IEEE Conference on Industrial Cyber-Physical Systems (ICPS)

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https://icps2026.ieee-ies.org/

Proposal for an ICPS 2026 Special Session

- **Title of the proposed Special Session:**

Advanced Control, Monitoring and Industrial Applications of Power Electronic Systems

- **Names, photos, very short bios, and emails of the organizers:**

Organizer 1: Zifan Lin (Zifan.lin@curtin.edu.au; Google Scholar) received the B.S. degree with distinction in Engineering Science in 2017 and the MPE degree with distinction in Electrical and Electronic Engineering in 2019, both from the University of Western Australia (UWA), Perth, WA, Australia, Where he completed his Ph.D. with the co-sponsor of Future Battery Industry Cooperative Research Center 2025. He is currently a Lecturer at Curtin University and adjunct Lecturer at UWA. His research interests include modulation and control for multilevel inverters, power converters, electric machine drives, and image enhancement.

Organizer 2: Yulin Liu (yulin-leo.liu@polyu.edu.hk, Google Scholar) received the B.E. degree in automation from the Southwest University, China, in 2018. He received his MPE degree in electrical and electronic engineering from The University of Western Australia (UWA), Australia, in 2020. He received his PhD degree in electrical and electronic engineering from UWA, Australia, in 2024. From 2024-2025, he was a postdoctoral research associate in the UWA, Australia. He joined the Hong Kong Polytechnic University (PolyU), China, as a postdoctoral fellow in 2025. His research focuses on the intelligent control of energy storage systems in renewable energy power grids, and his research interests have recently extended to intelligent manufacturing.

Organizer 3: Ehsan Pashajavid (Ehsan.Pashajavid@curtin.edu.au; Google Scholar) has been with Curtin University, Bentley Campus, as a Lecturer, since January 2022. Earlier on, he was with Central Queensland University, as a Lecturer. He has demonstrated a track record of research focused on MG, stochastic modeling and optimization of renewable energy resources, electric vehicles, and power quality. He has three-year work experience in the power industry.

- **Technical outline and topics of the special session:**

Outline (up to 100 words):

Industrial cyber-physical systems increasingly rely on advanced power engineering technology including power electronics and machine as critical interfaces between renewable energy sources, energy storage, industrial loads, and the grid. This special session focuses on the convergence of power

engineering, intelligent control, and industrial applications, addressing practical challenges in design, monitoring, fault tolerance, and system integration. We invite contributions that bridge theoretical advances and real-world implementations in industrial settings, including microgrids, renewable integration, and specialized industrial applications. The session emphasizes real-world application, industry collaboration, and solutions addressing the unique constraints of industrial power systems operating in isolated grids and challenging environments.

Topics:

- Advanced modulation and control strategies for industrial power converters
- Fault-tolerant control of power electronic systems
- Health monitoring and predictive maintenance for industrial applications
- Grid-forming and grid-following inverters for renewable energy integration
- Power quality, harmonics, and electromagnetic compatibility in industrial systems
- Multilevel converter topologies and their industrial applications
- Industrial microgrid design, control, and optimization
- Battery energy storage systems and their integration in industrial applications
- Hardware-in-the-loop and experimental validation of power electronic systems
- Renewable energy integration in isolated and weak grid systems
- Industrial applications: robotics, automation, electric vehicles, mining equipment

- **Technical track(s) with similar topics (clearly point out difference to the Track scope)**

Difference from T05 - ICPS Energy:

T05 covers broad cyber-physical energy system topics including smart grid, microgrid, renewable energy, energy storage, power trains, and electric vehicles. T05 focuses on cyber-physical system architectures and high-level energy system design.

This Special Session provides a complementary focus on the power electronic converter systems that form the critical hardware interface layer within these cyber-physical energy systems. Specifically, we emphasize:

1. Detailed converter-level control algorithms and modulation strategies
2. Hardware implementation and experimental validation
3. Fault diagnosis, health monitoring, and fault-tolerant operation of converters
4. Practical industrial applications with real hardware constraints
5. Model-independent control methods suitable for industrial deployment
6. Physics-informed approaches to power converter monitoring and control

While T05 addresses the system-level cyber-physical architecture, our session addresses the power electronics hardware layer that enables these systems to function reliably in industrial environments.

Difference from T06 - ICPS Advanced Modeling, Control, and Optimization:

T06 covers general ICPS system modeling, control theory, and optimization across all industrial domains. T06 provides broad control methodologies applicable to diverse cyber-physical systems.

This Special Session focuses specifically on power electronic systems and their unique control challenges:

7. Power converter-specific phenomena: switching dynamics, dead-time effects, modulation constraints
8. Grid interaction challenges: grid-forming control, synchronization, power quality
9. Industrial power system applications: marine inverters, mining equipment, robotic systems
10. Hardware-validated solutions rather than pure simulation studies
11. Industry-driven problem formulations from real CRC and commercial projects
12. Integration challenges specific to renewable energy and energy storage systems

While T06 provides general control frameworks, our session addresses power electronics domain-specific challenges that require specialized knowledge of converter topologies, grid codes, and industrial power system constraints.

- **IES Technical Committees supporting the special session (if any)**

- **At least 6 potential initial contributing authors (names, affiliations and institutional emails):**

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- **At least 10 potential reviewers (names, affiliations and emails):**

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The proposers have read and adhere to the overall IEEE IES Special session conditions as shown on the website https://icps2026.ieee-ies.org/for_authors/index.html#call-for-special-sessions: YES / NO
YES