Sandia National Laboratories

THE POWER ELECTRONICS AND ENERGY CONVERSION WORKSHOP

August 2 - 3, 2023

Co-Sponsored By:

TEXAS
The University of Texas at Austin

THE UNIVERSITY OF NEW MEXICO

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2023 Power Electronics and Energy Conversion Workshop

STATE BAR OF NEW MEXICO | 5121 MASTHEAD ST NE ALBUQUERQUE, NM 87109 | AUGUST 2-3, 2023
Co-Sponsors: University of New Mexico, New Mexico State, and University of Texas at Austin

Wednesday, August 2, 2023

Breakfast

7:00 am – 8:00 am

Session 0: Opening Remarks and DOE Program Managers

8:00 am – 10:15 am

8:00 – 8:05	Welcome: *Amy Halloran (Sandia National Laboratories)*
8:05 – 8:10	Welcome: *Charles Hanley (Sandia National Laboratories)*
8:10 – 8:20	Welcome: *Craig Lawton (Sandia National Laboratories)*
8:20 – 8:40	Energy Conversion – What We Need…Yesterday: *Robert (Bob) W. Cummings (Red Yucca Consulting, LLC)*
8:40 – 9:00	DOE Transformer Resilience and Advanced Components (TRAC) Program Overview: *Andre Pereira (Department of Energy – Office of Electricity)*
9:00 – 9:20	DOE Energy Storage Program Power Electronics Overview: *Dr. Imre Gyuk (Department of Energy – Office of Electricity) & Dr. Stan Atcitty (Sandia National Laboratories)*
9:20 – 9:40	ARPA-E Perspective on Power Electronics for the Future Grid: *Olga Spahn (Department of Energy – Advanced Research Projects Agency-Energy)*
9:40 – 10:00	Recent Funding Efforts in Power Electronics Hardware and Control by the Solar Energy Technologies Office: *John Seuss (Department of Energy – Solar Energy Technologies Office)*
10:00 – 10:15	Panel Discussion

Networking Break

10:15 am – 10:45 am

Session 1: Electrification of Everything – Electricity Delivery and the Future Grid

10:45 am – 12:15 pm	Co-Chairs: *Michael Ropp (Sandia National Laboratories) & Richard Fioravanti (Quanta Technology)*
10:45 – 11:00	Cost Challenges of Electrifying Everything: *Richard Fioravanti (Quanta Technology)*
11:00 – 11:15	Transportation Electrification in Dense Urban Regions: Challenges and Opportunities: *Ahmed Mohamed (City University of New York, City College)*
11:15 – 11:30	Learning to Operate Distribution Grids with Extreme Penetration of Renewables: *Di Shi (New Mexico State University)*
11:30 – 11:45	Building the New Grid Is a Marathon Not a Sprint: *Jonathan Sykes (Quanta Technology)*
11:45 – 12:00	Power Electronics for Electrify Everything: *Dr. Leo Casey (Google)*
12:00 – 12:15	Panel Discussion

Lunch

12:15 pm – 1:00 pm

Session 2: Solid-State Transformers: Grid Applications and Roadblocks

1:00 pm - 2:30 pm Co-Chairs: *Ali Bidram (University of New Mexico), Steve Glover (Sandia National Laboratories), Alex Huang (University of Texas at Austin), & Stan Atcitty (Sandia National Laboratories)*

1:00 – 1:15 Type I Solid State Transformer with Bidirectional Switches: *Jack Flicker (Sandia National Laboratories)*

1:15 – 1:30 Development of High Power Medium-Frequency Transformers for Solid State Transformer: *Zhicheng Guo (University of Texas at Austin)*

1:30 – 1:45 Medium Voltage Solid State Transformer for Grid Applications; Opportunities and Challenges: *Bogdan Borowy, Ph.D. (Eaton Research Labs)*

1:45 – 2:00 Empowering the Grid: Unleashing the Potential of Self-Healing Solid-State Transformers: *Mehdi Abolhassani (Resilient Power Systems)*

2:00 – 2:15 Transition towards future DC grids: Challenges and Possibilities: *Ghanshyamsinh Gohil (Hitachi Energy)*

2:15 – 2:30 Panel Discussion

Networking Break

2:30 pm – 3:00 pm

Session 3: Medium Voltage Circuit Topologies and Controls

3:00 pm - 4:45 pm Co-Chairs: *Jack Flicker (Sandia National Laboratories) & Jacob Mueller (Sandia National Laboratories)*

3:00 – 3:15 Medium Voltage Circuit Topologies and Controls: *Ramanathan Thiagarajan (National Renewable Energy Laboratory)*

3:15 – 3:30 A Cascaded Power Electronics Architecture for Transformerless Medium-Voltage PV Systems: *Brian Johnson (University of Texas at Austin)*

3:30 – 3:45 Integrated Liquid Metal Based Cooling -- An Ultimate Cooling Strategy for Electronics: *Jin Wang (Ohio State University)*

3:45 – 4:00 Solid State Transformer and DC Grids: From Concept to Pilot Demonstration in a Decade Enabled by HV SiC 10-15kV IGBTs and MOSFETs: *Subhashish Bhattacharya (North Carolina State University)*

4:00 – 4:15 Evaluating Medium Voltage, Multilevel Topologies in Electric Grid Applications: Realization and High Voltage Academic Facilities for Testing: *Brandon Grainger, Ph.D. (University of Pittsburgh)*

4:15 – 4:30 Power Electronics at PNNL: *Dr. Xiaoyuan Fan (Pacific Northwest National Laboratory)*

4:30 – 4:45 Panel Discussion

Evening Reception & Dinner

5:00 pm - 6:30 pm

Thursday, August 3, 2023

Breakfast

7:00 am – 8:00 am

Session 4: Semiconductor Materials

8:00 am – 10:15 am	Co-Chairs: *Bob Kaplar (Sandia National Laboratories) & Andrew Binder (Sandia National Laboratories)*
8:00 – 8:20	Advances in Wide and Ultrawide Bandgap Semiconductor Materials for High Voltage, High Power Electronics: *John F. Muth (North Carolina State University)*
8:20 – 8:40	Ultra-Wide Bandgap Semiconductors and Interfaces for High Power Electronics: *Robert J. Nemanich (Arizona State University)*
8:40 – 9:00	Recent Advancements in (Al)GaN High Electron Mobility Transistor Power Electronics at Sandia: *Brianna Klein (Sandia National Laboratories)*
9:00 – 9:20	Reliability Test and In-Situ Failure Analysis of Wide Bandgap Power Electronics: *Moinuddin Ahmed (Argonne National Laboratory)*
9:20 – 9:40	An Overview of Multi-Scale Device Level Control in Power Electronics Using Electrical and Photonic Device Technologies: *Sudip K. Mazumder (University of Illinois Chicago)*
9:40 – 10:00	Observation of Lock on in Gallium Nitride Photoswitches: *Jane Lehr (University of New Mexico)*
10:00 – 10:15	Panel Discussion

Networking Break

10:15 am 10:45 am

Session 5: Passives

10:45 am – 12:15 pm	Co-Chairs: *Todd Monson (Sandia National Laboratories) & Jane Lehr (University of New Mexico)*
10:45 – 11:00	Dielectric Materials and Capacitor Reliability for Power Electronic and Pulsed Power Applications: *Michael Lanagan (Penn State University)*
11:00 – 11:15	Recent Advances in Soft Magnetics for Emerging Applications in Electric Power Conversion Technologies: *Paul Richard Ohodnicki, Jr. (University of Pittsburgh)*
11:15- 11:30	Design of High Silicon Steel for Motors and Electronics: *Gaoyuan Ouyang (Ames National Laboratory)*
11:30 – 11:45	Designing Soft Magnetic Materials: *Dale Huber (Sandia National Laboratories)*
11:45 – 12:00	Inductor Core Design for Power Electronic Ultrahigh Frequency Applications: *Vincent G. Harris (Northeastern University)*
12:00 – 12:15	Panel Discussion

Lunch

12:15 am - 1:00 pm

Session 6: Packaging and Manufacturing; and Supply Chain, Power Density and Thermal Modeling

1:00 pm - 2:30 pm	Co-Chairs: *Lee Gill (Sandia National Laboratories), Luke Yates (Sandia National Laboratories), Lee Rashkin (Sandia National Laboratories)*
1:00 – 1:15	Medium Voltage PCB-based Bus Design and Insulation Coordination for Power Electronics Building Blocks: *Joshua Stewart (Virginia Tech)*
1:15 – 1:30	Packaging and Integration Design for High-Voltage WBG Modules: *Fang Luo (Stony Brook University)*
1:30 – 1:45	2.5D HI Packaging of Lower Voltage Power Converter Using TSV Interposer: *Helen Chung (Sandia National Laboratories)*
1:45 – 2:00	Liquid Immersion for Next Generation Utility Scale Power Electronics: *Giri Venkataremanan (University of Wisconsin-Madison)*
2:00 – 2:15	Reliability Characterization and In-Situ Health Estimation of WBG Semiconductor-Based Power Converters: *Dr. Harish Krishnamoorthy (University of Houston)*
2:15 – 2:30	Panel Discussion

Networking Break

2:30 pm – 3:00 pm

Session 7: R&D Gaps and Business Opportunities

3:00 pm - 4:30 pm	Co-Chairs: *Richard Baxter (Mustang Prairie Energy)*
3:00 – 3:15	Opportunities in the Renewable and Distributed Power Environment: *Rohan Raghunathan (Wolfspeed)*
3:15 – 3:30	Venture Capital in Industrial Technology: *Henk Both (Anzu Partners LLC)*
3:30 – 3:45	Addressing Compliance Hurdles to Gain Market Access: *Scott Daniels (CSA Group)*
3:45 – 4:00	Energy Storage Solutions for the Next 30 Years of Rapid Deployments: *C. Michael Hoff (American Battery Solutions)*
4:00 – 4:15	Critical Role of Power Electronics in Short and Long Duration Energy Storage: *Himamshu Prasad (Schneider Electric)*
4:15 – 4:30	Panel Discussion

Closing Remarks

4:30 pm – 5:00 pm *Charles Hanley (Sandia National Laboratories)*