Special Session 37: Artificial Intelligence-Aided Stability Analysis and Optimal Operation of High Renewable Penetrated Power Systems

Session Organizers:

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Brief Description of the Session Thematic:

The high penetration of renewable energy sources, such as solar and wind, poses intricate challenges to the optimal and stable operation of power systems. The intermittent and fluctuating nature of renewable generation introduces unpredictability and variability into grid operations, manifesting in issues such as frequency deviations, voltage instabilities, and operational limitations. Moreover, the decentralized and distributed nature of renewable resources further complicates grid management, requiring novel methodologies to maintain system stability and optimize operational performance. Artificial Intelligence (AI)-aided approaches offer a promising avenue to tackle the challenges brought by high renewable penetration in power systems. By leveraging AI techniques such as machine learning, neural networks, and optimization algorithms, grid operators can harness the power of data analytics and predictive modeling to enhance stability analysis and operational decision-making. AI enables real-time monitoring, forecasting, and control of grid parameters, empowering operators to proactively address grid imbalances, mitigate risks, and optimize system performance in the face of dynamic renewable generation patterns. Considering the need for addressing challenges related to the above new trend, we thus launched this special session to provide a worldwide platform that collects innovative works reporting recent advances in artificial intelligence-aided stability analysis and optimal operation of high renewable penetrated power systems.

Topics and Keywords:

1. Machine learning-based renewable generation/load forecasting;
2. AI-aided power system dynamic stability/security assessment;
3. Power system fault/event detection based on data analytics;
4. Machine learning-based optimal power flow;
5. AI-aided planning for renewable distributed generation integration;
6. AI-aided real-time distribution network reconfiguration;
7. AI-aided optimal operation of power systems for stability enhancement.

We welcome original research articles, review papers and case studies exploring innovative solutions at the intersection of AI, power system stability, and optimal operation.

Keywords: Generation Forecasting; Load Forecasting; Stability Assessment; Security Assessment; Fault Detection; Event Detection; Optimal Power Flow; Power Network Planning; Distribution Network Reconfiguration.