

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

Dr. Can Wang

School of Mechanical Engineering and Automation, Harbin Institute of Technology, Shenzhen 518055, China

Dr. Xuewei Pan

School of Mechanical Engineering and Automation, Harbin Institute of Technology, Shenzhen 518055, China



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Energies
Editorial Office
MDPI, Grosspeteranlage 5
4052 Basel, Switzerland
Tel: +41 61 683 77 34
energies@mdpi.com

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Editor-in-Chief

Prof. Dr. Enrico Sciubba

Department of Mechanical and Industrial Engineering, University
Niccolò Cusano, 00166 Roma, Italy

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