Call for Papers for the Special Session on

Intelligent Power Electronics Systems for efficient energy conversion: Design, Control, Monitoring and Reliability

Organized and co-chaired by

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Technical Outline of the Session and Topics

Power electronics systems enable efficient energy conversion and control in applications such as power systems, electric vehicles, industrial drives, renewable energy integration, and data centers. As requirements for higher efficiency, power density and quality , dynamic performance, and reliability continue to grow, these systems must operate robustly under wide operating conditions, thermal stress, and grid disturbances, while meeting tighter EMI and packaging constraints. Recent advances in AI and ML are creating new opportunities to enhance power electronics beyond conventional methods. AI is increasingly applied to data-driven modelling and identification, design optimization and automated tuning, adaptive control, real-time monitoring and protection, fault diagnosis, and predictive maintenance. When combined with physics-based understanding and practical implementation, these approaches can improve robustness, reliability, and overall system performance. This Special Session offers a platform for researchers and practitioners to present innovations and real-world implementations of AI-enhanced power electronics systems. We welcome contributions with theoretical, simulation, and experimental results, including hardware prototypes, HIL/PHIL demonstrations, benchmark datasets, and industrial case studies. This Special Session supports SDG 7 (Affordable and Clean Energy) by advancing high-efficiency, reliable power electronics that accelerate renewable integration and reduce energy losses across electrified applications.

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

- Control and optimization of power converters
- Intelligent methods for energy storage systems: SOC/SOH estimation, safety, lifetime improvement
- Intelligent converter design, modelling, parameter identification fault detection, diagnostics, and fault-tolerant operation
- Predictive maintenance and remaining useful life estimation for power electronic components
- Supervised learning-aided design and control of power converters with validation
- Digital twins and intelligent HIL/PHIL testing and validation for power converters
- Emerging intelligent techniques for power converters
- Other Similar Topics

Timeline for Author

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.