Special Session 4: AI-Assisted Control and Operation of Smart Grids

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Brief Description of the Session Thematic:
With the integration of multiple distributed energy sources, advanced metering infrastructure, and digital communication technologies, smart grids are transitioning toward decarbonization, decentralization, and digitalization. However, the uncertainties of renewable energy sources, fluctuating electricity demands, and the potential cyber-attack may compromise the reliability and safety of smart grid operations, such as network imbalance, voltage and frequency instability. At the same time, traditional model-based methods often struggle with modeling complexity and parameter uncertainty, while they typically fail to address multiple objectives issues. In contrast, state-of-the-art artificial intelligence (AI) technologies offer powerful tools to enhance the efficiency, reliability, and adaptability of smart grid controls and operations. Therefore, this special session is dedicated to exploring effective and flexible control strategies assisted by advanced AI technologies, ensuring economic, sustainable, and secure operations of smart grids.

Topics and Keywords:
1. Advanced AI Technologies for Control and Operation in Smart Grids
2. Cyber-physical security for smart grid control systems
3. Novel decentralized control strategies of smart grids
4. Data-driven optimal control strategies of smart grids
5. Intelligent control and operation of smart grids
6. Coordinated control and operation of multiple distributed energy sources
7. Hybrid data-driven and mechanistic modeling methods for voltage and frequency regulation