



FY25 Electric Grid Security (EGS) Annual Report

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U.S. DEPARTMENT
of ENERGY





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Introduction

Sandia's Electric Grid Security program advances a national vision of energy dominance and accessibility, while applying our national security-emphasis on ensuring of a secure, resilient, and affordable electric system for all users. Our achievements reflect a strategic approach combining technology development; modeling, simulation, and data analytics; and partnered demonstrations and outreach to further the adoption of advanced grid and storage technologies. Our FY25 efforts leverage the strengths of our partnerships—spanning Sandia's core science and technology competencies as well as external technology leaders—to develop the solutions today which enable the grid of tomorrow. Key accomplishments in this report that support our strategy span our technical program areas and include:

- New open-source analytical tools for systems-level planning and optimization, including significant advances to the QuEST analytical environment;
- Further advancement of artificial intelligence and machine learning to enhanced grid operations and planning as we rise to the challenge of new large loads;
- Development of solid-state power conversion technologies and a new medium-voltage research lab;
- New technologies to assess wildfire vulnerabilities and mitigate potential impacts;
- Advanced applications of new cybersecurity technologies with industry partners;
- Contributions to understanding the impacts of electromagnetic pulses and geomagnetic disturbances on grid components; and
- Digital twin development for hybrid microgrids with multiple generators, storage, and loads.

This report indicates key areas of research and engagement and summarizes the impact of Sandia's contributions through notable accomplishments, journal publications, patents, and technical conferences and presentations. It is provided with the hope that readers discover ways we can further team to create our modern grid and apply the outcomes of our efforts. The bulk of work described herein is funded by several offices within the U.S. Department of Energy (USDOE), including the Office of Electricity (OE); Cybersecurity, Energy Security, and Emergency Response (CESER); former offices such as the Office of Energy Efficiency and Renewable Energy (EERE), the Grid Deployment Office (GDO), the Office of Clean Energy Demonstrations (OCED), and other key programs at USDOE. As we continue to state in these annual reports, the contributors to our successes are too numerous to name here, though our team wishes to express our deep gratitude to the numerous program and project sponsors at the US Department of Energy, who often function equally as technical collaborators; our many partners in industry, academia, utilities, and other national labs; and fellow researchers and business partners at Sandia whose leadership and creativity have enabled the accomplishments described herein.

Charles Hanley
Electric Grid Security Program Manager
Sandia National Laboratories

HIGHLIGHTS

Publications

70

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95

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19

Patents

Presentations

81

Conferences

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Invited
Talks

ACRONYMS

ACRONYM	DEFINITION
ACS	American Chemical Society
AI	Artificial Intelligence
AI/ML	Artificial Intelligence / Machine Learning
BESS	Battery Energy Storage Systems
CEAA	Committee on Engineering Accreditation Activities
CRADA	Cooperative Research and Development Agreement
DOD	Department of Defense
DOE	Department of Energy
DETL	Distributed Energy Technology Laboratory
DER	Distributed Energy Resource
DERMS	Distributed Energy Resource Management System
ECS	Electrochemical Society
EESAT	Energy Storage and Advanced Technologies
ERCOT	Electric Reliability Council of Texas
ESS	Energy Storage System
FITT	Funding and Innovation for Transformative Technologies
FY	Fiscal Year
HEMP	High-Altitude Electromagnetic Pulse
IEEE	Institute of Electrical and Electronics Engineers
IAS	Industry Applications Society
INL	Idaho National Laboratory
LDES	Long Duration Energy Storage
MEPPI	Mitsubishi Electric Power Products, Inc.
ML	Machine Learning
MV	Medium Voltage
NAATBATT	National Alliance for Advanced Transportation Battery Cell Manufacture
NASA	National Aeronautics and Space Administration
NAE	National Academy of Engineering
NFPA	National Fire Protection Association
OCED	Office of Cybersecurity, Energy Security, and Emergency Response (DOE)
OE	Office of Electricity (DOE)
ORNL	Oak Ridge National Laboratory
PEEC	Power Electronics and Energy Conversion
PES	Power & Energy Society
PNNL	Pacific Northwest National Laboratory
PI	Principal Investigator
PNM	Public Service Company of New Mexico
QUEST	Quantitative Energy Storage Tool
RTG	Radioisotope Thermoelectric Generator
SEI	Solid Electrolyte Interphase
SIC	Silicon Carbide
SOF	Special Operations Forces
SPARC	Secure Pathways for Resilient Communications
TA	Technical Area
VTO	Vehicle Technologies Office (DOE)
WEC	Wave Energy Converter

Accomplishments



Accomplishments

Multi-Band Inverter Control Architecture

The Generalized Synchronous Machine Control Architecture Project developed a unified grid-forming control framework that integrates droop and virtual synchronous machine concepts. The approach improves stability and flexibility in low-inertia power systems and allows control tuning to balance grid support with revenue-generating objectives. Open-source implementation of this architecture supports broad adoption and accelerates deployment of advanced inverter-based resources.

ProGRESS released

ProGRESS: Probabilistic Grid Reliability Assessment with Energy Storage project resulted in the release of an open-source probabilistic reliability assessment tool with advanced ESS operational and failure modeling. ProGRESS provides the community with a transparent, utility-grade capability for evaluating the reliability impacts of energy storage under uncertainty. Multiple software releases on Sandia's QuEst platform and on Github added graphical interfaces, documentation, and benchmarking with utility partners. ProGRESS also was showcased at Federal Energy Regulatory Commission Software Conference, which was held on July 8-10, 2025, in Washington DC. The conference is highly visible to electric power system operators, software developers, government employees, research centers, and academics.

Demonstration provides model in use of energy storage for grid stability and flexibility

Sandia collaborated with two Vermont electric utility companies, Green Mountain Power and Vermont Electric Cooperative, to deploy and demonstrate a 3 MW/12 MWh lithium-ion battery system for management of transmission grid reliability, efficiency, and congestion reduction. The system was substantially completed at the end of FY24 and placed into full operation in FY25. The battery is designed to store energy produced by variable generation that would normally lead to grid congestion or curtailments and discharge that energy during times of peak demand. The project showcases how storage can be used for grid stability and operational flexibility and serves as a model for other utilities facing similar challenges.

Safe, scalable electrochemical energy storage method patented and licensed to U.S. startup

From the Advanced Flow Batteries project, the mediated lithium-sulfur (Li-S) flow battery patent was granted and a commercial license was executed between Sandia and U.S.-based startup company Gridflow. The patent describes a safe, scalable method for electrochemical energy storage, which is being commercialized by GridFlow. The company ultimately aims to increase grid reliability and resiliency using domestically made batteries. The project's success has led to continued funding from the State of New Mexico for Sandia and GridFlow to continue collaborating.

Outreach raises awareness of cybersecurity's critical role in battery energy storage deployments

Cybersecurity plays a critical role in battery energy storage safety and reliability. In FY25, Sandia led research and external outreach on best practices for cybersecurity in BESS. The presentation "Cybersecurity for Battery Energy Storage Systems" at a meeting of the NAATBatt cybersecurity committee not only raised awareness but also led to an invitation from a U.S.-based battery management system manufacturer to test and integrate Sandia's intrusion detection algorithms into

their products. Increased awareness, commercial integration, and testing are important steps to foster and evaluate cybersecurity measures for a secure, reliable national grid.

New manuscript advances battery safety with most substantial module cycling dataset in open literature to date

The manuscript titled “Impact of Module Configuration on Lithium-ion Battery Performance and Degradation: Part 1. Energy Throughput, Voltage Spread, and Current Distribution” (J. Electrochem. Soc., 2025, 172, 050540), was published, representing the most substantial dataset on module cycling in open literature to date. It supports the selection of optimal module configurations for different utility operations, aids in the development of improved controls for battery management systems and enhances existing battery pack models and assessments of pack penalties. Several energy storage system manufacturers, simulation software developers, and utilities have expressed interest in the data.

Study provides insights into battery aging mechanisms to improve Lithium-Ion battery performance and safety

Sandia researchers published the manuscript titled, “Impact of Testing Method on Safety Assessment of Aged Li-ion Cells: Part I. SEI Growth as Main Aging Mechanism.” The publication represents the broadest experimental study on the impact of aging on Li-ion battery abuse response. The published study supplies pivotal data for battery safety standards, providing essential insights into how aging mechanisms—particularly SEI growth—affect the safety and performance of aged Li-ion cells.

Sandia Releases QuEST Planning Tool for Strategic Energy Infrastructure Investment

Sandia National Laboratories released version 1.0.0 of the QuEST Planning tool to the SandiaLabs GitHub repository, providing a powerful, open-access capacity expansion model designed to guide cost-optimal investments in energy storage, generation, and transmission. Developed under the PNM CRADA project and funded by the DOE Office of Electricity’s Energy Storage Program, QuEST Planning supports national efforts to decarbonize the electric grid while maintaining reliability. This tool enables policymakers and utilities to evaluate diverse energy storage technologies and accelerate the transition to a clean, resilient energy future

Innovative sensor testing at Sandia to enhance flow battery performance for the U.S. Grid

Sandia is collaborating with FlowCellutions, a Pennsylvania-based startup pioneering advanced sensor technology for real-time monitoring of flow battery electrolytes. Sandia has acquired two sets of these cutting-edge sensors for deployment in vanadium redox flow batteries and a flowing Zn/Air system project. These tests represent some of the first national evaluations of this innovative sensor technology. The Sandia team will rigorously assess sensor performance across multiple flow battery chemistries and investigate their potential to improve system efficiency, reliability, and scalability. This work supports the advancement and broader adoption of flow battery energy storage systems, strengthening the resilience and security of the U.S. electric grid and contributing to the nation’s energy future.

Demonstration and testing of Grid Elevated’s DERMS at Sandia’s DETL

Sandia has advanced capabilities to develop and evaluate DERMS to accelerate the deployment of advanced grid management technologies that enhance the integration, reliability, and resilience of distributed energy resources across the U.S. electric grid. In FY25, Sandia partnered with Grid Elevated in

demonstrating and rigorously testing the performance of their commercial DERMS at Sandia's Distributed Energy Technology Laboratory (DETL). The outcomes help utilities and grid operators better manage distributed energy assets, enabling a more flexible and secure energy infrastructure that supports national energy security goals.

AI-based power system protection demonstration shows ~100x speed improvement

The Sandia-designed AI-based traveling-wave protective relay is in demonstration with a New Mexico electric utility operating in parallel with traditional protection to compare and evaluate the novel protection algorithms. The relay operates in ~1.4ms which is fast enough to significantly reduce probability of wildfire ignition from the grid. The impact could be reduced wildfires and reduced need for public safety power shutoffs.

Sandia conducted large-scale visual cognition studies with utility grid operators.

Sandia partnered with several grid operators at several utilities to enhance cognition of events through enhanced visualization practices. These studies led to a better understanding of how grid operators react to identical data presented in different ways. Different visualizations were presented to grid operators as to whether to perform Public Safety Power Shutoffs for wildfire mitigation. Depending on how the data is visualized changes their decisions. The impact shows the importance of selecting appropriate visualizations for grid operators when viewing uncertain data.

Dynagrid Project advances microgrid protection and resilience

The Dynagrid project team at Sandia successfully demonstrated adaptive protection strategies for networked microgrids, showcasing enhanced resilience and self-healing capabilities critical for national energy security. Results were presented at the Hawaii International Conference on System Sciences, with additional innovations including traveling wave relay arc detection submitted to IEEE PES General Meeting. Collaborating with Roosevelt Electric Cooperative, the team developed hardware-in-the-loop demonstrations of the SHAZAM microgrid protection concept, with research accepted for publication at IEEE KPEC and IEEE PES GM. These advancements support the deployment of robust microgrids to strengthen the nation's distributed energy infrastructure.

Sandia develops innovative control and modeling techniques for modern power systems

Sandia achieved breakthroughs in estimating damping and synchronizing torque coefficients from ambient grid data, enabling the development of novel control schemes and dynamic assessment tools to enhance grid stability and reliability nationwide. The team also created reduced-order models integrating variable generation sources, with plans to extend applications to constant power loads such as data centers and modular nuclear reactors. These efforts will address increasing complexities in grids like the Electric Reliability Council of Texas, supporting a more secure and flexible national electric system.

Sandia leads interagency AI/ML and energy training for federal partners

Sandia delivered comprehensive Artificial Intelligence and Machine Learning training to program managers across the Department of Energy, NASA, Air Force, Army, and Navy through the Interagency Advanced Power Group's Electrical Systems Working Group. Additionally, Sandia provided a 5-hour "AI for Energy Introduction" course to over 100 interagency partners, enhancing cross-agency expertise and

collaboration in energy technologies. These training initiatives bolster the nation's workforce readiness and accelerate innovation in critical energy and defense sectors.

Sandia hosts Power Electronics Workshop to shape the future of grid control

The Sandia Power Electronics and Energy Conversion (PEEC) Workshop, held July 15-16 in Albuquerque, convened over 130 experts from across the nation to address critical research and deployment needs for the U.S. electric grid. Opening remarks by Michael Pesin, Deputy Assistant Secretary of DOE's Office of Electricity, highlighted the pivotal role of advanced power electronics in grid control and protection. The workshop showcased Sandia's leadership across device development to system deployment, fostering collaborations with industry, universities, and national labs to accelerate national grid resilience and security.

Sandia leads DOE Microgrids research and development collaboration

Sandia hosted the U.S. Department of Energy Microgrids R&D Program Semi-Annual Meeting, a multi-laboratory collaboration sponsored by the Office of Electricity. With over 45 participants, the meeting focused on integrating diverse generation sources—including nuclear reactors—and advancing AI-driven protection and control systems. Sandia presented key projects on microgrid hardening, port electrification, and advanced protection technologies. This program is central to national priorities, enhancing the reliability and resilience of grid-connected microgrids that support critical infrastructure such as data centers.

Expanding Medium Voltage research capabilities to strengthen grid stability

Sandia's new Medium Voltage (MV) laboratory, capable of operating at 15 kV, represents a unique national asset for advancing hardware and control technologies to improve grid stability. In parallel, Sandia is planning an extension of the MV facility to include high-inertia sources with realistic fault current capabilities. This expansion will further enhance the nation's ability to develop and test advanced grid components, supporting a more resilient and secure electric infrastructure.

Pioneering high power density Solid State Transformer development

Sandia's solid state transformer project is fabricating a high power density modular AC:AC prototype utilizing Silicon Carbide (SiC) BiDFETs, advancing national capabilities in power electronics. This year, the team identified unique degradation mechanisms in 3.3 kV semiconductors through detailed analysis, informing device reliability improvements. Concurrently, fabrication of key subassemblies for medium voltage DC-DC converters—including custom magnetic components and control electronics—is underway, positioning Sandia at the forefront of next-generation grid hardware innovation.

Secure Pathways for Resilient Communications (SPaRC) Program

Sandia is a key contributing partner for DOE's Secure Pathways for Resilient Communications (SPaRC) Program. This program is creating a secure communications architecture for the grid. The program is designing a first-of-its-kind, multi-National Lab, research and development testbed bringing together communications and grid critical infrastructures. The SPaRC testbed provides the means to test and benchmark next-generation, secure communications architectures and technologies. Accomplishments include an eight-paper White Paper series on grid evolution topics and quality of service parameters, as they apply to grid services, published on the SPaRC website. The final White Paper in the series,

"Guidelines for Next-Generation Grid Communications Architecture" was delivered this year, along with website design modifications. Test bed interconnection with ORNL, PNNL, INL is complete and approved. A prototype equipment and grid services database for use in an architecture design tool for grid utilities was also delivered. Education and testing are the primary focus and impact of this work.

Sandia Advances Alternative Power Technologies for Special Operations Forces

Sandia contributed to high-level discussions on advancing alternative power generation technologies to support Special Operations Forces (SOF). Sandia expertise informed evaluations of radioisotope thermoelectric generators (RTGs) and associated radioisotopes, as well as fuel cell and hybrid power solutions. These efforts are critical to enhancing the operational endurance, reliability, and energy independence of SOF missions, directly supporting national defense capabilities and mission success in challenging environments.

Sandia leads multinational collaboration on high-altitude electromagnetic pulse preparedness

Sandia National Laboratories led a critical virtual engagement with key national security stakeholders including the Department of Defense, Defense Threat Reduction Agency, Department of Homeland Security, Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and international partners from the United Kingdom to advance understanding and preparedness for High-Altitude Electromagnetic Pulse (HEMP) threats. Sandia co-presented a joint briefing with Los Alamos National Laboratory, strengthening interagency and international collaboration to protect U.S. critical infrastructure from electromagnetic disruptions.

The Energy Storage Technologies and Systems program publishes a separate accomplishments report. The listings below reflect only a small number of the Energy Storage accomplishments. To view the full FY25 Energy Storage Accomplishments and Impacts Report [here](#).

Leadership, Committee Participation, and Awards



Leadership, Committee Participation, and Awards

Through participation in professional societies, standards organizations, and other research or community institutions, Sandia National Laboratories' researchers and teams deliver technical, professional, and scientific leadership that support national priorities and advance scientific knowledge.

Awards and Honors

- Babu Chalamala named Fellow of the Materials Research Society for 2025 Fellow class.
- Charles Hanley was named Fellow of the IEEE in November, 2025.
- Stan Atcitty received Honorary Doctor of Science degree from Navajo Technical University, May 16, 2025.
- Rachid Darbali-Zamora received a Luminary Award at the Great Minds in STEM conference (Nov 6-9, 2024).
- David Rosewater received the IEEE IAS Electrical Safety Committee's Young Professional Achievement Award at the 2025 IEEE Electrical Safety Workshop.
- Stephen Percival nominated to attend The Grainger Foundation Frontiers of Engineering 2025 Symposium (NAE) and selected for the "Class of Influential Researchers 2025" by the American Chemical Society.
- Raymond H. Byrne elected to the Sigma Xi national board of directors (2024-2026 term).
- George Fragkos received Best Paper Award at Resilience Week 2024 for 'A Protocol-Agnostic DER Intrusion Detection System using an IEEE 1547-Enabled Digital Twin'.
- Jubair Yusuf and Brian J. Pierre were best paper finalists at the 2025 IEEE PES General Meeting.
- Daniel J. Kelly and Matthew J. Reno were best paper finalists at the 2025 IEEE PES General Meeting.

Conference and Symposium Roles

- Yuliya Preger co-organized the 2024 Electrochemical Society Fall Meeting symposium and is co-organizing the 2025 ECS Fall Meeting.
- Timothy Lambert chaired and co-chaired symposia on Zn Batteries at the 247th ECS Meeting, May 21, 2025.
- Alex Bates served as symposium lead organizer for ECS 247 A05.
- Amalie Frischknecht and Hee Jeung Oh organized sessions at the 2025 APS Global Physics Summit.
- Summer Ferreira was Technical Chair of the inaugural 2025 IEEE Power and Energy Policy Forum; Will McNamara and Ray Byrne served on the planning committee.
- Dylan Poindexter served as Sandia lead for DOE Office of Electricity Annual Peer Review Meeting, August 2025.
- Will McNamara moderated a panel on LDES policies at IEEE EESAT 2025.

- Bryan Wygant served as Session Organizer for ACS Rocky Mountain Regional Meeting and Alternative Counselor for ACS Central New Mexico Local Section.
- Sandia co-organized a panel session at the 2024 IEEE Energy Conversion Congress and Exposition.

Committee and Working Group Memberships

- David Schoenwald is Chair of IEEE Standards Association Working Group on Energy Storage Management Systems in Grid Applications.
- Tim Lambert serves on the National Alliance for Advanced Transportation Battery Cell Manufacture (NAATBatt) International Zinc Battery committee.
- Timothy Lambert serves on thesis committees for graduate students at Northeastern University and Georgia Tech.
- Atri Bera is a member of IEEE Standard P762 Working Group on Electric Generating Unit Reliability, Availability, and Productivity.
- Raymond H. Byrne serves on IEEE PES Fellow Selection Committee, IEEE Committee on Engineering Accreditation Activities (CEAA), and is an IEEE ABET program evaluator.
- Ray Byrne and Michael Ropp served on the IEEE PES Fellow Selection Committee (May 11-14, 2025).
- Waylon Clark appointed as Principal voting member on NFPA 855 Technical Committee and Working Group Chair for IEEE P3434.

Project Leadership and Roles

- Sandia's Will McNamara serves as PI for the Long Duration Energy Storage (LDES) National Consortium (DOE-funded through Sept 2026).
- Will McNamara served as Co-Chair of the Energy Storage Symposium Track at the 2025 TechConnect Innovation Conference and Expo and on the planning committee for the 2025 IEEE Power & Energy Forum.
- Matthew Reno was Vice Chair for IEEE C53: Collection, Management, and Analysis of Protection & Control Data Sets for AI/ML Applications.

Publications and Research Impact

- Yuliya Preger co-authored a multi-institution paper "Knees" in Lithium-ion Battery Aging Trajectories, recognized as top 1% most cited in IOP Publishing (2021-2023).
- David Rosewater's research advanced battery worker safety and electrical safety standards, including development of a battery safety training class.
- George Fragkos' paper, 'A Protocol-Agnostic DER Intrusion Detection System using an IEEE 1547-Enabled Digital Twin' won Best Paper Award at Resilience Week 2024.

Patents



Patents

Filed Patents

Cheng, Z., R. Trevizan, J. Pagano, Juergen Holbach, M.J. Reno, and E.A. Udren.

"Synchrophasor-Based Zonal Current Differential Protection for Low-Voltage Networks with High Distributed Energy Resources Penetration."

Quanta Technology, LLC. Application No. 63/802,205. Filed May 8, 2025.

Dutta, D., D. Turney, T. N. Lambert, and S. Banerjee.

Acetate-Based Electrolyte for Use in High-Voltage Zinc Aqueous Batteries. Full patent filed.

Meyerson, M.L., and L.J. Small.

"Mediated Metal-Sulfur Flow Battery for Grid-Scale Energy Storage." SD 15712. U.S. Application No. 17/740,128. Filed May 9, 2022, and accepted Jan. 6, 2025.

Percival, S. J., and E. D. Spoerke.

Recycled Metal for Emergency Long Duration Energy Storage. Provisional Patent Application 63/743,408. Filed January 9, 2025. From SNL TA SD# 16560.0.

Percival, S. J., M. Blea, and M. Stalcup.

Compounds for Aluminum Material Deposition from Non-Aqueous and Aqueous Systems. Provisional Patent Application 63/829,071. Filed June 24, 2025. From SNL TA SD# 16771.

Peretti, A.S., E.D. Spoerke, and L.J. Small.

"Method to Minimize Humidity Effects During NaSICON Processing." U.S. Application No. 19/222,465. May 29, 2025.

Robinett III, R.D., D.G. Wilson, W.W. Weaver, R.H. Byrne, S.F. Glover, T.A. Nguyen, and M.G. Veurink.

Power Packet Networks for WEC (Wave Energy Converter) Arrays. NTESS, LLC, Albuquerque, NM. U.S. Patent No. 11,725,622. Filed August 15, 2023.

Small, L.J. and M.L. Meyerson.

"Mediated Metal-Sulfur Flow Battery for Grid-Scale Energy Storage." SD 15712. U.S. Application No. 17/740,128. Filed May 9, 2022, and accepted Jan. 6, 2025.

Spoerke, E.D., and A.S. Peretti.

"Method to Minimize Humidity Effects During NaSICON Processing." U.S. Application No. 19/222,465. May 29, 2025.

Udren, Eric A., Zheyuan Cheng, Rodrigo Daniel Trevizan, John Pagano, Juergen Holbach, and Matthew John Reno.

"Synchrophasor-Based Zonal Current Differential Protection for Low-Voltage Networks with High Distributed Energy Resources Penetration." Quanta Technology, LLC. Application No. 63/802,205. Filed May 8, 2025.

Wilson, D.G., R.D. Robinett III, W.W. Weaver, R.H. Byrne, S.F. Glover, T.A. Nguyen, and M.G. Veurink. Power Packet Networks for WEC (Wave Energy Converter) Arrays. NTESS, LLC, Albuquerque, NM. U.S. Patent No. 11,725,622. Filed August 15, 2023.

Issued Patents

Flicker, J., J. Mueller, L. Gill, and L. Garcia Rodriguez.

“Optically Switched Circuit Breaker with Cascaded Transistor Topology.” U.S. Patent 12,218,497 B1, filed Oct. 12, 2022, and issued Feb. 4, 2025.

Gonzalez, S., T.C. Monson, E. Langlois, N.S. Gurule, O.A. Lavrova, and J.D. Flicker.

“Magnetostrictive Current Sensor Method and System.” U.S. Patent 12,196,784 B1, filed Jan. 18, 2022, and issued Jan. 14, 2025.

Guttromson, R., and I. Gravagne.

“Wind Turbine Management System for Controlled Energy Storage.” U.S. Patent 12,372,057 B1, filed Sept. 11, 2023, and issued July 29, 2025.

Kirschen, D.S., P. Arabshahi, and R. Elliott.

“Systems and methods for power system stabilization and oscillation damping control.” U.S. Patent 12,191,666, 2025.

Mueller, J., J. Flicker, L. Gill, and L. Garcia Rodriguez.

“Optically Switched Circuit Breaker with Cascaded Transistor Topology.” U.S. Patent 12,218,497 B1, filed Oct. 12, 2022, and issued Feb. 4, 2025.

Mueller, J., Y. Preger, J.C. Hewson, and A. Kurzawski.

“Dispersion of Stored Energy within a Battery System at Risk of Failure.” U.S. Patent 12,255,296 B2, filed Nov. 16, 2023, and issued March 18, 2025.

Reno, M.J., F.B. Wilches Bernal, and J. Hernandez Alvidrez.

“Dynamic Mode Decomposition Systems and Methods to Detect Power Quality Events.” U.S. Patent 12,366,598 B1, filed July 14, 2022, and issued July 22, 2024.

Wilches Bernal, F.B., M.J. Reno, and J. Hernandez Alvidrez.

“Dynamic Mode Decomposition Systems and Methods to Detect Power Quality Events.” U.S. Patent 12,366,598 B1, filed July 14, 2022, and issued July 22, 2024.

Publications



Publications

Journal Publications

Energy Storage Technologies and Systems

Acharya, K., N. Paudel, B. A. Magar, T. N. Lambert, and I. Vasiliev. 2025. "Ab Initio Studies of the Discharge Mechanism of CuO Cathodes Modified with Bi₂O₃ in Rechargeable Alkaline Zn/CuO Batteries." *Journal of The Electrochemical Society* 172, no. 2: 020504. <https://doi.org/10.1149/1945-7111/adad45>.

Austgen, B. G., M. Garcia, J. J. Yip, B. Arguello, B. J. Pierre, E. Kutanoglu, J. J. Hasenbein, and S. Santoso. 2024. "Three-Stage Optimization Model to Inform Risk-Averse Investment in Power System Resilience to Winter Storms." *IEEE Access* 12: 135117–135134.

Ayalasomayajula, S. M., Y. Preger, J. Mueller, and S. Allu. 2025. "Physics-Based Analysis of Cell Imbalances and Aging in Lithium-Ion Battery Modules and Packs." *Journal of The Electrochemical Society* 172, no. 8: 080526. <https://doi.org/10.1149/1945-7111/adf66f>.

Bates, A., L. Torres-Castro, P. Albertus, P. P. Mukherjee, J. Jeevarajan, N. Johnson, B. Bhargava, Z. Wang, T. Ogundipe, B. S. Vishnugopi, A. Karmakar, and W. S. Tang. 2024. "A Multi-Scale Framework for Advancing Battery Safety Through Early Calorimetric Analysis of Materials and Components." *The Electrochemical Society Interface* 33, no. 3: 69. <https://doi.org/10.1149/2.F10243IF>.

Bertrand, M., N. B. Johnson, L. Jin, A. M. Bates, P. Chartrand, L. Torres-Castro, and M. Dollé. 2025. "Unveiling the Thermite-Driven Lithium Fire Ignition in Solid-State Batteries." *Joule* 9, no. 5: 101953. <https://www.sciencedirect.com/science/article/pii/S2542435125001345>.

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Bhujel, N., N. Guruwacharya, U. Tamrakar, R. H. Byrne, T. M. Hansen, D. M. Hummels, and R. Tonkoski. 2025. "Optimization-Based Dynamic Voltage Support of Microgrids Using Energy Storage Systems." *IEEE Access* 13: 157918–157932. <https://doi.org/10.1109/ACCESS.2025.3606815>.

Bird, L., C. Walker, J. Womble, S. Atcity, R. Trevizan, L. Concessao, H. Meenawat, and B. Tarekegne. 2024. "Distributed Energy Resources as an Equity Asset: Lessons Learned from Deployments in Disadvantaged Communities." *IEEE Power and Energy Magazine* 22, no. 4: 64–74.

Blakely, L., M. J. Reno, J. A. Azzolini, C. B. Jones, and D. Nordy. 2024. "Applying Sensor-Based Phase Identification with AMI Voltage in Distribution Systems." *IEEE Access* 12: 1235–1249.

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Austgen, Brent. 2024. "Synthesizing the Stochastic Behavior of Surmised Heterogeneous Subpopulations When Only the Stochastic Behavior of the Population as a Whole Is Known." Presented at *INFORMS 2024 Annual Meeting*.

Bhela, S., S. Gumussoy, D. Kelly, M. Reno, A. Banaie, and U. Muenz. 2025. "Co-Optimization of Inverter Controls and Line Protection Functions for Improved Protection Reliability and System Stability." In *Proceedings of the 2025 IEEE Power & Energy Society General Meeting*.

Braid, Jennifer. 2025. "Technoeconomic and Finite Element Analyses of Robust PV Module Designs to Mitigate Glass Failure." *PV ModuleTech USA*, June 17-18, Napa, California, United States of America.

Braid, Jennifer. 2025. "Technoeconomic Modeling of Solar Energy Generation and Storage Grid Penetration." *Photovoltaic Performance Modeling Collaborative Workshop*, May 13-15, Albuquerque, New Mexico, United States of America.

Darbali-Zamora, Rachid. 2024. "A Performance Comparison Between Hydraulic and Electric Energy Storage Systems for Wave Energy Applications." *The 56th North American Power Symposium (NAPS 2024)*, October 13-15, El Paso, Texas, United States of America. <https://doi.org/10.1109/NAPS61145.2024.10741712>.

Elliott, Ryan. 2022. "Data-Driven Power Flow Estimation with Inverter Interfaced Energy Storage Using Dynamic Injection Shift Factor." *IEEE Power & Energy Society General Meeting*, July 17-21, Denver, Colorado, United States of America. <https://doi.org/10.1109/PESGM48719.2022.9916701>.

Elliott, Ryan. 2024. "Grid-Forming Inverter Dynamics: Frequency-Domain Insights." *Annual Conference of the IEEE Industrial Electronics Society (IECON)*, November 3, Chicago, Illinois, United States of America.

Elliott, Ryan. 2024. "Suppressing Post-Fault Active Power Transients in Grid-Forming Inverters." *IEEE Photovoltaic Specialists Conference*, June 9-14, Seattle, Washington, United States of America. <https://doi.org/10.1109/PVSC57443.2024.10749013>.

Fragkos, Georgios. 2024. "A Protocol-Agnostic DER Intrusion Detection System Using an IEEE 1547-Enabled Digital Twin." *Resilience Week 2024*, December 3-5, Austin, Texas, United States of America.

Jimenez Aparicio, Miguel. 2024. "A Fixed-Step Under Frequency Load Shedding Scheme Based on Load Criticality." *The 56th North American Power Symposium (NAPS 2024)*, October 13-15, El Paso, Texas, United States of America.

Jones, Christian. 2024. "Security Vulnerability Considerations for Community Grid Resilience." *DOE SETO Workshop: Solar and DERs for Community Energy Resilience*, November 14, Washington, D.C., District of Columbia, United States of America.

Kelly, Daniel, M. Reno, S. Bhela, A. Banerjee, N. Xue, U. Muenz, A. Banaie, and A. Haddadi. 2025. "Transmission Protection with Various Grid-Forming Inverter Controls for 100% Inverter Based Generation." In *Proceedings of the 2025 IEEE Power & Energy Society General Meeting*.

Mammoli, Andrea. 2025. "Climate Emergencies and Electric Vehicles." *IEEE PES Grid Edge Technologies*, January 20-23, San Diego, California, United States of America.

Pierre, Brian. 2025. "Artificial Intelligence Applied to the Electric Grid." *Sandia Lunch & Learn*, June 2, Albuquerque, New Mexico, United States of America.

Pierre, Brian. 2024. "Electric Grid Security Wildfire Risk and Resilience: Wildfire Ignition and Consequence Mitigation." *Resilience Week 2024*, December 3, Austin, Texas, United States of America.

Pierre, Brian. 2025. "Power System Security: Electric Grid Wildfire Mitigation." *The 2025 IEEE Power & Energy Society General Meeting*, July 26-31, Austin, Texas, United States of America.

Pierre, Brian. 2025. "Power System Security: Mitigate Electric Grid Wildfire Ignitions." *FERC Software Conference: Increasing Real-Time and Day-Ahead Market and Planning Efficiency Through Improved Software*, July 8-10, Washington, D.C., District of Columbia, United States of America.

Reno, Matthew. 2024. "AMI for DER Integration and Hosting Capacity Analysis." *IEEE PES Grid Edge Technologies Conference and Exposition*, January 21-23, San Diego, California, United States of America.

Reno, Matthew. 2024. "Electric Grid Security Wildfire Risk and Resilience: Wildfire Ignition and Consequence Mitigation." *Resilience Week 2024*, December 3, Austin, Texas, United States of America.

Reno, Matthew. 2024. "Emerging Developments in Microgrid Technology and Protection." *IEEE PES Grid Edge Technologies Conference and Exposition*, January 21-23, San Diego, California, United States of America.

Reno, Matthew. 2024. "Hardware-in-the-Loop Testing of Direct Transfer Trip for Network Protector Units in the Presence of Distributed Energy Resources." *The 56th North American Power Symposium*, October 13-15, El Paso, Texas, United States of America.

Reno, Matthew. 2025. "Improving DER Capacity Analysis with Data-Driven Methods." *IEEE PES General Meeting*, July 28-31, Austin, Texas, United States of America.

Reno, Matthew. 2025. "Inverter-Dominated Transmission Systems - Protection and Stability." *2025 Power Electronics & Energy Conversion Workshop*, July 15-16, Albuquerque, New Mexico, United States of America.

Reno, Matthew. 2025. "Modeling of Inverter-Based Resources (IBR) and Their Protection Impacts." *Gridscale X Advanced Protection Assessment 2025 Global User Group Meeting and Conference*, June 2-6, Ann Arbor, Michigan, United States of America.

Reno, Matthew. 2025. "Microgrid Review: LV Networks and Microgrid Protection in a Box." *DOE Microgrid Program Review Meeting*, June 26-27, Albuquerque, New Mexico, United States of America.

Reno, Matthew. 2024. "Networked Microgrid Protection." *GridTECH Connect Forum Northeast*, October 28-30, Newport, Rhode Island, United States of America.

Reno, Matthew. 2024. "Security Constrained Uncertainty Interval Estimation Using Sensitivity Trajectories in Dynamical Systems." *2024 American Control Conference (ACC)*, July 10-12, Toronto, Ontario, Canada. <https://doi.org/10.23919/ACC60939.2024.10644345>.

Reno, Matthew. 2024. "Suppressing Post-Fault Active Power Transients in Grid-Forming Inverters." *IEEE Photovoltaic Specialists Conference*, June 9-14, Seattle, Washington, United States of America.

Yusuf, Jubair. 2025. "Hardware Implementation and Validation of a Protection Scheme Based on Local Measurements for Self-Healing Microgrids." *2025 IEEE Kansas Power & Energy Conference*, April 24-25, Manhattan, Kansas, United States of America.

Yusuf, Jubair, H. A. Eagleston, M. Bester, and B. Pierre. 2025. "A Framework for Wildfire Risk Assessment to Electric Grid." *IEEE Access*.

Yusuf, Jubair, M. Ropp, and M. Reno. 2025. "Hardware Implementation and Validation of a Protection Scheme Based on Local Measurements for Self-Healing Microgrids." In *Proceedings of the 2025 IEEE Kansas Power and Energy Conference (KPEC)*.

Yusuf, Jubair, M. Ropp, and M. Reno. 2025. "Reliability Evaluation for Self-Healing Microgrids with Different-Sized Inverters Using Only Local Measurements." In *Proceedings of the 2025 IEEE Power & Energy Society General Meeting*.

Yuan, S., J. Zhao, J. Yusuf, and B. Pierre. 2025. "Graph Deep Reinforcement Learning for Electric Vehicle Charging Navigation Considering Power-Transportation Interactions." *2025 IEEE Power & Energy Society General Meeting*, Austin, Texas. (Best Paper Award)

Power Electronics and Energy Conversion Systems

Cardoza, A., J. Flicker, J. Mueller, L. Garcia-Rodriguez, and F. Palacios II. 2025. "In-Situ Wide Bandgap Bidirectional Switch Comparison in Three-Phase, Type I Solid State Transformer." In *40th Annual IEEE Applied Power Electronics Conference & Exposition (APEC)*, Atlanta, Georgia.

De Angelis, Valerio. 2025. "DOE-Cofounded Energy Storage Projects." *International Decentralized Energy Access Solutions (IDEAS) Conference*, January 7-9, Bali, Indonesia.

Flicker, J. 2025, March. "Grid Forming Solutions with Energy Storage Integration." Industry session presentation, *40th Annual IEEE Applied Power Electronics Conference & Exposition (APEC)*, Atlanta, Georgia.

Flicker, J., F. P. McCluskey, S. K. Mazumder, and P. Hacke. 2025, October. "Time for Power Electronics to Consider Both Physical and Cyber-Physical Reliabilities." Tutorial presentation, *IEEE Energy Conversion Congress & Expo*, Philadelphia, Pennsylvania.

McNamara, W. 2025, June. "Building Out LDES in Alaska." Panel session moderator, *Alaska Sustainable Energy Conference*, Anchorage, Alaska.

Mueller, J. 2024, October 18. "Power Conversion and Control Systems for a Modern Electric Grid." Presentation, *Center for High Performance Power Electronics (CHPPE) Annual Review*, Columbus, Ohio.

Mueller, J. 2024, October 22. "Power Electronics for Grid Integration of Energy Storage." Presentation, *2024 Energy Conversion Congress and Exposition (ECCE)*.

Ropp, Michael. 2024. "Application of Direct Transfer Trip to Distributed Energy Resources, and Potential Alternatives." *GridTech Connect--Northeast*, October 28-30, Newport, Rhode Island.

Ropp, Michael. 2024. "Interconnection Standards for Energy Storage." *Industrial Electronics Conference*, November 3-6, Chicago, Illinois.

Yusuf, J., M. E. Ropp, and M. J. Reno. 2025. "Hardware Implementation and Validation of a Protection Scheme Based on Local Measurements for Self-Healing Microgrids." In *Proceedings of the 2025 IEEE Kansas Power and Energy Conference (KPEC)*, Manhattan, Kansas.

Yusuf, J., M. E. Ropp, and M. J. Reno. 2025. "Reliability Evaluation for Self-Healing Microgrids with Different-Sized Inverters Using Only Local Measurements." In *Proceedings of the 2025 IEEE Power & Energy Society General Meeting*, Austin, Texas.

Electric Grid Security and Communications

Bretas, Arturo. "Benchmarking the Geomagnetically Induced Currents Related Harmonics Analysis Tool (GICharm) Against Time-Domain Simulation." *Texas Power and Energy Conference*, February 10-11, 2025, College Station, Texas, United States of America.

<https://doi.org/10.1109/TPEC63981.2025.10907111>.

Bretas, Arturo. "Data Fusion-Based Hybrid Framework for Cyber-Physical Security of the Smart Grid." *Resilience Week*, December 3-5, 2024, Austin, Texas, United States of America.

<https://doi.org/10.1109/RWS62797.2024.10799345>.

Bretas, Arturo. "Energy Supply Time in an Islanded Grid Portion Re-Energized by Local Renewable Sources." *CIREC Chicago Workshop 2024*, November 7-8, 2024, Chicago, Illinois, United States of America. <https://doi.org/10.1049/icp.2024.2623>.

Bretas, Arturo. "GMD Integrated Tool (GeoIT): An Integrated Tool for Performing Geomagnetic Disturbance Vulnerability Assessment Studies." *Texas Power and Energy Conference*, February 10-11, 2025, College Station, Texas, United States of America.

<https://doi.org/10.1109/TPEC63981.2025.10906874>.

Drake, Sheryl. "Cybersecurity by Design Framework for Wireless Technologies for Safety Functions of Advanced Reactors." *Nuclear Plant Instrumentation and Control & Human-Machine Interface Technology*, June 15-18, 2025, Chicago, Illinois, United States of America.

Drake, Sheryl. "Wireless Technologies Cybersecurity Evaluation and Testing Framework for Safety Functions." *Nuclear Plant Instrumentation and Control & Human-Machine Interface Technology*, June 15-18, 2025, Chicago, Illinois, United States of America.

Kilwein, Zachary. "Performant Optimization Strategies for Multifidelity Stochastic Power Grid Models." *18th INFORMS Computing Society (ICS) Conference*, March 14-16, 2025, Toronto, Canada.

Author(s) not specified. (2025, June). *Cybersecurity by design framework for wireless technologies for safety functions of advanced reactors*. Paper presented at the American Nuclear Society (ANS) - Nuclear

Plant Instrumentation and Control & Human-Machine Interface Technology (NPIC & HMIT 2025), Chicago, IL.

Author(s) not specified. (2025, June). *Wireless technologies cybersecurity evaluation and testing: Framework for safety evaluations*. Paper presented at the American Nuclear Society (ANS) - Nuclear Plant Instrumentation and Control & Human-Machine Interface Technology (NPIC & HMIT 2025), Chicago, IL.

Paramo, G., & Bretas, A. (2025). The impact of transmission line model selection on GMD simulation results. Paper accepted for presentation at IEEE Power & Energy Society General Meeting (PES GM 2025).

Author(s) not specified. (2025). Enhancing cyber-physical system interdependencies through the integration of Node2Vec-based approach and temporal analysis using LSTM autoencoders. Paper accepted for presentation at IEEE Power & Energy Society General Meeting (PES GM 2025).

Bretas, A., McNair, J., & Boamoah, S., et al. (2025). Data fusion-based hybrid framework for cyber-physical security of the smart grid. Paper accepted for presentation at Resilience Week.

[Defense Energy and Electromagnetics](#)

Guttromson, R, Gravagne, I, Wind Turbine Management System For Controlled Energy Storage, US Patent No.12,372,057 B1, Issued 7/29/2025

Presentations



Presentations

Invited Talks

Energy Storage Technologies and Systems

Bates, A. 2024. "Multiscale Safety Evaluation of Sodium-Ion: Safer Than Lithium-Ion?" In *ECS PRiME*, Honolulu, HI, October.

Bates, A. 2024. "Multiscale Safety Evaluation of Sodium-Ion: Safer Than Lithium-Ion?" In *Battery Safety Council, Forum 14*, Washington, D.C., October.

Bates, A. 2024. "Multi-Scale Safety Evaluation of Commercial Sodium-Ion Cells and Materials." In *Battery Safety Summit*, Chicago, IL, November, invited.

Bates, A. M., L. Torres-Castro, J. Langendorf, N. B. Johnson, J. Kustas, M. Rodriguez, and C. Rich. 2025. "(Invited) Multiscale Safety Evaluation of Beyond Li-Ion Systems." In *ECS 247*, Montreal, QC, Canada, May.

Bera, A. 2025. "Probabilistic Grid Reliability Analysis with Energy Storage Systems: An Open-Source Tool for Assessing the Resource Adequacy of Power Systems." In *Increasing Real-Time and Day-Ahead Market and Planning Efficiency Through Improved Software*. Online: FERC.gov, July. <https://www.ferc.gov/media/probabilistic-grid-reliability-analysis-energy-storage-systems-open-source-tool-assessing>.

Binder, A. T., et al. 2024. "Silicon Carbide Research for Energy Efficiency and National Security." In *Silicon Carbide Materials & Devices Workshop (SiC+X)*, Fayetteville, AR, invited.

Binder, A. T., et al. 2025. "Closing in on the Materials Limit: Reducing Channel Resistance for Wide Bandgap Devices." In *Compound Semiconductor Week 2025*, Banff, Alberta, Canada, invited.

Byrne, R. H. 2025. "New and Emerging Technologies for the U.S. Electric Grid: Energy Storage and EMP/GMD Mitigation." In *University of Idaho Energy Executive Course*, Moscow, ID, June.

Byrne, R. H. 2025. "New and Emerging Technologies for the U.S. Electric Grid: Energy Storage and EMP/GMD Mitigation." In *University of Idaho Energy Executive Summit*, Coeur d'Alene, ID, June.

Byrne, R. H. 2025. "Energy Storage Applications Tutorial." In *2025 IEEE Power and Energy Society General Meeting (PESGM)*, Austin, TX, July.

Byrne, R. H., and E. D. Spoerke. 2025. "Grid Energy Storage Technologies." In *2025 IEEE Power and Energy Society General Meeting (PESGM)*, Austin, TX, July.

Choi, H., T. Nguyen, Y. Preger, and R. Byrne. 2025. "Economic Analysis of Battery Energy Storage Systems Incorporating Uncertain Battery Model." In *The 2025 Power and Energy Society General Meeting (PESGM)*, Austin, TX.

Darbali, R. 2025. "Automating Interconnection Standards Testing for Distributed Wind Power Converters." In *2025 Distributed Wind Energy Association (DWEA)*, Residence Inn Arlington Capital View, Arlington, Virginia, February.

Johnson, N. B. 2024. "Identifying Variability in Differential Scanning Calorimetry for Materials-Level Battery Safety." In *2024 ECS PRiMe*, Honolulu, HI, October, session co-chair and speaker.

Johnson, N. B. 2024. "Predictive Safety Evaluation of Emerging Technologies from the Materials Scale." In *Battery Safety Summit*, Alexandria, VA, November, invited.

Johnson, N. B. 2024. "Predictive Safety Evaluation of Emerging Technologies from the Materials Scale." In *TA-Waters Town Hall*, Virtual, November, invited.

Johnson, N. B. 2025. "Are Solid-State Batteries Non-Flammable? Thermite Reaction Between LiFePO₄ and Li-Metal." In *247th ECS Meeting*, Montreal, Canada, May, session chair and speaker.

Johnson, N. B. 2025. "How Safe Are Solid State Batteries? Identifying Hazards with a Bottom-Up Approach." In *2025 Solid State Battery Summit*, Chicago, IL, August, invited.

Johnson, N. B. 2025. "Multi-Scale Safety Evaluation of Emerging Battery Technologies." In *Advanced Automotive Battery Conference*, Las Vegas, NV, December, invited.

Lambert, T. N. 2025. "Investigations into the Electrochemical Cycling of Zinc in Mildly Acidic Electrolytes." In *247th Meeting of the Electrochemical Society*, Montreal, Canada, May.

Lambert, T. N. 2025. "Investigations into the Electrochemical Cycling of Zinc-Based Batteries." In *4th International Zinc and Other Aqueous Batteries Workshop (4th IZABW)*, Kyoto, Japan, September, invited.

McNamara, W. 2024. "Doe/Sandia National Labs PUC Policy & Outreach." In *National Association of Regulatory Utility Commissions (NARUC) Annual Meeting*, Anaheim, CA, November.

McNamara, W. 2024. "How to Add Storage to the Grid More Quickly?" In *Organization of PJM States (OPSI) 2024 Annual Meeting*, Columbus, OH, October.

McNamara, W. 2025. "LDES Discussion with the Massachusetts Office of Energy Transformation." Presentation delivered to the Massachusetts Office of Energy Transformation, Virtual, June.

McNamara, W. 2025. "Long Duration Energy Storage." Panel moderator. In *Alaska Energy Conference*, Anchorage, AK, June.

McNamara, W. 2025. "Long Duration Energy Storage." Panel moderator. In *Utah Energy Week*, Salt Lake City, UT, September.

McNamara, W. 2025. "Overview of LDES Technologies." In *13th IEEE Electrical Energy Storage Applications and Technologies (EESAT) Conference*, Charlotte, NC, January.

McNamara, W. 2025. "The LDES National Consortium: Mission, Activities & Progress." In *Battery Council International (BCI) Convention + Power Mart Expo 2025*, San Antonio, TX, May.

McNamara, W. 2025. "The LDES National Consortium: Mission, Activities & Progress." In *DOE Energy Storage Financing Summit*, New York, NY, January.

McNamara, W. 2025. "The LDES National Consortium: Mission, Activities & Progress." In *Energy Storage Summit*, Dallas, TX, March.

McNamara, W. 2025. "Technical Assistance with Sandia National Laboratories." In *CESA National Energy Summit for States: Navigating Energy Trends and Federal Programs*, Washington, DC, May.

O'Brien, V. 2024. "Cybersecurity for Battery Energy Storage Systems." Abstract, Newark, New Jersey.

O'Brien, V., and M. Culler. 2025. "Security Concerns and Considerations for Battery Energy Storage Systems: Cybersecurity, Physical Security, and Supply Chains." In *Proceedings of the IEEE Power & Energy Society General Meeting*, co-chairs of the panel.

Poindexter, D. 2025. "Navigating Energy Trends and Federal Programs." In *CESA National Energy Summit for States*, Washington, DC, May. <https://www.cesa.org/event/2025-national-energy-summit/>.

Preger, Y. 2025. "Building Your Professional Brand: Networking, Visibility, and Career Growth." In *MRS Early Career Professional Webinar Series*, Virtual, August, invited panelist.

Preger, Y. 2025. "Enhancing Battery Safety Through Advanced Sensing." In *Upstate New York Energy Storage Safety Summit*, Albany, NY, May, invited panelist.

Preger, Y. 2025. "Impact of Aging on Battery Safety." In *2025 Interagency Advanced Power Group Chemical Working Group Safety Panel*, Virtual, September, invited talk.

Preger, Y. 2025. "Impact of Aging on the Safety of Lithium-Ion Batteries and Implications for Diagnostics." In *2025 Electrochemical Society Spring Meeting*, Montreal, Canada, May, invited talk.

Torres-Castro, L. 2024. "Safety and Reliability of Energy Storage Systems." In *Lunch & Learn at Genera*, San Juan, PR, October, invited talk.

Torres-Castro, L. 2025. "Advancing Battery Safety Through a Bottom-Up Approach to Evaluation." In *Amazon's 9th Annual ABC Summit*, Seattle, WA, August, invited keynote presentation.

Torres-Castro, L. 2025. "Advancing Battery Safety Through a Bottom-Up Approach to Evaluation." In *Battery Safety Workshop*, Charlotte, NC, June, invited keynote presentation.

Torres-Castro, L. 2025. "Are Batteries Safe?" In *Battery Workforce Challenge Webinar*, February, invited talk.

Torres-Castro, L. 2025. "Are Batteries Safe?" In *PPL Electric Utility Webinar*, July, invited talk.

Trevizan, R. 2025. "Consequence-Focused Cybersecurity Considerations for BESS." In *Proceedings of the IEEE Power & Energy Society General Meeting*, invited talk.

Wittman, R. M., and S. Macchi. 2025. "Lessons from Vanadium Flow Batteries for Non-Vanadium Flow Batteries." In *Electrochemical Society Meeting Abstracts 247*, Montreal, Canada, pp. 2367.

Wittman, R. M. 2025. "Influence of Hydroxide Concentration on Zn Passivation for Zn-Alkaline Batteries." In *Beyond Li-Ion Conference 15*, Richland, WA.

Resilient and Distributed Systems Integration

Darbali-Zamora, R. (2025). Panelist, 2025 Marine Energy Career Panel. Hosted by Pacific Northwest National Laboratory (PNNL).

Darbali-Zamora, R. (2025). Advisory board member, University of Texas at El Paso Alliance for Clean Energy Education and Research (ACEER).

Darbali-Zamora, R. (2025). Co-chair, 2025 IEEE Resilience Week Control Systems track, National Harbor, MD.

Darbali-Zamora, R., & Ferreira, S. (2025). Principal investigator, American-Made Program's Utility Digitization/Data Challenge Voucher project supporting Grid Elevated at Sandia's Distributed Energy Technology Laboratory.

Fragkos, Georgios. "Explainable AI for High-Accuracy Cyber-Physical Security in the Power Grid." Presentation (Non Conference). Unclassified Unlimited Release (UUR). Completed on June 17, 2025.

Hart, Olga. "Integration of Equitable Resilience Metrics into Electric Utility Planning Processes." Presentation (Non Conference). Unclassified Unlimited Release (UUR). Completed on November 4, 2024.

Jones, Christian. "Photovoltaic System Cybersecurity Research." Presentation (Non Conference). Unclassified Unlimited Release (UUR). Completed on April 8, 2025.

Jones, Christian. "Securing Solar for the Grid Industry Advisory Board Spring Virtual Meeting." Presentation (Non Conference). Unclassified Unlimited Release (UUR). Completed on April 7, 2025.

Leon-Quiroga, Jorge Andres. "Investigation of Sargassum Seaweed Intrusion for Power Plant and Other Water Intake Applications." Presentation (Non Conference). Unclassified Unlimited Release (UUR). Completed on January 21, 2025.

Leon-Quiroga, Jorge Andres. "Tech Transfer Presentation for Mondragon University TEAMER Award." Presentation (Non Conference). Unclassified Unlimited Release (UUR). Completed on December 5, 2024.

Mammoli, Andrea. "DOE Analysis Tools to Help Ports Understand and Manage Electrical Load Growth." Presentation (Non Conference). Unclassified Unlimited Release (UUR). Completed on June 23, 2025.

Mammoli, Andrea. "ETIPP Energy Planning Process Update." Presentation (Non Conference). Unclassified Unlimited Release (UUR). Completed on July 17, 2025.

Mammoli, Andrea. "Quantifying the Inconvenience of Long-Dwell Public Charging." Presentation (Non Conference). Unclassified Unlimited Release (UUR). Completed on October 29, 2024.

Mammoli, Andrea. "Buildings, Electric Cars and Resilience: Preparing for Climate Change at the Grid Edge." Presentation (Non Conference). Unclassified Unlimited Release (UUR). Completed on October 29, 2024.

Rodriguez, Luis. "Microgrid Design Toolkit (MDT) Based Modeling of Sargassum Intrusions as Design-Based Threats for Coastal Power Plants." Presentation (Non Conference). Unclassified Unlimited Release (UUR). Completed on July 18, 2025.

Wittman, R. "(Some) Lessons Learned From Vanadium Flow Batteries," Spring 2025 Electrochemical Society Meeting in Montreal Canada titled. May 19, 2025.

Electric Power Systems Research

Avila, Antonio. "Optimizing Evacuation with Electric Vehicle Integration for Resilient Power Grids Across Extreme Weather Events." Presentation (Non Conference). *Unclassified Unlimited Release (UUR)*. Completed July 29, 2025.

Bester, Michelle Sheryll Ann. "RIO GRANDE RESEARCH SLAM - Decoding the Canopy." Presentation (Non Conference). *Unclassified Unlimited Release (UUR)*. Completed October 21, 2024.

Blakely, Logan, and George Fragkos. 2025. "Data Fusion and Machine Learning Approaches for Cyber-Physical Systems Analysis." Invited talk, Lunch and Learn event hosted by 5620.

Chavez, Adrian. "Proactive Intrusion Detection and Mitigation System." Presentation (Non Conference). *Unclassified Unlimited Release (UUR)*. Completed January 13, 2025.

Elliott, R. 2024, November 5. "Grid-Forming Inverter Dynamics: Frequency-Domain Insights." Panelist, IEEE Industrial Electronics Society Annual Conference (IECON), Chicago, IL.

Elliott, R. 2025, May. "Power System Oscillations Revisited: 25 Years of Progress." Webinar, IEEE Power & Energy Society.

Gunda, Thushara. "A Review of Load Growth Drivers & Associated Resource Planning Activities." Presentation (Non Conference). *Unclassified Unlimited Release (UUR)*. Completed February 10, 2025.

Guttromson, Ross. "Accelerated Electric Grid Recovery Post Wildfire." Presentation (Non Conference). *Unclassified Unlimited Release (UUR)*. Completed January 21, 2025.

Guttromson, Ross. "Multi-Factor OPF: Implementing Co-Optimized Reserves in the Texas Market." Presentation (Non Conference). *Unclassified Unlimited Release (UUR)*. Completed December 11, 2024.

Jimenez Aparicio, Miguel. "PSCAD for Power Electronics: Capabilities & Applications." Presentation (Non Conference). *Unclassified Unlimited Release (UUR)*. Completed July 8, 2025.

Kelly, Daniel. "PSCAD Automation Presentation to NMSU." Presentation (Non Conference). *Unclassified Unlimited Release (UUR)*. Completed March 1, 2025.

Pierre, Brian. 2025, March. "Power System Security: Wildfire Electric Grid Resilience." Presentation, U.S. Army Engineer Research and Development Center (ERDC).

Pierre, Brian. 2025, July. "Mitigating Electric Grid Ignited Wildfires." Presentation, 16th Annual FERC Software Conference, Washington, DC.

Pierre, Brian. 2025, July. "Reliability, Resilience, & Wildfire Mitigation." Panelist, IEEE Power & Energy Society Summit, hosted by PG&E.

Pierre, Brian. 2025. "Special Breaking News Panel on Wildfires; Moderated Panel on Eliminating Grid-Initiated Wildfires; Panel on Grid Edge Resources for Wildfire Resilience." IEEE Grid Edge Conference & Exposition, San Diego, CA.

Preger, Yuliya. "Impact of Module Configuration on Lithium-Ion Battery Performance and Degradation: Part I. Energy Throughput, Voltage Spread, and Current Distribution." Presentation (Non Conference). *Unclassified Unlimited Release (UUR)*. Completed [date not provided].

Reno, Matthew. "Networked Microgrid Protection." Presentation (Non Conference). *Unclassified Unlimited Release (UUR)*. Completed February 28, 2025.

Reno, Matthew. "Protective Relaying Solutions to Reduce Wildfire Ignition Risks." Presentation (Non Conference). *Unclassified Unlimited Release (UUR)*. Completed November 11, 2024.

Reno, Matthew, and J. Azzolini. 2025, February 20. "Model-Free Hosting Capacity Analysis (MoHCA)." Invited presentation, DOE SETO Solar Colloquium.

Reno, Matthew, et al. 2025. "Protection Methods Used to Reduce Wildfire Risks Due to Transmission and Distribution Lines." IEEE PES Technical Report PES-TR130. https://resourcecenter.ieee-pes.org/publications/technical-reports/pes_tr_130_psrc_060525.

Yusuf, Jubair. "Improving Resiliency during Evacuations for Increased Electric Vehicle Penetration." Presentation (Non Conference). *Unclassified Unlimited Release (UUR)*. Completed January 14, 2025.

Power Electronics and Energy Conversion Systems

Aparicio, Miguel Jimenez. "PSCAD for Power Electronics: Capabilities & Applications." Presentation (Non Conference). *Unclassified Unlimited Release (UUR)*. Completed on July 8, 2025.

Gill, Lee. "Gallium Nitride (GaN) Device Characterization and Evaluation Techniques." Presentation (Non Conference). *Unclassified Unlimited Release (UUR)*. Completed on April 29, 2025.

Neely, Jason. "Embedded Sensors for Diagnostics and Prognostics." Presentation (Non Conference). *Unclassified Unlimited Release (UUR)*. Completed on May 21, 2025.

Palacios, Felipe. "Multilevel Converter for Distribution Level Grid Connected Battery Energy Storage Systems." Presentation (Non Conference). *Unclassified Unlimited Release (UUR)*. Completed on March 30, 2025.

Electric Grid Security and Communications

Alfant, Rachael. "Multifidelity Modeling for Achieving Performant Optimization of Power Grids." Presentation (Non Conference). *Unclassified Unlimited Release (UUR)*. Completed on April 10, 2025.

Drake, Sheryl. "Advanced Reactor Safeguards and Security - Advanced Reactor Wireless Communications - Safety Related/Important to Safety Functions." Presentation (Non Conference). *Unclassified Unlimited Release (UUR)*. Completed on April 9, 2025.

Drake, Sheryl. "Advanced Reactor Safeguards & Security - Secure Elements Spring 2025 Project Review." Presentation (Non Conference). *Unclassified Unlimited Release (UUR)*. Completed on April 10, 2025.

Drake, Sheryl. "January 2025 ARSS Wireless Workshop_DC - Rowland." Presentation (Non Conference). *Unclassified Unlimited Release (UUR)*. Completed on January 22, 2025.

Gray, Titus. "Advanced Reactor Safeguards & Security - Secure Elements Spring 2025 Project Review." Presentation (Non Conference). *Unclassified Unlimited Release (UUR)*. Completed on April 14, 2025.

O'Brien, Victoria. "Cybersecurity of Battery Energy Storage Systems." Presentation (Non Conference). Unclassified Unlimited Release (UUR). Completed on November 5, 2024.

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