Call for Papers for the Special Session on

Current Challenges in Grid Integration: New Technologies, Practical Solutions, and Advanced Modeling & Control

Organized and co-chaired by

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Technical Outline of the Session and Topics

The rapid integration of renewable energy sources into modern power grids is introducing unprecedented challenges across planning, operation, protection, and control. This special session will address critical issues affecting grid stability, reliability, and flexibility as renewable penetration continues to rise. It brings together experts from academia, TSOs, software developers, and industry to present cutting edge research, validated methodologies, and real-world applications that tackle the next generation of grid-integration challenges.

Topics of the session include, but are not limited to:

- **Key Challenges in Renewable-Dominated Grids**
  - ➤ Reduced inertia and system strength; evolving stability boundaries in high-IBR grids
  - ➤ Fault-ride-through compliance; weak-grid operation, control, and protection challenges
  - ➤ Grid congestion, curtailment mechanisms, and operational uncertainty
- **Emerging and Enabling Technologies**
  - ➤ Grid-forming inverters (VSM, virtual inertia, advanced droop)
  - ➤ Hybrid power plants (PV–wind–storage)
  - ➤ HVDC grids and offshore energy hubs
- **Practical, Scalable Solutions**
  - ➤ System-strengthening strategies: FACTS, synchronous condensers, and GFM assets.
  - ➤ Battery energy storage for frequency support, fast reserves, and synthetic inertia.
  - ➤ Solutions for voltage stability, oscillation damping, and short-circuit support in weak grids.
- **Advances in Modeling, Simulation & Control**
  - ➤ High-fidelity dynamic modeling of IBRs, HVDC, and hybrid plants (RMS/EMT/hybrid)
  - ➤ Co-simulation platforms, digital twins, and hardware-in-the-loop validation
  - ➤ AI/ML-enhanced stability assessment and adaptive control

Timeline for Authors

All the instructions for paper submission are available on the conference website. Please visit www.iecon2026.org or scan the QR code for the timeline.