IECON 2026

Doha, Qatar | 18-21 October

The 52nd Annual Conference of the IEEE Industrial Electronics Society

Call for Papers for the Special Session on

Intelligent Condition Monitoring of Smart Grids Under Net-Zero Transition and Uncertainty

Organized and co-chaired by

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Technical Outline of the Session and Topics

The rapid transition toward net-zero energy systems is significantly increasing the complexity, uncertainty, and operational stress within modern smart grids. The high penetration of renewable energy sources, distributed energy resources, electric vehicles, and power-electronic interfaces, along with bidirectional power flows, introduces new reliability challenges that traditional monitoring approaches cannot adequately address. This special session aims to bring together recent advances in intelligent, uncertainty-aware condition monitoring, diagnostics, and prognostics for smart grids and converter-dominated energy systems. Emphasis is placed on data-driven, physics-informed, and hybrid approaches that enhance situational awareness, predictive maintenance, and resilient grid operation under stochastic and dynamic conditions. The session particularly welcomes contributions that explicitly consider uncertainty quantification, net-zero operational scenarios, and real-world deployment challenges in modern power and energy systems.

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

- AI/ML-based condition monitoring for smart grids
- Monitoring of converter-dominated and low-inertia power systems
- Condition monitoring of energy storage systems and EV infrastructure
- Digital twins for smart grid asset monitoring and hybrid data-driven approaches
- Predictive maintenance in renewable-rich grids and energy storage systems
- Cyber-physical monitoring and real-time monitoring and edge intelligence
- Net-Zero operational scenarios and uncertainty-aware prognostics

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.