Special Session 28: Data-Driven Operations and Planning for Low-Carbon Power Systems with Distributed Flexible Resources

Session Organizers:

Wei Lin, The University of Hong Kong, wlin1994@hotmail.com

Zipeng Liang, The Hong Kong Polytechnic University, liangzipeng.ye@163.com
Qin Wang, The Hong Kong Polytechnic University, qin-ee.wang@polyu.edu.hk

Xin Yin, South China University of Technology, sinyinedu@163.com

Bifei Tan, Wuyi University, tanbifei0487@hotmail.com

Brief Description of the Session Thematic:

As global efforts to mitigate climate change grow, transitioning to low-carbon power systems is essential for reducing greenhouse gas emissions. The integration of renewable energy sources, such as solar and wind, alongside distributed flexible resources like energy storage, electric vehicles, and demand response, is transforming power system operation and planning. These resources present both opportunities and challenges, particularly in flexibility, reliability, and real-time optimization. Data-driven approaches, including advanced analytics, AI, and machine learning, offer significant potential to enhance the efficiency and resilience of low-carbon power systems. This special session explores the latest research on data-driven methods for operating and planning low-carbon power systems, with a focus on distributed flexible resources.

Topics and Keywords:

1 Data-Driven Optimization for Low Carbon Power System Operation and Planning
2 Integration of Distributed Energy Resources in Power Systems
3 Flexibility Management through Distributed Resources
4 Machine Learning and AI for Power System Operation and Control
5 Uncertainty Modeling and Risk-Aware Planning in Low-Carbon Power Systems
6 Real-Time Decision-Making for Renewable Energy Integration
7 Optimization of Electric Vehicle Charging and Discharging in Power Grids
8 Advanced Analytics for Distributed Energy Resource Aggregation

This session aims to gather researchers, industry professionals, and policymakers to discuss advancements in data-driven approaches for low-carbon power system operation and planning. Focusing on distributed flexible resources, it will highlight state-of-the-art methods to enhance system flexibility, reliability, and sustainability. We welcome original research, reviews, and case studies showcasing innovative applications of AI, machine learning, and other data-driven techniques in addressing the challenges of low-carbon power systems.

Keywords: Low-Carbon Power Systems; Distributed Energy Resources; Flexibility Resources; Renewable Energy Integration; Data-Driven Optimization; Power System Planning; Energy Storage

Systems; Electric Vehicles; Demand Response; Machine Learning in Power Systems; Artificial Intelligence (AI) Applications; Uncertainty Modeling; Grid Flexibility; Real-Time Operation; Energy Transition