

Special Issue

Modeling, Control and Simulation of Power Electronic Converters for the Power Grid Application

Message from the Guest Editors

- Multi-physics/multi-time scale modeling of PECs.
- Black-box/white-box/grey-box modeling for stability analysis.
- Modelling of converter interactions in AC/DC hybrid grids.
- Representation of converter dynamics during faults and transients.
- Modelling of emerging topologies (MMC variants, solid-state transformers, direct AC/AC converters).
- Advanced control for grid-forming and grid-supporting converters.
- Coordinated control strategies for converter clusters, MVDC/HVDC systems, and hybrid AC/DC grids.
- Fault ride-through (FRT) and fault management strategies under diverse grid conditions.
- Resilient and adaptive control for grid restoration and black-start.
- AI/ML-enhanced converter control for optimization, diagnostics, and security.
- Real-time simulation (RTS) and hardware-in-the-loop (HIL) testing techniques for grid-connected converters.
- Development and validation of computationally efficient models for large-scale system studies.
- Co-simulation frameworks integrating electromagnetic transients (EMTs), transient stability (TS), and optimal power flow (OPF) tools.
- Digital twins for converter monitoring, control optimization, and lifetime prediction.

Guest Editors

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