Special Session XV

Special Session Basic Information:

专栏题目 Session Title	中文：E-mobility 赋能未来电力系统 英文：E-mobility: Enabler of Next Generation Flexible, Resilient & Sustainable Energy Systems

专栏介绍和征稿主题
Introduction and topics

With the rapid advancement of the global energy transition and transportation electrification, electric mobility (e-mobility) is no longer an end-use electricity sector. Instead, it is recognized as a key source of flexibility and resilience in modern power systems. This special session focuses on the integration of electric mobility and power systems, and explores its role in enhancing system flexibility, resilience, and sustainability.

Attention will be given to Vehicle-to-Grid (V2G) technologies. Through bidirectional charging and discharging, electric vehicles can contribute to peak shaving, frequency regulation, renewable energy integration, and emergency power supply. These capabilities enable distributed and user-side resources to transition from passive loads to active participants in power system operation, thereby significantly improving overall system flexibility and reliability. At the same time, the rapid development of electric vertical take-off and landing vehicles (eVTOLs) is further expanding interactions between mobility systems and power networks. Their high-power demand and operational mobility pose new challenges for distribution network planning and operation. At the same time, eVTOLs offer opportunities for power system support, including transmission and distribution line inspection, condition monitoring, disaster assessment, emergency repair, and resilience enhancement. Electrified and automated inspection and emergency response technologies can also improve system visibility and accelerate recovery under extreme weather events and other disturbances.

By addressing technological innovations and engineering deployments, this special session aims to bring together research from the power systems, transportation, low-altitude aviation, and digital technology communities. The target is to support the development of flexible, resilient, and low-carbon power systems enabled by e-mobility.

This special session welcomes original research articles and review papers. Topics of interest include, but are not limited to, the following:

- Coordinated planning and operation of electric mobility and power systems
- V2G and their applications in peak shaving, frequency regulation, reserve provision, and emergency power supply
- Coordinated optimization and aggregation of electric vehicles, charging infrastructure, and distributed energy resources
- Impacts of electric mobility on power system flexibility under high penetration of renewable energy
- Demand characteristics of low-altitude electric aircraft and their impact on urban energy systems
- Applications of eVTOL in power line inspection, condition monitoring, disaster assessment, and system resilience
- Integrated modeling, simulation, and digital-twin methods for energy–transportation–low-altitude systems
- Applications of data analytics, artificial intelligence, and communication technologies in e-mobility systems

在全球能源转型与交通电气化加速推进的背景下，E-mobility 正在从单一的用能终端，演进为新型电力系统中的关键灵活性与韧性资源。本专题聚焦电动交通与电力系统的深度融合，探讨其在提升系统灵活性、韧性与可持续性方面的创新潜力与实践路径。

专题将重点讨论车网互动（Vehicle-to-Grid，V2G） 技术如何通过电动汽车的双向充放电能力，参与电力系统调峰调频、可再生能源消纳及应急供电，推动分布式、用户侧资源由“被动负荷”向“主动调节单元”转变，从而增强

电力系统的运行灵活性与抗冲击能力。与此同时，随着低空飞行器（如电动垂直起降飞行器，eVTOL）及电动无人机的快速发展，其在电力系统中的角色正不断拓展。一方面，低空飞行器高功率、高机动性的用能特征为城市配电网规划、电力基础设施布局及运行调度带来新的挑战与机遇；另一方面，其在输配电线路巡检、灾害快速评估、应急抢修与容灾保障中的应用潜力日益凸显。通过电动化、智能化的低空巡检与应急响应能力，可显著提升电力系统在极端气候和突发事件下的可视化感知水平与恢复效率，增强系统整体韧性。

通过政策、技术与商业模式的多维度交流，本专题旨在汇聚电力、交通、低空经济与数字化领域的前沿洞见，探索以 E-mobility 为纽带，构建更加灵活、韧性强且低碳可持续的未来电力系统。

本期特刊欢迎原创研究论文和评论。研究领域包括（但不限于）以下内容：

- 电动交通与新型电力系统的协同规划与运行
- 车网互动技术及其在调峰调频、备用与应急供电中的应用
- 电动汽车、充换电设施与分布式能源的协同优化与聚合控制
- 高比例可再生能源条件下，电动交通负荷对电力系统灵活性的影响
- 低空飞行器的电力需求特性及其对配电网和城市能源系统的影响
- 低空飞行器在输配电线路巡检、状态感知、灾害评估与电力系统容灾中的应用
- 面向极端气候与突发事件的电动交通与低空飞行器应急能源保障机制
- 能源—交通—低空系统的多层级协同建模、仿真与数字孪生
- 数据、人工智能与通信技术在车网互动与低空电力应用中的作用

Scope and topics of of the special session
1: Power Generation and Distribution - Energy storage systems
3: Energy Efficiency and Management - Energy conservation in transportation

Names of potential participants, such as program committee members and invited speakers
Quanquan Zhang (The Hong Kong Polytechnic University)
Chao Lei (The University of British Columbia)
Zhongbei Tian (University of Birmingham)
Yichen Shen (Shanghai Jiao Tong University)
Guangyao Chen (Cornell University)

Special Session Chair(s):

姓名 Name	李双歧 Shuangqi Li
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Organizer's Brief Biography

中文：李双岐博士现任香港理工大学电机及电子工程学系电网现代化研究中心助理教授。他于2023年获得英国巴斯大学电子与电气工程博士学位。在此之前，他曾在国家电动汽车工程实验室担任研究助理，随后在香港理工大学和康奈尔大学从事博士后研究工作。他的研究方向聚焦于利用 AI4Sci、数据挖掘和系统工程方法，提升互联能源与交通系统中的电池设计、建模与管理水平。他已发表50余篇期刊论文，被引超过1,800次，H 指数为25。曾获多项荣誉与奖项，包括中国政府优秀留学生奖以及美国Schmidt AI for Science 项目资助。

英文：Dr. Shuangqi Li is an Assistant Professor at the Research Centre for Grid Modernization in the Department of Electrical and Electronic Engineering at The Hong Kong Polytechnic University. He received his Ph.D. in Electronic and Electrical Engineering from the University of Bath in 2023. Before that, he worked as a Research Assistant at the National Engineering Laboratory for Electric Vehicles and later as a Postdoctoral Research Fellow at The Hong Kong Polytechnic University and Cornell University. His research focuses on using AI4Sci, data mining, and system engineering method to improve battery design, modeling, and management in the connected energy and transportation systems. He has published over 50 journal papers, with more than 1,800 citations and an h-index of 25. He received several awards, including the Chinese Government Award for Outstanding Students Abroad and Schmidt AI for Science program.

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Organizer's Brief Biography

中文：向月教授现任四川大学电气工程学院副院长，研究方向主要包括电力系统规划与优化运行以及车网互动（V2G）技术。他入选中国电机工程学会（CSEE）青年人才计划，被中国科学技术协会评为高级工程师，并入选四川省学术和技术带头人后备人选。向教授现任 IEEE 电力与能源学会（PES）中国区电网运行与控制分委会秘书长，同时担任电动汽车与能源交通系统分委会执行委员，并担任《CSEE Journal of Power and Energy Systems（JPES）》、《IET Smart Grid》、《The Innovation》等期刊的编委。他曾获得多项荣誉与奖励，包括 IEEE PES 中国区杰出青年工程师奖和 IEEE PCCC 优秀青年工程师奖。

英文：Professor Yue Xiang is the Deputy Head of the Department of Electrical Engineering at Sichuan University, specializing in power system planning & optimal operation, and vehicle-to-grid integration. He has been recognized through the CSEE Young Talent Program, named a Senior Engineer by the China Association for Science and Technology, and selected as a Candidate for Sichuan Academic and Technological Leadership. Prof. Xiang serves as Secretary-General of the IEEE PES China Subcommittee on Power Grid Operation & Control, Executive Member of its EVs & Energy Transportation Systems Subcommittee, the editorial boards of CSEE JPES, IET Smart Grid, The Innovation, etc. He received several awards, including IEEE PES China Outstanding Young Engineer Award and the IEEE PCCC Excellent Young Engineer Award.