron Research Laboratory and Sandia National Laboratories. Susan earned her BS Degree in Physics from Iowa State University, MS and PHD Degrees in Mechanical Engineering from Stanford University. Relevant publications include 5 major Sandia reports on the costs and benefits of Energy Storage.

EVA GARDOW

Eva L. Gardow is a Senior Project Manager at FirstEnergy Service Company. Her responsibilities include management of the strategy and evaluation of energy storage technologies and its analysis and integration into the power system. She is immediate past Chair of EPRI's Energy Storage Integration Council and was a board of director for the Energy Storage Association, 2007-2015. She was the project manager for the EPRI Smart Grid Integrated Distributed Energy Resources project deployed in FirstEnergy's New Jersey distribution company, JCP&L. She has also managed JCP&L's renewable energy program and the solar electric business of GPU Solar and provided technical guidance for the Ballard Generation Systems fuel cell power plant development. Previous experience was gained at UTC Fuel Cells and Stone & Webster Engineering Corp. She has a BSME from Clarkson University and an MBA from the University of Hartford.

PRAMOD KULKARNI

Pramod joined the Customized team in January 2013. He is a Senior Consultant in the Emerging Technologies Group that focuses on regulatory, technology, and market developments that create opportunities for clients in emerging technologies sector, including energy storage. Pramod brings 30+ years of experience. Prior to joining Customized, Pramod worked at the California Energy Commission for 23 years where he managed programs that provided funding for development and demonstration of renewable energy, energy storage, demand response and industrial energy efficiency. Before joining the Energy Commission, Pramod worked in the private sector that included working for a Fortune 100 company as a financial analyst, with an energy consulting company, an angel investor and a startup. Pramod has a BS and MS from India and an MBA from the US.

BIOGRAPHICAL NOTES

ANTHONY PRICE

Anthony Price has been working in the energy storage sector for 20 years, taking projects from concept through to delivery. His work covers the research, design, development, and commercialization of energy storage devices and systems. He is an accomplished speaker on energy storage and energy policy. Anthony Price served as a director of the Electricity Storage Association for five years, has been Chairman and a member of the Energy Panel of the Institution of Civil Engineers, and has been a member of the United States Department of Energy Peer Review Panel of Energy Storage Systems. He has published numerous magazine and journal articles on energy storage technologies and applications, many with especial reference to flow batteries.

SATISH RANADE

Satish Ranade is PNM Professor and Head of Electrical and Computer Engineering at New Mexico State University. His interests are in Electric Energy Systems with emphasis on renewables integration and microgrids. His recent work is in the area of stochastic scheduling for distribution feeders with renewables and energy storage. He is a past chair of the IEEE PES Transmission and Distribution Committee.

MATTHEW LAZAREWICZ

Mr. Lazarewicz is President and one of the founders of Helix Power Corporation. Helix Power is an early stage company whose mission is to push state-of-the-art flywheels and introduces a 1MW flywheel capable of delivering and absorbing 1 MW for a total of 90 seconds at full power with extremely high cyclic life. Prior to his current position, Mr. Lazarewicz served 9 years as Chief Technical Officer and 4 as VP of Engineering at Beacon Power Corporation. Prior to his tenure at Beacon Power, he served for 25 years at GE Aircraft Engines and Power System in various areas of responsibility. He has BS and MS degree in Mechanical Engineering and an MBA degree from MIT. He has served on the Electricity Storage Association Board of Directors for ten years.

VISWANATH KRISHNAMOORTHY

Dr. Krishnamoorthy is the CEO at Qynergy Corporation a technology development company that works with inventors to develop their ideas from concept to product. Dr. Krishnamoorthy has been involved in the development of several technologies including betavoltaic devices, neutron detectors, neutron generators, materials for thermal batteries, and ultracapacitors. He also mentors companies at entrepreneur and start up accelerators such as High Desert Discovery District, ABQid, and Technology Ventures Corporation. Prior to joining Qynergy, Dr. Krishnamoorthy worked at Uniroyal Optoelectronics (UOE), an LED manufacturing company where he held posts of Director of Process and Fabrication Development and Manager of the Fabrication Facility. Dr. Krishnamoorthy has over 40 publications in refereed journals and proceedings and has over 30 conference presentations.

ANGANA SHAH

Ms. Shah is currently the Director, Department of Compact Operations, Finance Investment and Trade at Millennium Challenge Corporation. She previously served as an Investment Climate/Business Enabling Environment Expert at International Finance Corporation, a consultant at AECOM, and a commercial law/business enabling environment advisor at Bearing Point TAPR II Project in Egypt. Ms. Shah earned her Bachelor's degree in Economics from the University of Michigan-Ann Arbor and her J.D. Law degree from University of Michigan Law School.

UPCOMING EVENTS:



“Meeting the Challenge” Energy Storage Systems Safety & Reliability Workshop

February 22-24, 2017

The La Fonda Hotel, Santa Fe, NM
Contact Dr. Summer Ferreira at ESSForum@sandia.gov

Electrical Energy Storage Applications & Technologies (EESAT) Conference and

DOE/OE Annual Peer Review

iSTORAGE

September 2017

**EESAT: Contact Dr. David Schoenwald and/or
Peer Review: Contact J. Hernandez
at SNL_ENERGY_STORAGE@sandia.gov**



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