Call for Papers

IEEE Journal of Emerging and Selected Topics in Power Electronics

Modular Power-Electronics and Reconfigurable Circuits in Energy Storage, Energy Conversion, and Power Management

Far beyond their origin in high-voltage applications, the latest high-performance semiconductors allow highly flexible as well as modular circuit structures that would have not been feasible or economical before. Furthermore, the combination of those semiconductors and circuits led to the integration of power electronics into previously rather inflexible applications e.g., battery packs and photovoltaics, for the exploitation of unrealized potential. Having started primarily in the high-voltage field, the modular technology development is increasingly including lower-voltage applications and circuits.

Instead of relying on a single expensive high-power unit, modular electronics harness the benefits of economy-of-scale effects by employing multiple, typically identical modules. Concurrently, power electronics increasingly explores and enhances traditionally hard-wired structures such as storage and energy sources, e.g., batteries or fuel-cells, where it can enable dynamic reconfiguration or active power distribution. This approach offers several advantages, including increased controllability through the inherent redundancy of modular systems, more degrees of freedom (DOF) to manage other properties, higher functional integration, improved power and energy distribution control, enhanced thermal management, higher efficiency, and increased utilization. Nevertheless, the high number of DOF in these structures presents challenges in design, control, and integration. Managing trade-offs between different objectives necessitates innovative and flexible topologies, control, and monitoring approaches. These approaches should capitalize on the system's capabilities while keeping costs within acceptable limits. Moreover, the dynamic nature of modular structures requires ongoing research and development efforts to address emerging challenges and optimize system performance.

Topics of interest include, but are not limited to:

- Novel structures and circuits for modular or reconfigurable systems;
- Novel control and modulation techniques (distributed, hierarchical, or central) to reduce complexity, improve efficiency, introduce new functionalities, or increase stability;
- Higher functional integration by exploiting available DOF in available power electronics;
- Multiport (multi-input or output) energy conversion or storage systems;
- Reconfigurable electronics-integrated energy storage systems, such as reconfigurable or smart batteries or fuel-cells;
- Advanced thermal management in modular reconfigurable storage or conversion systems, e.g., active thermal and power balancing;
- Modeling and analysis of reconfigurable or dynamic storage and energy conversion systems;
- Reliability and lifetime aspects of modular power electronics systems, degradation, and ageing;
- Strategies for cost reduction in the power electronics circuitry, such as sensor or communication reduction through novel estimators or diagnostics;
- Functional safety of modular power electronics;
- Fault-tolerant operation of modular and reconfigurable power electronics;
- Multi-objective optimization for trade-offs in modular power electronics design;
- Novel applications of modular or reconfigurable circuits;
- Modular power electronics in renewable energy systems, such as reconfigurable photovoltaic (PV) systems;
- Energy management and dynamic power distribution with modular power electronics;

All submissions should be made through *Manuscript Central* at http://mc.manuscriptcentral.com/jestpe-ieee. The cover page should be clearly marked with "Special Issue on <TITLE>" and the appropriate manuscript type should be selected when uploading the submission. Manuscripts submitted for this special issue will be handled by the guest editorial board outlined below. For more information on special issues and electronic submissions, please go to http://www.ieee-pels.org/publications/jestpe.

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Deadline for Submission of Manuscript: 31 Jan. 2025

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Proposed Timeline

- **Aug. 31, 2024:** Call for papers to IEEE JESTPE Editorial Office
- **Jan. 31, 2025:** Manuscript submission deadline
- **Apr. 30, 2025:** Final acceptance notification
- **May. 31, 2025:** Manuscript forwarded to IEEE for publication
- **Jul. 2025:** Special Issue appears in IEEE JESTPE