

ISSN 0258 - 8013

CODEN ZDGXER

中国电机工程学报

中国电机工程学报

半月刊

第 43 卷 第 6 期

Proceedings of the CSEE

SEMIMONTHLY

Vol.43 No.6

第四十三卷 第六期 2023年3月

Proceedings of the CSEE

Vol.43 No.6 March 2023



3月
2023
2023-03-20 出版

ISSN 0258-8013



9 770258 801230

06>



中国电机工程学会主办
THE CHINESE SOCIETY FOR ELECTRICAL ENGINEERING



中国电机工程学报

ZHONGGUO DIANJI GONGCHENG XUEBAO

第 43 卷

第 6 期 (总第 713 期)

2023 年 3 月 20 日

目 次

(论文电子版 <http://www.pcsee.org/CN/column/home.shtml>)

· 灵活低碳热能动力系统基础理论与共性关键技术 ·

“灵活低碳热能动力系统基础理论与共性关键技术”专题特约主编寄语 严俊杰, 刘明 (2079)
燃煤发电机组瞬态过程灵活高效协同运行的理论与技术研究综述

..... 赵永亮, 许朋江, 居文平, 陈锋, 刘明, 王珠, 严俊杰 (2080)
提升直流炉供热机组灵活性的电热协调控制策略 王玮, 申朋玉, 李雪寒, 张光明, 曾德良, 刘吉臻 (2100)
太阳能-地热能混合式发电系统的性能评价 刘强, 张恩涛, 贺江龙, 段远源 (2109)
基于经济模型预测控制的光伏光热一体化热泵系统动态能效优化 吴梦丹, 张俊礼, 吴嘉峰, 孙立 (2119)
光热电站熔融盐储热罐冷却速率研究 王渊静, 胡松, 张燕平 (2130)
耦合超临界二氧化碳储能循环燃煤机组动态特性仿真 王迪, 司龙, 谢欣言, 周云龙, 李晓莉 (2142)
烟气余热利用场景的非共沸混合工质有机朗肯循环发电系统性能分析 汪安明, 赵文学, 冉颖, 杨辉 (2153)
二氧化碳捕集的理论极限能耗分析 许朋江, 陈锋, 薛朝囡, 邓佳, 郑卫东, 居文平 (2162)
非稳定电源驱动的恒压绝热压缩空气储能系统设计 肖昊逾, 杨承, 肖润珂, 谢广平, 马晓茜 (2168)

· 可再生能源与储能 ·

面向电力系统的多能源云储能模式: 基本概念与研究展望 李姚旺, 张宁, 张世旭, 刘昱良, 杜尔顺, 王鹏, 肖伟, 慈松 (2179)
大规模电力系统仿真用新能源场站模型结构及建模方法研究(二): 机电暂态模型 孙华东, 李佳豪, 李文锋, 郭剑波, 安宁, 张怡 (2190)
考虑性能热衰减和热失控传播的大规模电池储能系统可靠性建模与评估 李思颖, 叶承晋, 丁一, 包铭磊, 尹逊虎, 高强 (2202)
基于改进稀疏表示的海上风电场交流海底电缆短路故障分类方法 唐文虎, 梁启恒, 赵柏宁, 辛妍丽, 古一灿 (2212)
直流换相失败下计及撬棒保护的双馈风机暂态特性解析与撬棒参数修正 郑子萱, 宋东徽, 杜凯健, 肖先勇, 任杰, 谢琦 (2222)
基于梯级水电调节的风光水联盟与区域电网联合运行优化调度策略 李咸善, 杨拯, 李飞, 程杉 (2234)

· 综合能源 ·

面向区域能源互联网的边云协同架构及其优化策略研究 肖迁, 李天翔, 贾宏杰, 穆云飞, 乔骥, 陆文标, 蒲天骄 (2248)
考虑电-气-交通耦合的城市综合能源系统规划 李珂, 邵成成, 王雅楠, 严胜, 周前, 王秀丽, 王锡凡 (2263)
基于 LSTNet-Skip 的综合能源系统多元负荷超短期预测 鲁斌, 霍泽健, 俞敏 (2273)

· 电力系统 ·

直流配电系统动态相量-电磁暂态混合仿真与误差机理分析 陈鹏伟, 卢亮, 刘念, 孙雅旻 (2283)
一种抑制输电线路次档距振荡的新型阻尼间隔棒及其减振效果分析 刘春城, 王冬, 侯萌, 孙红运 (2295)
直流侧免供电的配电网接地故障电流柔性调控方法 简玉婕, 郭谋发, 张彬隆 (2306)
基于注意力机制与跨尺度特征融合的 YOLOv5 输电线路故障检测 郝帅, 杨磊, 马旭, 马瑞泽, 文虎 (2319)
电网阻抗比对跟网变换器同步稳定性的影响机理 陈俊儒, 李冠群, 刘牧阳, 叶华 (2331)

· 电力电子 ·

构网型变流器稳定性研究综述 詹长江, 吴恒, 王雄飞, 田杰, 王新宝, 卢宇 (2339)
输入电流低纹波的超高增益非隔离 DC-DC 变换器 丁新平, 曹益畅, 赵振伟, 周明珠, 韦正怡, 蔡骏 (2359)
三态 Boost PFC 变换器的高功率因数和轻载效率提升方法研究 杨平, 范文, 胡富平, 彭晨光 (2371)
IGBT 开关模块的附加支路恒导纳模型 侯延琦, 刘崇茹, 王鑫艳, 郑乐 (2381)
基于多层次模拟的压接型 IGBT 器件短路失效机理分析 李辉, 余越, 姚然, 赖伟, 向学位, 李金元 (2392)
具有强抗偏移及轻量化特性的电场耦合式无人机无线电能传输系统 武帅, 陈星维, 孟祥尧, 蔡春伟, 柴文萍, 杨世彦 (2404)

· 电机及其系统 ·

基于刚性转子模型辅助线性自抗扰的电磁轴承-柔性转子系统过二阶弯曲临界转速振动控制 李翁衡, 祝长生 (2413)
考虑次同步分量的变压器时间并行有限元及铁心动态损耗分析 孙佳安, 李琳, 王亚琦 (2426)
一种永磁辅助开关磁阻电机的四区间 DITC 方法 黄朝志, 徐俊鑫, 刘细平, 曹文盛, 吴玉良 (2438)
永磁同步电机准谐振自抗扰电流谐波抑制 许家群, 王天琪, 贾普凡 (2450)

· 高电压 ·

有载分接开关级间气泡形变规律及对电场分布的影响 李鹏, 李嘉熙, 汪可, 张书琦, 李刚, 李戈琦, 杨帆 (2460)
应对特高压直接接地极电流影响的油气管道大功率阴保系统参数优化配置 李雄, 陆家榆, 曹方圆, 白锋, 李成榕 (2472)
220kV 交联聚乙烯电缆绝缘料性能对比研究 侯帅, 傅明利, 黎小林, 朱闻博, 章彬, 徐曙, 伍国兴 (2483)

· 英文概述见论文电子版 ·

**PROCEEDINGS OF THE CHINESE SOCIETY FOR
ELECTRICAL ENGINEERING**
(PROCEEDINGS OF THE CSEE)

Vol.43 No.6 (Ser. 713)

Mar. 20, 2023

CONTENTS

(Electronic Journals <http://www.pcsee.org/EN/volumn/current.shtml>)

• Fundamentals and Key Technologies of Flexible and Low-carbon Thermal Power Systems •

- Foreword From the Guest Editor in Chief of Special Columns for "Fundamentals and Key Technologies of Flexible and Low-carbon Thermal Power Systems" YAN Junjie, LIU Ming (2079)
Overview of Theoretical and Technical Research on Flexible and Efficient Synergistic Operation of Coal-fired Power Units During Transient Processes ZHAO Yongliang, XU Pengjiang, JU Wenping, CHEN Feng, LIU Ming, WANG Zhu, YAN Junjie (2080)
Electricity-heat Coordinated Control Strategy for Improving the Flexibility of a Once-through CHP Unit WANG Wei, SHEN Pengyu, LI Xuehan, ZHANG Guangming, ZENG Deliang, LIU Jizhen (2100)
Performance Evaluation of a Hybrid Solar-geothermal Power Generation System LIU Qiang, ZHANG Entao, HE Jianglong, DUAN Yuanyuan (2109)
Dynamic Energy Efficiency Optimization of Photovoltaic/Thermal Integrated Heat Pump System Based on Economic Model Predictive Control WU Mengdan, ZHANG Junli, WU Jiafeng, SUN Li (2119)
Research on Cooling Rate of Molten Salt Heat Storage Tank in Concentrating Solar Power Plant WANG Yuanjing, HU Song, ZHANG Yanping (2130)
Simulation of Dynamic Characteristics of Coal-fired Unit Coupled With Supercritical Carbon Dioxide Energy Storage Cycle WANG Di, SI Long, XIE Xinyan, ZHOU Yunlong, LI Xiaoli (2142)
Performance Analyses of the Organic Rankine Cycle With Zeotropic Mixtures in Gas Waste Heat Recovery WANG Anming, ZHAO Wenxue, RAN Hao, YANG Hui (2153)
Theoretical Minimum Energy Consumption Analysis of Carbon Dioxide Capture XU Pengjiang, CHEN Feng, XUE Zhaonan, DENG Jia, ZHENG Weidong, JU Wenping (2162)
Design on Isobaric Adiabatic Compressed Air Energy Storage System for Unstable Input at Power Source-side XIAO Minyu, YANG Cheng, XIAO Runke, XIE Guangping, MA Xiaoqian (2168)

• Renewables and Energy Storage •

- Multi-energy Cloud Energy Storage for Power Systems: Basic Concepts and Research Prospects LI Yaowang, ZHANG Ning, ZHANG Shixu, LIU Yuliang, DU Ershun, WANG Peng, XIAO Wei, CI Song (2179)
Research on Model Structures and Modeling Methods of Renewable Energy Station for Large-scale Power System Simulation (II): Electromechanical Transient Model SUN Huadong, LI Jiahao, LI Wenfeng, GUO Jiangbo, AN Ning, ZHANG Yi (2190)
Reliability Modeling and Evaluation of Large Scale Battery Energy Storage Systems Considering Thermal Degradation and Thermal Runaway Propagation LI Siying, YE Chengjin, DING Yi, BAO Minglei, YIN Xunhu, GAO Qiang (2202)
Short-circuit Fault Classification Method for AC Submarine Cables in Offshore Wind Farms Based on Improved Sparse Representation TANG Wenhua, LIANG Qiheng, ZHAO Baining, XIN Yanli, GU Yican (2212)
Analysis of Transient Characteristics and Correction of Crowbar Resistance of Doubly Fed Induction Generator With Crowbar Protection Under HVDC Commutation Failure ZHENG Zixuan, SONG Donghui, DU Kaijian, XIAO Xianyong, REN Jie, XIE Qi (2222)
Optimization Scheduling Strategy for Joint Operation of Wind-solar-water Power Alliance and Regional Power Grid Based on Cascade Hydropower Regulation LI Xianshan, YANG Zheng, LI Fei, CHENG Shan (2234)

• Integrated Energy •

- Research on Edge Cloud Collaboration Architecture and Optimization Strategy for Regional Energy Internet XIAO Qian, LI Tianxiang, JIA Hongjie, MU Yunfei, QIAO Ji, LU Wenbiao, PU Tianjiao (2248)
Optimal Planning of Urban Integrated Energy Systems Considering Electricity-gas-transportation Interactions LI Ke, SHAO Chengcheng, WANG Yanan, YAN Sheng, ZHOU Qian, WANG Xiuli, WANG Xifan (2263)
Multi Load Ultra Short-term Forecasting of Integrated Energy System Based on LSTNet-Skip LU Bin, HUO Zejian, YU Min (2273)
• Power Systems •
- Dynamic Phasor-electromagnetic Transient Hybrid Simulation and Error Mechanism Analysis of DC Distribution System CHEN Pengwei, LU Liang, LIU Nian, SUN Yamin (2283)
A New Type Damping Spacer to Reduce Sub-span Oscillation of Transmission Line and Its Vibration Reduction Analysis LIU Chuncheng, WANG Dong, HOU Meng, SUN Hongyun (2295)
Flexible Adjustment and Control Method for Grounding Fault in Distribution Networks Without Power Supply in DC-side JIAN Yujie, GUO Moufa, ZHANG Binlong (2306)
YOLOv5 Transmission Line Fault Detection Based on Attention Mechanism and Cross-scale Feature Fusion HAO Shuai, YANG Lei, MA Xu, MA Ruize, WEN Hu (2319)
Influence Mechanism of R/X Ratio on Synchronization Stability of Grid-following Converter CHEN Junru, LI Guanqun, LIU Muyang, YE Hua (2331)

• Power Electronics •

- An Overview of Stability Studies of Grid-forming Voltage Source Converters ZHAN Changjiang, WU Heng, WANG Xiongfei, TIAN Jie, WANG Xinbao, LU Yu (2339)
Non-isolated Ultra-high Voltage Gain DC-DC Converter With Low Input Current Ripple DING Xinpeng, CAO Yichang, ZHAO Zhenwei, ZHOU Mingzhu, WEI Zhengyi, CAI Jun (2359)
Research on Tri-state Boost PFC Converter With High Power Factor and High Light-load Efficiency YANG Ping, FAN Wen, HU Fuping, PENG Chengguang (2371)
Additional-branches Fixed-admittance Model of IGBT Switching Module HOU Yanqi, LIU Chongru, WANG Xinyan, ZHENG Le (2381)
Study on the Short Circuit Failure Mechanism of Press Pack IGBT Device Based on Multi-level Simulation LI Hui, YU Yue, YAO Ran, LAI Wei, XIANG Xuewei, LI Jinyuan (2392)
Electric-field Coupled Wireless Power Transfer System With Misalignment-tolerance and Light-weight Characteristics for Unmanned Aerial Vehicle Applications WU Shuai, CHEN Xingwei, MENG Xiangyao, CAI Chunwei, CHAI Wenping, YANG Shiyan (2404)

• Motors and Their Systems •

- Vibration Control of an Active Magnetic Bearing-Flexible Rotor System Passing the Second Bending Critical Speed Based on Linear Active Disturbance Control Assisted by Rigid Rotor Model LI Wengheng, ZHU Changsheng (2413)
Finite Element Method for Transformers Using Parareal and Core Dynamic Loss Analysis Considering Subsynchronous Components SUN Jia'an, LI Lin, WANG Yaqi (2426)
A Four Region DITC Method for Permanent Magnet Assisted Switched Reluctance Motor HUANG Chaozhi, XU Junxin, LIU Xiping, CAO Wensheng, WU Yuliang (2438)
Quasi-resonant Active Disturbance Rejection Control for Current Harmonics Suppression of Permanent Magnet Synchronous Motor XU Jiaqun, WANG Tianqi, JIA Pufan (2450)

• High Voltage •

- Bubble Deformation Law Between the Interstage of on Load Tap Changer and Its Influence on Electric Field Distribution LI Peng, LI Jiaxi, WANG Ke, ZHANG Shuqi, LI Gang, LI Geqi, YANG Fan (2460)
Optimal Configuration of High-power Cathodic Protection System Parameters for Coping With the Influence of UHVDC Grounding Electrode Current on Oil and Gas Pipelines LI Xiong, LU Jiayu, CAO Fangyuan, BAI Feng, LI Chengrong (2472)
Comparative Study on Performances of 220kV XLPE Cable Insulation Materials HOU Shuai, FU Mingli, LI Xiaolin, ZHU Wenbo, ZHANG Bin, XU Shu, WU Guoxing (2483)

• For Extended Summaries, Please See the Electronic Journals •