

Call for Papers for the Special Session on

GRID STABILITY ANALYSIS AND CONTROL IN RENEWABLE-DOMINATED POWER SYSTEMS

Organized and co-chaired by

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Technical Outline of the Session and Topics

The increasing penetration of inverter-based renewable energy resources (IBRs) is fundamentally transforming power system dynamics and challenging conventional notions of grid stability. Unlike synchronous-machine-dominated systems, renewable-dominated grids exhibit reduced inertia, fast control-driven dynamics, and strong coupling between power electronics, communication layers, and protection systems. These characteristics necessitate a paradigm shift in how stability is modeled, analyzed, and ensured. This Special Session focuses explicitly on grid stability mechanisms, analytical frameworks, and validation approaches for renewable-rich power systems. The session is structured around a multi-time-scale stability framework, covering interactions between converter-level controls, system-level dynamics, protection coordination, and resilience strategies. Emphasis is placed on modeling assumptions, analytical methods, and experimental validation, bridging theory with practical deployment challenges.

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

- Stability Modeling and Time-Scale Separation in Renewable-Dominated Grids.
- Inertia, Frequency Stability, and Fault Dynamics, Power quality assessment and improvement.
- Protection Coordination and Stability-Constrained Control.
- Stability-Aware Energy Management and Cyber-Physical Enablers.
- Mobility-aware vehicle-to-grid control in smart grids.
- Smart enabling technologies for the effective penetration of renewable-based microgrids.
- Small-signal and large-signal stability of grid-forming converters.
- Converter-grid interaction and impedance-based stability methods.
- Interaction between grid-forming, grid-following, and grid-supporting controls.
- Stability of hierarchical and distributed control architectures.
- Fault-induced stability phenomena in converter-dominated grids.
- Virtual inertia and fast frequency dynamics in low-inertia power systems.
- Dynamic stability during islanding, resynchronization, and black start.

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.

