# Special Session XIII

## Special Session Basic Information:

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| **专栏题目<br>Session Title** | 中文：新型电力系统主动支撑控制与优化技术<br>英文：Active Support Control and Optimization Technology for New-type Power Systems |

**专栏介绍和征稿主题**
**Introduction and topics**

中文：“双碳”目标推进下，光伏、风电等新能源已成为我国第一大装机电源，正加速向电力供应的“主体电源”发展。作为未来新型电力系统的核心电源，新能源必须与常规电源共担系统稳定支撑和调节责任。在此背景下，如何保障与提升新能源规模化接入下的系统并网稳定性，以及增强其主动支撑能力，已成为决定新型电力系统安全稳定运行的关键。目前，新能源并网稳定与支撑能力的建模分析、稳定机理与优化提升等方面仍面临着诸多挑战。一方面，通过电力电子变流器并网运行的新能源机组，其动态行为高度依赖控制策略，导致系统惯量、阻尼等固有稳定特性发生根本性改变，给系统频率、电压稳定及宽频振荡等稳定性问题带来了新的挑战，亟需发展新的分析与建模理论方法。另一方面，新能源支撑调节能力随风光资源波动强时变，且受电网状态与控制策略等耦合影响，如何实现不同层级的网源状态智能感知与动态匹配，是实现新能源支撑能力精准响应电网实际需求的关键。此外，随着新能源占比不断升高，电力系统“低惯量、弱阻尼、弱支撑”等特征日益明显，在资源宽范围波动、电网复杂故障扰动等场景下新能源维持并网稳定与提供有效主动支撑的难度急剧增加，已成为制约高比例新能源消纳与系统安全运行的国际性难题。鉴于此，深入开展新能源并网稳定分析与主动支撑优化提升研究，对保障新能源并网安全稳定、系统调控能力与新能源消纳水平提升具有重要意义。

英文：Driven by the "dual-carbon" goals, renewable energy sources such as photovoltaics and wind power have become China's largest installed power source and are rapidly developing into the "main power source" for electricity supply. As the core power source of the future new-type power system, renewable energy sources must share the responsibility of system stability support and regulation with conventional power sources. Against this backdrop, ensuring and improving the grid connection stability of the system under large-scale new energy integration, and enhancing its active support capabilities, has become crucial to the safe and stable operation of the new-type power system. Currently, there are still many challenges in the modeling analysis, stability mechanism, and optimization of renewable energy grid connection stability and support capabilities. On the one hand, the dynamic behavior of renewable energy units connected to the grid via power electronic converters is highly dependent on control strategies, leading to fundamental changes in the inherent stability characteristics such as system inertia and damping. This brings new challenges to stability issues such as system frequency, voltage stability, and wideband oscillations, necessitating the development of new analytical and modeling theories and methods. On the other hand, the support and regulation capabilities of renewable energy sources are highly time-varying with fluctuations in wind and solar resources and are coupled with the grid state and control strategies. Achieving intelligent perception and dynamic matching of grid and source states at different levels is key to ensuring that the support capabilities of renewable energy sources accurately respond to the actual needs of the grid. Furthermore, with the increasing proportion of renewable energy, the characteristics of the power system, such as "low inertia, weak damping, and weak support," are becoming increasingly apparent. The difficulty of maintaining grid connection stability and providing effective active support for renewable energy in scenarios involving wide-range resource fluctuations and complex grid fault disturbances has increased dramatically, becoming an international challenge restricting the consumption of high-proportion renewable energy and the safe operation of the system. Therefore, in-depth research on renewable energy grid connection stability analysis and active support optimization is of great significance for ensuring the safe and stable grid connection of renewable energy, improving system regulation capabilities, and enhancing the level of renewable energy consumption.

## Special Session Chair(s):

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### Organizer's Brief Biography

中文：刘绪斌，中南大学副教授，博士生导师，湖南省自然科学优秀青年基金获得者。2019 年获湖南大学电气工程专业博士学位，2016 年 9 月至 2017 年 9 月于美国康涅狄格大学访学，2019 年 7 月至 2021 年 7 月于华中科技大学（思构课题组）从事博士后研究。第一/通讯作者发表专业顶级 SCI 论文 30 篇，授权国家发明专利 10 余项。担任《上海交通大学学报》副编辑、《Scientific Reports》编委。获湖南省优秀博士学位论文、湖南省优秀博士毕业生、中国可再生能源学会科技进步一等奖、中国电力科学技术进步一等奖、中国发明协会发明创业奖一等奖、中国电工技术学会科技进步一等奖，获 IEEE PES 中国区优秀青年工程师奖、APET 青年科学家奖。近年来主持国家自然科学基金 2 项、湖南省优青项目、湖南省重点研发计划、湖南省自然科学基金、国家电网总部项目课题等项目。主要研究方向：新型电力系统安全本质特征评估、智能风险在线预警、主动支撑控制与调度技术等。

英文：Xubin Liu is an associate professor and doctoral supervisor at Central South University, he is the recipient of the Hunan Provincial Natural Science Outstanding Youth Fund. He received the Ph.D. degree in electrical engineering from Hunan University, Changsha, China, in 2019. From 2019 to 2021, he was a Postdoctoral Researcher with the School of Electrical and Electronic Engineering, Huazhong University of Science and Technology, Wuhan, China. He has published over 30 papers such as IEEE Trans as the first or corresponding author, and has been granted more than 10 national invention patents. He has been awarded the title of Outstanding Doctoral Dissertation of Hunan Province, Outstanding Doctoral Graduate of Hunan Province, First Prize for Scientific and Technological Progress of the Chinese Renewable Energy Society, First Prize for Scientific and Technological Progress of China Electric Power, IEEE PCCC Outstanding Young Engineer Award, APET Young Scientist Award. His research interests include new-type power system safety inherent characteristics assessment, intelligent online risk early warning, active support control and dispatch technologies, etc.