

Special Session II

Special Session Basic Information:

专栏题目
Session Title

中文：人工智能驱动的高比例新能源微电网及虚拟电厂的运行优化及控制
英文：AI-Driven Operational Optimization and Control of Microgrids and Virtual Power Plants with High-Penetration Renewable Resources

专栏介绍和征稿主题
Introduction and topics

中文：
随着全球能源系统向低碳化、智能化和可持续化转型，高比例新能源微电网和虚拟电厂（VPP）成为实现能源高效利用和电网韧性提升的核心技术。然而，高比例可再生能源的接入带来了系统波动性加剧、电能质量下降、运行优化难度增加以及电网韧性不足等挑战。人工智能（AI）技术的快速发展为解决这些复杂问题提供了创新思路 and 高效工具。
本 Special Session 聚焦于 AI 驱动的新能源微电网和虚拟电厂的运行优化与控制技术，旨在探讨如何利用先进的 AI 算法和工具提升这些系统的运行效率、稳定性和韧性。会议将重点关注 AI 在新能源微电网和虚拟电厂发电预测、系统优化、实时控制、故障诊断与自愈等领域的应用，同时分享实际案例中 AI 技术的落地与效果验证。
征稿主题包括但不限于：
1) 基于AI的新能源发电预测方法。
2) 微电网多目标优化调度与实时控制。
3) 基于强化学习的微电网自适应控制策略。
4) 分布式能源资源的AI聚合与协调控制。
5) VPP参与电力市场的AI驱动决策与交易策略。
6) AI在VPP灵活性与电网韧性提升中的应用。
7) 基于AI的储能配置优化与调控。
8) 氢储能与燃料电池系统的AI优化与控制。
9) 混合储能系统协同优化的AI方法。
英文：
With the global energy system transitioning toward low-carbon, intelligent, and sustainable solutions, high-renewable microgrids and virtual power plants (VPPs) have emerged as critical technologies for achieving efficient energy utilization and enhancing grid resilience. However, the integration of high proportions of renewable energy sources poses significant challenges, including increased system volatility, degraded power quality, difficulty in operation optimization, and reduced grid resilience. The rapid advancement of artificial intelligence (AI) provides innovative solutions and efficient tools to address these complex issues.
This Special Session focuses on AI-driven operational optimization and control technologies for microgrids and VPPs with high-penetration renewable resources. It aims to explore how advanced AI algorithms and tools can enhance the efficiency, stability, and resilience of these systems. The session will emphasize AI applications in renewable energy forecasting, system optimization, real-time control, fault diagnosis, and self-healing for microgrids and VPPs. Practical case studies and implementation experiences of AI technologies will also be shared.
The topics of interest include, but are not limited to:
1) AI-based forecasting methods for renewable energy generations.

- 2) Multi-objective optimal scheduling and real-time control of microgrids.
- 3) Reinforcement learning-based adaptive control strategies for microgrids.
- 4) AI-based aggregation and coordinated control of distributed energy resources.
- 5) AI-driven decision-making and trading strategies for VPPs participating in electricity markets.
- 6) Applications of AI in enhancing VPPs' flexibility and grid resilience.
- 7) AI-based configuration optimization and control of energy storage systems.
- 8) AI-based optimization and control of hydrogen energy storage and fuel cell systems.
- 9) AI-based methods for collaborative optimization of hybrid energy storage systems.

Special Session Chair(s):

	姓名 Name	Wenliang Yin (尹文良)
	称谓 Prefix	A/Prof. (副教授)
	部门 Department	School of Electrical and Electronic Engineering (电气与电子工程学院)
	单位 Organization	Shandong University of Technology (山东理工大学)
	城市/地区 City/Region	Zibo, Shandong (山东省淄博市)

Organizer's Brief Biography


中文:

山东理工大学副教授，硕士生导师；华北电力大学博士、澳大利亚新南威尔士大学联合培养博士、悉尼大学博士后研究员。主要从事新能源发电技术与装备、风电制氢储能、智能电网与虚拟电厂等方面的研究；主持国家自然科学基金、国家留学基金、山东省自然科学基金、山东省高等学校青年创新团队项目、国网公司委托项目等纵/横向项目 10 余项。现任山东理工大学电气工程系主任、山东省分布式电源并网示范工程技术研究中心副主任、淄博市智能电网装备产业创新研究院副秘书长、山东省高等学校青年创新团队带头人；兼任山东储能协会常务理事、IEEE/中国电机工程协会会员、山东电子学会青年科学家工委委员、《电工技术》和《中国电力》期刊青年编委。截至目前，发表学术论文 47 篇，授权国家发明专利 10 余项，以第一/通讯作者，发表 SCI/EI 检索论文 30 余篇。

英文:

Dr. Wenliang Yin is an Associate Professor at Shandong University of Technology. He holds a Ph.D. from North China Electric Power University, a joint Ph.D. program from the University of New South Wales, Australia, and a postdoctoral research position at the University of Sydney. His research focuses on renewable energy generation technology and equipment, wind power hydrogen production and storage, smart grids, and virtual power plants (VPPs).

Dr. Yin has led over 10 national and industry-sponsored projects, including grants from the National Natural Science Foundation of China, the Shandong Provincial Natural Science Foundation, and the State Grid Corporation of China. Currently, he serves as the Head of the Electrical Engineering Department at SDUT, Deputy Director of the Shandong Provincial Distributed Power Grid-Connection Demonstration Engineering Technology Research Center, Deputy Secretary-General of the Zibo Smart Grid Equipment Industrial Innovation Institute, and Leader of the Shandong Provincial Higher Education Young Innovation Team. He is also a Standing Council Member of the Shandong Energy Storage Association, a member of IEEE and CSEE. Additionally, he serves on the Young Scientists Committee of the Shandong Electronics Society and is a Young Editorial Board Member of Electric Engineering Technology and China Electric Power. Dr. Yin has published 47 academic papers, authored 10+ granted national invention patents, and contributed 30+ SCI/EI-indexed papers as first or corresponding author.

	姓名 Name	Lin Liu (刘琳)
	称谓 Prefix	Dr. (博士)
	部门 Department	School of Electrical and Data Engineering (电气与信息工程学院)
	单位 Organization	University of Technology Sydney (悉尼科技大学)
	城市/地区 City/Region	Sydney, Australia (澳大利亚 悉尼)

Organizer's Brief Biography

中文：
2024 年获得华北电力大学、俄罗斯南乌拉尔国立大学硕士双学位，2024 年获悉尼科技大学博士学位师从国际著名电机/电磁专家 Jianguo Zhu 教授；2024 年至今获校长奖学金赴香港理工大学攻读博士第二学位。主要研究领域包括：电机驱动系统设计与优化、磁性材料特性建模、人工智能在电力能源系统中的应用。截至目前，累计发表/录用学术论文 39 篇，以第一/通讯作者在 IEEE Trans. TIE、TTE 等顶级期刊发表 SCI 论文 15 篇、《电网技术》、《机械工程学报》等领军期刊发表中文 EI 论文 4 篇，参加国际会议 10 余次，特邀报告 3 次。承担澳大利亚研究委员会（ARC）、国家基金委面上和重点实验室项目的研究任务；获聘连续 18 个月的悉尼科技大学科研助理；现为 IEEE 会员、IEEE 和 IET 等电气领域权威期刊审稿专家、Frontiers 客座编辑、UTS IEEE 学生分会副主席。荣获 IEEE TIE 编辑部授予的优秀审稿人奖(Top 1%)；获聘连续 30 个月的教学助理，获 2022 年度 UTS 杰出教学助理奖（Top 1%）。

英文：
Dr. Lin Liu obtained dual master's degrees from both North China Electric Power University and South Ural State University in 2024. In the same year, she earned his Ph.D. degree from the University of Technology Sydney (UTS), under the supervision of internationally renowned Professor Jianguo Zhu. Since 2024, she has been pursuing a second Ph.D. degree at the Hong Kong Polytechnic University, supported by a President's Scholarship. Her research focuses on the design and optimization of motor drive systems, modeling of magnetic material properties, and the application of artificial intelligence in power and energy systems.

Dr. Liu has authored or co-authored 39 academic papers, including 15 SCI papers as first or corresponding author in top journals such as IEEE Trans. TIE and TTE, and 4 leading Chinese EI papers in journals like 《Power System Technology》 and 《Journal of Mechanical Engineering》. She has participated in over 10 international conferences and delivered 3 invited reports. Dr. Liu has been involved in research projects funded by the Australian Research Council (ARC), the National Natural Science Foundation of China (NSFC), and key laboratory programs. She served as a research assistant at UTS for 18 months. Currently, he is a member of IEEE, a reviewer for authoritative journals in the electrical field such as IEEE and IET, and a guest editor for Frontiers. She also holds the position of Vice-Chair of the UTS IEEE Student Branch. She has been recognized with the IEEE TIE Editorial Board's Outstanding Reviewer Award (Top 1%) and the 2022 UTS Outstanding Teaching Assistant Award (Top 1%).