04 Panel Session

Planning and Control Methods for HVDC/HVAC Hybrid Power Systems with Growing Penetration of Renewable Energy

Introduction and topics

In the context of building new power systems with the goals of full absorption of renewable energy, optimized allocation of large-scale energy resources, reliable supply of electricity, and secure and stable operation of power grid, this panel will discuss research on revolutionizing theory and methodologies of power system planning, operation and control, by focusing on solving critical issues caused by the uncertainty of developing renewable energy projects, strong uncetainty of renewable generators'power outputs and the new characteristics of high-penetration power electronics. In particular, this panel includes topics of (1) large-scale spatio-temporal optimization models for planning cross-regional DC interconnection network; (2) theory and methodologies for coordinated planning of various regional renewable energy, supporting power supplies, energy storage, and HVDC topology considering multi-timescale power and energy balance as well as stability constraints; (3) security and stability control theory and technologies for coordinated precise control of source, network, load and storage devices in various types of power grid partitions; (4) combined balance control of active power and reactive power, ride-through control of renewable energy clusters, and coordinated stability control of renewable generators and storage devices for the control areas with renewable energy only and without sufficient synchronous power supplies. This panel will also discuss new theory and technologies for optimizing active power scheduling and frequency control with multi-timescale and cross-regional coordination.

Panel Session Chairs

Ruisheng Diao
Zhejiang University

Prof. Ruisheng Diao obtained his Ph.D. degree in EE from Arizona State University, Tempe, AZ, in 2009. Serving as a PM/PI/co-PI, Dr. Diao has been managing and supporting a portfolio of research projects in the area of power system modeling, dynamic simulation, online security assessment and control, dynamic state estimation, integration of renewable energy, AI and HPC implementation in power systems, etc. The project funds range from $30K to $4M. Dr. Diao has published 112 peer reviewed journal and conference papers, as well as dozens of technical reports. He is the co-applicant for 30+ patents. Dr. Diao is the recipient of the 2018 R&D 100 Awards, 2018 IEEE PES Conference Prize Paper Award, and multiple IEEE PES best paper awards. He is Fellow of IET, Senior Member of IEEE, editor for IEEE Transactions on Power Systems, IEEE Power Engineering Letters, IEEE Access, IET Generation, Transmission&Distribution, and a registered Professional Engineer (PE) in Washington State.

Dr. Diao is now with ZJU-UIUC Institute, as Director of Renewable Power System Simulation & Intelligent Control and tenured associate professor, leading a research team to develop HPC&AI-based applications for modern power systems (renewable integration, high-fidelity grid modeling and simulation, autonomous voltage control, line flow control, intelligent maintenance scheduling and others for power utilities and control centers).

Haiwang Zhong
Tsinghua University

Haiwang Zhong, Associate Professor, IEEE Senior Member. His research interests include power system operations and planning, electricity markets and demand response. He is the Primary Investigator for 3 projects funded by National Natural Science Foundation of China, one project funded by Beijing Natural Science Foundation. He served as the Chair of the IEEE PES Working Group on Demand Response. He was awarded the ProSPER.Net Young Scientist Award. He was awarded 4 provincial Science & Technology Awards. He won 2 Gold Medals in Geneva International Invention Exhibitions.