



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 Reviewer Meetings		
8:00 AM	9:10 AM	Session 1: 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 Consulting
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	Enhance Ionic Conductivity & Stability of $\text{La}_{2/3-x}\text{□}_{1/3-2x}\text{Li}_3\text{TiO}_3$ (LLTO) Solid-Electrolyte by Grain Boundary Glass Doping	Xingbo Liu	West Virginia University
3:15 PM	3:30 PM	Recent Progress in Intermediate Temperature Na-metal Halide Battery Technology for Stationary Energy Storage Applications	Guosheng 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	Vincent Sprenkle	Pacific Northwest National Laboratory
4:30 PM	4:45 PM	Lifecycle Evaluation of Different Li-Ion Battery Chemistries Under Grid Duty Cycles	Daiwon Choi	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			



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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	Stafford Hill Solar Storage Project	Dan Belarmino	Green Mountain Power
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 International Exploration & Production (US) Inc.
11:20 AM	11:35 AM	Hawai'i Energy: Status, Issues, Storage	Richard Rocheleau	HNEI/University of Hawaii
11:35 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	Tze Yong Lim, Hoon Tong Ngin	Energy Market Authority / Sandia National Laboratories
9	Canada WEICAN ES in Wind Application Study	Ben Schenkman	WEICAN / Sandia National Laboratories
10	Chemistry Agnostic Cost Performance model for redox flow batteries	Vish Viswanathan	Pacific Northwest National Laboratory
11	Low-cost Sodium Battery for Grid Scale ES	Sai Bhavaraju	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 Eyer, 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
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	Xiaochuan 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	Vijayakumar Murugesan	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	Create, LLC
28	Eugene Water Electric Board (EWEB) Grid Storage Demo Project	Matthew Ibaraki	Eugene Water & Electric Board
30	Consequence of Molecular Design in Redox Flow Battery Electrolyte Performance	Mitchell Anstey	Davidson College
32	New Mexico Municipal Profile	Tia-Lanette Oliver, Matt Tafoya	CESA
33	Development of Anode Materials for Sodium-ion Batteries	Donghai Wang	Pennsylvania State University
34	Oahu Storage Study	James Ellison	Sandia National Laboratories
35	DOE & SNL ESS Strategic Outreach 2016	Tia-Lanette Oliver/ Jacquelynne Hernandez	Sandia National Laboratories



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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 adoption of new design and simulation capabilities, software 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 Akhil	Renewable Energy Venture LLC
8:45 AM	9:15 AM	Session 10: Grid Integration		
8:45 AM	9:00 AM	ESS Safety	Dr. Wei-Jen Lee	University of Texas at Arlington
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		