

Special Session XII

Special Session Basic Information:

专栏题目

Session Title

英文: Advancements in HVDC Technology: Stability, Control, and Grid Integration

中文: 高压直流技术的进展: 稳定性、控制与并网

专栏介绍和征稿主题

Introduction and topics

中文: 高压直流 (HVDC) 技术在现代电力系统中扮演着越来越重要的角色, 促进了可再生能源的高效集成、远距离电力传输和跨境电力交换。随着多端和环网 HVDC 系统的部署不断增加, 系统规划、运行、控制、稳定性和保护等方面面临新的挑战。近年来, 变流器技术、混合交流-直流电网架构以及先进控制策略的进展对于提升未来电网的可靠性和弹性至关重要。本专题会议旨在汇聚研究人员和行业专家, 讨论 HVDC 系统的最新发展, 解决关键挑战和新兴趋势。

本会议欢迎关于以下主题的贡献, 内容不限于:

- **HVDC 系统的稳定性与控制**
 - HVDC 系统的小信号与暂态稳定性分析
 - 电压源换流器 (VSC-HVDC) 的先进控制策略
 - 多端 HVDC (MTDC) 网络的层次化与分布式控制
- **HVDC 系统的变流器技术**
 - 模块化多电平变流器 (MMC) 的设计与优化
 - 混合型直流断路器 (DCCB) 技术
 - 故障容忍运行与保护方案
- **HVDC 电网集成与规划**
 - 基于 HVDC 的海上风电集成与电网构建技术
 - 混合交流-直流电网协调运行
 - 未来 HVDC 电网的可靠性与弹性评估
- **先进的建模与仿真**
 - 基于数据驱动与人工智能的 HVDC 系统分析方法
 - 实时数字仿真与硬件在环 (HIL) 测试

本专题会议旨在促进关于 HVDC 技术最新创新的讨论, 并探讨其在未来电力传输与配电网中的重要作用。

英文: High-Voltage Direct Current (HVDC) technology is playing an increasingly vital role in modern power systems, enabling the efficient integration of renewable energy sources, long-distance power transmission, and cross-border electricity exchange. With the growing deployment of multi-terminal and meshed HVDC networks, new challenges arise in terms of system planning, operation, control, stability, and protection. Recent advancements in converter technologies, hybrid AC-DC grid architectures, and advanced control strategies are crucial for enhancing the reliability and resilience of future power grids. This special session aims to bring together researchers and industry experts to discuss the latest developments in HVDC systems, addressing key challenges and emerging trends.

Topics of Interest

This session welcomes contributions on, but not limited to, the following topics:

- **HVDC System Stability and Control**
 - Small-signal and transient stability analysis of HVDC systems
 - Advanced control strategies for voltage source converters (VSC-HVDC)
 - Hierarchical and distributed control for multi-terminal HVDC (MTDC) networks

- **Converter Technologies for HVDC Systems**
 - Modular Multilevel Converter (MMC) design and optimization
 - Hybrid and direct current circuit breaker (DCCB) technologies
 - Fault-tolerant operation and protection schemes
- **HVDC Grid Integration and Planning**
 - HVDC-based offshore wind integration and grid forming technologies
 - Coordinated operation of hybrid AC-DC transmission networks
 - Reliability and resilience assessment of future HVDC grids
- **Advanced Modeling and Simulation**
 - Data-driven and AI-based approaches for HVDC system analysis
 - Real-time digital simulation and hardware-in-the-loop (HIL) testing

This special session aims to foster discussions on the latest innovations in HVDC technology and its role in shaping the future of power transmission and distribution networks.

Special Session Chair(s):

	姓名 Name	Yin Chen (陈殷)
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Organizer's Brief Biography

中文：

英文： Yin Chen received the B.S. degree in electrical engineering from Huazhong University of Science and Technology, Wuhan, China, in 2009, and the M.S. degree in electrical engineering from Zhejiang University, Hangzhou, China, in 2014. He received the Ph.D. degree in Electrical Engineering from University of Strathclyde, Glasgow, U.K., in 2020. He is currently an associate researcher with University of Strathclyde in Glasgow, UK. His research interests include the modeling of power electronic converters, the technology of grid integration of new energy sources, and stability analysis of HVDC transmission systems.