

**Call for Papers for the Special Session on**

**NEXT-GENERATION POWER CONVERSION AND ENERGY MANAGEMENT  
SOLUTIONS FOR SMART ELECTRIC RAILWAY SYSTEMS**

**Organized and co-chaired by**

**Bashir Bakhshideh Zad**, University of Mons, Belgium

**Olivier Deblecker**, University of Mons, Belgium

**Hamed Jafari Kaleybar**, Politecnico di Milano, Italy

**Morris Brenna**, Politecnico di Milano, Italy

[bashir.bakhshidehzad@umons.ac.be](mailto:bashir.bakhshidehzad@umons.ac.be)

[olivier.deblecker@umons.ac.be](mailto:olivier.deblecker@umons.ac.be)

[hamed.jafari@polimi.it](mailto:hamed.jafari@polimi.it)

[morris.brenna@polimi.it](mailto:morris.brenna@polimi.it)

**Technical Outline of the Session and Topics**

Electric railways have long been recognized as a clean and sustainable mode of transportation. As the global energy transition accelerates, the demand for efficient, high-performance, and resilient railway systems continues to rise, calling for advanced power conversion and energy management solutions. In response, modern railways are evolving into smart, multi-source energy systems that integrate storage and renewable generation. This transformation leads to increasingly complex energy flows, which in turn require sophisticated optimal scheduling and control strategies. In parallel, recent technological breakthroughs in new semiconductor devices, advanced power module packaging, and energy storage technologies provide new opportunities to enhance both onboard and stationary power converters and storage systems in railways. Furthermore, advances in digital technologies enable the development of innovative identification techniques and digital twins, enhancing the monitoring, predictive maintenance, and overall reliability of power converters and traction systems. These new solutions are required across a wide range of electric railway structures, from low-power systems such as tramways to high-power, high-speed trains.

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

- Optimal scheduling and energy management in smart electric railway grids integrating battery energy storage systems, renewable generations, bidirectional substations, etc.
- New design topologies for onboard power converters (modular architecture, WBG devices, solid-state transformers, matrix converters, etc.)
- Integrated multimodal energy and propulsion systems for next-generation railway vehicles (fuel cell, hydrogen-based, battery-electric, and hybrid systems)
- Power quality assessment and mitigation in traction systems
- Advanced control and modulation strategies (model predictive control, high-bandwidth control for WBG converters, fault-tolerant control schemes, etc.)
- Thermal management and high-power density for compact power electronics in railways
- System identification and digital twin techniques for monitoring and predictive maintenance
- Regenerative braking energy utilization and optimization

**Timeline for Authors**

All the instructions for paper submission are available on the conference website. Please visit [www.iecon2026.org](http://www.iecon2026.org) or scan the QR code for the timeline.

