Special Session V: 新能源铁路牵引供电与新型电力系统相互作用

介绍：

在“双碳”目标发展背景下，新能源接入电力系统及电气化铁路的形态演变带来诸多变革。高比例新能源的新型电力系统呈现高电力电子化和强不确定性特征，新能源接入铁路牵引供电系统呈现拓扑多源异构和源-荷非线性时空耦合特征。新能源铁路牵引供电系统与新型电力系统的时空相互作用将更加复杂多变，亟需研究在新型电力系统背景下如何将新能源和储能接入铁路牵引供电的不同场景并保证安全可靠运行，解决新能源铁路牵引供电与新型电力系统相互作用的干扰源建模、传播、交互、评估和控制等系列难题，探究构网型技术在新能源牵引供电中的应用、新能源铁路牵引供电系统对新型电力系统频率与惯量支撑等新挑战，以实现新能源铁路牵引供电与新型电力系统的绿色低碳和谐发展。

本次特别会议的目的是为研究人员和从业者提供一个机会，全面交流和阐述新能源铁路牵引供电与新型电力系统相互作用的研究方向，从而实现有效引导新型电力系统背景下新能源铁路牵引供电的高质量发展和产业应用，进一步加强全球视野的学术交流，我们诚挚邀请全球研究人员积极投稿，分享最新观点。

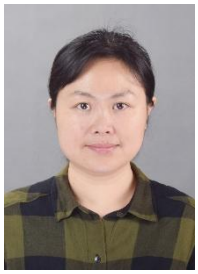
感兴趣的主题包括但不限于：

- 电气化铁路牵引负荷时空不确定性建模技术
- 新能源电力机车运行的能量管理及智能调控技术
- 牵引供电系统与新型电力系统相互影响及评估技术
- 多能互补分布式新能源接入铁路牵引供电系统多源融合技术
- 多源异构新能源铁路牵引供电与新型电力系统时空交互作用
- 多源异构新能源接入铁路牵引供电多能流交互及影响评估技术
- 多源异构新能源接入铁路牵引供电的电能质量分析及控制技术
- “源-荷”时空不确定性建模及牵引供电潮流协同控制技术
- 构网型分布式光伏与储能接入铁路牵引供电的支撑应用技术
- 新能源铁路牵引供电系统对新型电力系统频率与惯量支撑技术
- 特殊环境下铁路牵引供电多能互补能源系统融合运行及控制技术
- 数据和机理混合驱动下多源异构铁路牵引供电系统交互提升技术

车玉龙，兰州交通大学

车玉龙，男，副教授，博士生/硕士生导师，主要从事电气化铁路牵引负荷不确定性建模及其应用、牵引供电系统与新型电力系统相互作用、交通能源融合等方面的研究教学工作。《中国电力》期刊青年编委。作为项目负责人承担纵向项目 10 项，参与项目 10 余项，发表学术论文 30 余篇。

吕晓琴，西南交通大学



吕晓琴，工学博士，副教授，硕士生导师，主要从事电气化铁路车网建模与分析、电能质量分析与控制等方面研究工作，发表学术论文 34 篇(SCI 检索 11 篇，EI 检索 23 篇)，授权发明专利 2 项，主持、主研科研项目 10 项。

Special Session V: The Interaction between Renewable Energy-based Railway Traction Power Supply and New-type Power Systems.

Under the development goals of "dual carbon", the integration of renewable energy into power systems and the evolution of electrified railways have brought about significant transformations. The new-type power system, characterized by a high proportion of renewable energy, exhibits high power electronics penetration and strong uncertainty. The integration of renewable energy into railway traction power supply system presents features of multi-source heterogeneous topology and nonlinear spatiotemporal coupling between sources and loads. The spatiotemporal interaction between renewable energy-based railway traction power supply systems and modern power systems will become more complex and dynamic. There is an urgent need to study how to integrate renewable energy and energy storage into railway traction power supply systems under the new-type power system framework, ensuring safe and reliable operation across different scenarios. This involves addressing a series of challenges, including modeling, propagation, interaction, evaluation, and control of interference sources arising from the interaction between renewable energy-based railway traction power supply and new-type power systems. Additionally, it is essential to explore the application of grid-forming technologies in renewable energy-based traction power supply and investigate new challenges, such as the frequency and inertia support provided by renewable energy-based railway traction power supply systems to new-type power systems. The ultimate goal is to achieve green, low-carbon, and harmonious development of renewable energy-based railway traction power supply and new-type power systems.

The purpose of this special session is to provide researchers and practitioners with an opportunity to comprehensively exchange and elaborate on research directions related to the interaction between renewable energy-based railway traction power supply and new-type power systems. This aims to effectively guide the high-quality development and industrial application of renewable energy-based railway traction power supply under the framework of new-type power systems, while further strengthening global academic exchanges. We sincerely invite researchers worldwide to actively contribute and share their latest insights.

The topics of interest include but are not limited to:

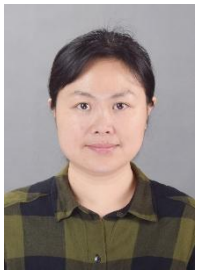
- Modeling Techniques for Spatiotemporal Uncertainty of Electrified Railway Traction Loads
- Energy Management and Intelligent Control Technologies for Renewable Energy-Powered Electric Locomotives

- Interaction and Evaluation Technologies Between Traction Power Supply Systems and New-type Power Systems
- Multi-Source Integration Technologies for Distributed Renewable Energy Integration into Railway Traction Power Supply Systems
- Spatiotemporal Interaction Between Multi-Source Heterogeneous Renewable Energy-Based Railway Traction Power Supply and New-type Power Systems
- Multi-Energy Flow Interaction and Impact Assessment Technologies for Multi-Source Heterogeneous Renewable Energy Integration into Railway Traction Power Supply
- Power Quality Analysis and Control Technologies for Multi-Source Heterogeneous Renewable Energy Integration into Railway Traction Power Supply
- Spatiotemporal Uncertainty Modeling of "Source-Load" and Coordinated Power Flow Control Technologies for Traction Power Supply
- Grid-Forming Technologies for Distributed Photovoltaic and Energy Storage Integration into Railway Traction Power Supply
- Frequency and Inertia Support Technologies of Renewable Energy-Based Railway Traction Power Supply Systems for New-type Power Systems
- Integrated Operation and Control Technologies for Multi-Energy Complementary Systems in Railway Traction Power Supply Under Special Environmental Conditions
- Hybrid Data- and Mechanism-Driven Technologies for Enhancing Interaction in Multi-Source Heterogeneous Railway Traction Power Supply Systems

Yulong Che, Lanzhou Jiaotong University, China

Yulong Che was born in Tianshui, China in 1988. He received his Ph.D. degree in Electrical Engineering from Southwest Jiaotong University, Chengdu, China, in 2022. Since 2014, he has been with Lanzhou Jiaotong University, Lanzhou, China, where he is currently an associate professor with the School of Automation and Electrical Engineering. His current research interests include the interaction between traction power supply system and power system, uncertainty modeling of traction load and its application, uncertainty analysis of new-type power system.

Xiaoqin Lyu, Southwest Jiaotong University, China



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