



IEEE ENERGY CONVERSION CONGRESS & EXPO **Detroit, Michigan, USA Oct. 9-13**

1. Special Session Title

Paradigm Shift towards 100% Renewables in Modern Power Systems: Theory and Practice of Grid-Forming Inverter Technologies

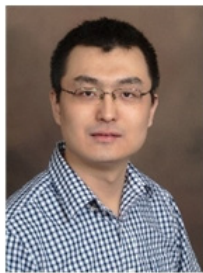
2. Abstract

There are tremendous research efforts and industry practice of modernizing power systems with power electronics technologies nowadays, and the topics include but are not limited to localized and network-interconnected microgrids, grid-forming capabilities, interactive and integrated inverter-based resources, solid-state substation modeling and control, among others. Advanced and cutting-edge technologies have been proposed and developed to address the challenges and concerns with the growing development and deployment of inverter-based resources (IBRs). Note that the challenges and R&D efforts lie in multiple sections throughout the entire electric grid, ranging from grid-edge customers and substations to large-scale distribution systems and upstream transmission grids. Innovative and cutting-edge technologies are being developed and field-validated toward resilient and modernized power grids with 100% IBRs.

To showcase the cutting-edge technologies of power electronics intensive power systems with special emphasis on grid-forming inverters, this special session will aim at industry needs and practice and technology innovations in academia. The session intends to share the latest research progress and industry practice of grid-interactive power electronics and stimulate the interests of a broad audience group, including the researchers and engineers from manufacturers, utilities, national labs, and universities. Invited presentations from leading industry experts, academic researchers, national lab scientists, and government employees will be organized. Panel discussions and interactions with the audience will also be incorporated in this special session.

3. Special Session Organizers

Xiaonan Lu, Ph.D., Associate Professor, Purdue University, xiaonanlu@purdue.edu



Xiaonan Lu received his B.E. and Ph.D. degrees in electrical engineering from Tsinghua University, Beijing, China, in 2008 and 2013, respectively. From September 2010 to August 2011, he was a guest Ph.D. student at the Department of Energy Technology, Aalborg University, Denmark. From October 2013 to December 2014, he was a Postdoc Research Associate at the Department of Electrical Engineering and Computer Science, University of Tennessee, Knoxville. From January 2015 to July 2018, he was with Argonne National Laboratory, first as a Postdoc Appointee and then as an Energy Systems Scientist. From July 2018 to August 2022, he was with Temple University as an Assistant Professor. In August 2022, he joined Purdue University West Lafayette as an Associate Professor. His research interests include modeling and control of power electronic inverters, hybrid AC and DC microgrids, and real-time hardware-in-the-loop simulation. Dr. Lu is the Associate Editor of IEEE Transactions on Industrial Electronics, the Associate Editor of IEEE Transactions on Industry Applications, the Editor of IEEE Transactions on Smart Grid, and the Editor of IEEE Power Engineering Letters. He serves as the Chair of the Industrial Power Converters Committee (IPCC) in the IEEE Industry Applications Society (IAS). He is also the recipient of the 2020 Young Engineer of the Year Award in the IEEE Philadelphia Section.

Jin Tan, Ph.D., Senior Engineer and Distinguished Research Staff, National Renewable Energy Laboratory, jin.tan@nrel.gov



Jin Tan is a principal engineer and a Distinguished Member of the Research Staff in the transmission and distribution interaction Group at NREL. She received her B.E. and Ph.D. degrees in electrical engineering from Southwest Jiaotong University, Chengdu, China, in 2007 and 2014, respectively. From 2009 to 2011, she was a visiting Ph.D. student at the Department of Energy Technology, Aalborg University, Denmark. In 2014, she was a postdoctoral researcher in the Department of Electrical Engineering and Computer Science, University of Tennessee, Knoxville, TN, USA. She joined NREL in 2015. She leads development of multi-timescale integrated dynamic and scheduling model (MIDAS) to address the challenges of planning and operating extremely high renewable penetrated grid. She is also working on developing the advanced electromagnetic transient (EMT) simulation capability for power grid with a large amount of distributed energy resources to study the stability issues of 100% renewables. Her research interests include power system stability and control with large-scale renewable integration, multi-timescale dynamic modeling of various renewable generation, and energy storage for grid applications. She is the Editor of International Transaction on Electrical Energy System. She is a Member of Institute of Electrical and Electronics Engineers (IEEE), Power and Energy Society (PES) and IEEE Women in Engineering. She received President Award at National Renewable Energy Laboratory in 2018 and 2020, NREL Outstanding Mentor Awards in 2020 and 2021 and Best Paper Award in 2016, 2018, 2019 and 2020.

4. Special Session Panelists/Speakers

John Seuss, Technology Manager, **Solar Energy Technologies Office (SETO)**, U.S. Department of Energy (DOE), USA

Title: Overview of Solar Energy Technology Office (SETO) Funding Efforts to Achieve a 100% Decarbonized Electric Grid (tentative title)

Abhishek Banerjee, Research Scientist, **Siemens Technology**, USA

Title: Grid-Forming Inverters, an Enabling Technology to Realize Autonomous Microgrid Restoration during Natural Events

Wei Du, Senior Research Engineer, **Pacific Northwest National Laboratory**, USA

Title: Fault Ride-through Control and Modeling of Grid-Forming Inverters at Scale

Phil Hart, Senior Engineer, **General Electric Research**, USA

Title: Recent Developments in Grid-Forming Control at GE Research (tentative title)

Yu Li, Manager in Transmission Planning, **Hawaiian Electric Corporation (HECO)**, USA

Title: Grid Forming Inverter Based Resource in Hawai'i 100% Renewable Plan (tentative title)

Cameron Kruse, Engineering and Technology Manager, **Kauai Island Utility Cooperative (KIUC)**, USA, and **Alston Dcosta**, Microgrid Solutions Engineer, **AES**, USA

Title: Microgrid Operation with GFM Inverters in Kauai Island