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

POWER CONVERTERS AND AI-DRIVEN CONTROL FOR INTELLIGENT EV CHARGING INFRASTRUCTURE

Organized and co-chaired by

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Technical Outline of the Session and Topics

The rapid growth of electric vehicle (EV) adoption demands the development of ultra-fast and megawatt-level charging infrastructures capable of delivering high power while maintaining grid stability, reliability, and efficiency. However, high-power charging hubs introduce challenges such as voltage instability, harmonic distortion, thermal stress, and increased converter failure risks. This special session focuses on advanced power electronics architectures and grid-supportive charging strategies designed to address these technical barriers and enable scalable, resilient EV charging ecosystems. A key emphasis of the session is the integration of AI-enabled predictive and adaptive control techniques with high-power converter systems. It aims to clearly distinguish conventional model-based control approaches (e.g., PI, MPC, droop control) from true AI-driven solutions such as machine learning-based load forecasting, reinforcement learning for adaptive power allocation, and data-driven fault diagnosis. Strong attention will be given to embedded implementation (DSP/FPGA), hardware-in-the-loop validation, and experimental benchmarking, ensuring practical relevance and alignment with IEEE IES priorities in power electronics, control, and industrial embedded systems.

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

- Converter architectures for Ultra-Fast and Megawatt Charging Systems (MCS)
- Reliability-oriented and fault-tolerant design for high-power charging
- Grid impact analysis and mitigation for large EV charging hubs
- AI-driven predictive control vs. conventional control: comparative evaluation
- Reinforcement learning and data-driven optimization for charging management
- Embedded and real-time implementation of AI-based controllers
- HIL and experimental validation platforms
- Smart charging strategies (V2G, V2X) with ancillary service support
- Solid-State Transformers (SSTs) for high-power charging applications
- Modular and scalable power converter architectures

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.