IEEE I&CPS
ASIA 2026
2026 IEEE IAS Industrial and Commercial Power System Asia
July 11-14, 2026 | Kunming, China

Special Session 04

Control Interaction and IBR-Induced Sub-Synchronous Oscillations in Modern Power Systems

Introduction and Topics

The rapid integration of inverter-based resources (IBRs), such as wind power, photovoltaic systems, and battery energy storage, is fundamentally transforming modern power systems. While these technologies enable cleaner and more flexible grids, they also introduce new dynamic behaviors due to their fast-acting control systems. One of the most critical emerging challenges is sub-synchronous oscillation (SSO) caused by complex control interactions among IBRs, synchronous machines, and network components.

Unlike traditional SSO phenomena dominated by turbine-generator shaft dynamics, IBR-induced SSO is primarily driven by control loops, phase-locked loops, and grid-following or grid-forming strategies. These interactions can lead to poorly damped or even unstable oscillatory modes, especially in weak grids or systems with high penetration of power electronics. In addition, AC–DC and DC–AC power conversion interfaces play a critical role in shaping system dynamics, where advanced control strategies can significantly influence stability and oscillatory behavior. Recent field incidents have demonstrated that such oscillations can propagate across wide areas, posing serious risks to system stability and reliability.

This special session aims to bring together researchers and industry experts to explore the mechanisms, modeling, analysis, and mitigation of control interaction and IBR-induced SSO.

Topics including but not limited to:

1.Small-signal and impedance-based stability analysis
2.Interaction between multiple converters
3.Impact of grid strength and network topology
4.Advanced control design for damping oscillations
5.Grid-following/grid-forming control
6.Real-world case studies
7.Hardware-in-the-loop or field validation
8.Advanced control of power conversion interfaces and their impact on system-level stability

By fostering discussion on these critical issues, this session seeks to advance understanding and promote practical solutions for ensuring stable and resilient future power systems.

Special Session Chairs

Dr. Shuailong Dai
National Energy System Operator

Dr. Yulin Liu
The Hong Kong Polytechnic University

Dr. Zifan Lin
Curtin University

Dr. Yixin Li
Ove Arup & Partners International Ltd.

Dr. Xiang Zhang
State Grid Liaoning Electric Power Co.

Prof. Herbert Ho Ching Iu
University of Western Australia

Paper Submission

Submission Method

* View paper submission instruction on website
https://www.ieee-icps.com/sub.html

* Submit your paper through the website or QR code
https://easychair.org/conferences/?conf=ieeeicpsasia2026

Important Dates

Submission Deadline	May 25, 2026
Notification Deadline	June 10, 2026
Early-bird Registration Deadline	June 15, 2026
Author Registration Due	June 15, 2026

Publication

Submissions to IEEE I&CPS 2026 will be peer reviewed on the basis of technical quality, relevance to conference topics, originality, significance, clarity, etc. Accepted papers will be submitted for inclusion into IEEE Xplore subject to meeting IEEE Xplore's scope and quality requirements.

Excellent papers will be recommended for review by **IEEE Trans on Industry Applications** (proportion can reach up to 50%), **Global Energy Interconnection** and **DeCarbon**.

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