

ISSN 0258 - 8013  
CODEN ZDGXER

# 中国电机工程学报

半月刊

第 41 卷 第 12 期

## Proceedings of the CSEE

SEMIMONTHLY

Vol.41 No.12

中国电机工程学报

第四十一卷 第十二期 二〇二一年六月

Proceedings of the CSEE Vol.41 No.12 June 2021



ISSN 0258-8013



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 41 卷

第 12 期 (总第 671 期)

2021 年 6 月 20 日

## 目 次

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

### · 支撑碳达峰、碳中和的能源电力关键技术 ·

碳约束条件下电力行业低碳转型路径研究..... 李政, 陈思源, 董文娟, 刘培, 杜尔顺, 麻林巍, 何建坤 (3987)

### · 大电网规划与运行 ·

考虑互联互通的区域综合能源系统规划研究综述..... 吕佳伟, 张沈习, 程浩忠, 韩丰, 原凯, 宋毅, 方斯顿 (4001)

主动配电网中基于统一运行模型的电制氢(P2H)模块组合选型与优化规划..... 李佳蓉, 林今, 邢学韬, 邱一苇, 宋永华, 邓占锋, 徐桂芝, 宋洁 (4021)

美国得州 2021 年大停电事故对我国新能源发展的启示..... 王伟胜, 林伟芳, 何国庆, 石文辉, 冯双磊 (4033)

考虑惯量支撑及频率调节全过程的分布鲁棒机组组合..... 葛晓琳, 刘亚, 符杨, 贾锋 (4043)

极高光伏渗透率下基于潮流雅可比矩阵和卷积神经网络的静态电压稳定在线预测..... 吴倩红, 韩蓓, 李国杰, 汪可友 (4058)

### · 输变电技术 ·

基于零序环流控制器的海上风电 MMC-HVDC 并网系统小干扰稳定分析与优化控制..... 刘凯, 姚骏, 汪军, 刘育明, 陈诗玥, 黄森, 夏翰林 (4068)

海上风电直流并网工程用新型柔性直流耗能装置电气设计研究..... 张静, 高冲, 许彬, 王治翔, 周建辉 (4081)

基于单端电流积聚量的高压直流输电线路全线速动保护..... 曹虹, 周泽昕, 柳焕章, 阮思焯, 王兴国, 杜丁香, 李勇 (4091)

### · 智能电网 ·

电能质量扰动检测与识别方法研究综述..... 汪飞, 全晓庆, 任林涛 (4104)

基于非同步电能质量监测系统的谐波状态估计..... 肖先勇, 胡誉蓉, 王杨, 徐群伟 (4121)

基于谐波传递函数矩阵的单相并网系统建模研究..... 钱强, 张犁, 谢少军, 许津铭 (4132)

考虑冰载荷的近海固定桩风电机组运行特性建模与分析..... 宋子秋, 刘吉臻, 胡阳, 房方, 余照国 (4144)

风储联合系统爬坡事件的日前能量最优平抑方法..... 李江, 马昊天, 宋田宇 (4153)

### · 发电 ·

氨燃烧研究进展..... 周上坤, 杨文俊, 谭厚章, 王毅斌, 王金华, 王学斌, 杨富鑫 (4164)

单颗粒燃料燃烧特性研究方法综述..... 李珊, 李凤杰, 闫勇, 钱相臣 (4182)

计及工质流和热传导的热力管网能流动态建模..... 胡宪法, 张树卿, 唐绍普, 彭振 (4198)

进口预旋和孔序对蜂窝密封动力学特性影响研究..... 顾承璟, 张万福, 杨兴辰, 曹浩, 李春 (4208)

汽轮发电机高位布置基础振动试验研究..... 王树民, 吕智强, 宋畅, 张翼, 李延兵, 郝玮, 李红星, 高峰 (4217)

### · 电力电子与电力传动 ·

一种定频移相控制双向隔离型直流变换器的运行特性统一分析方法研究..... 范红, 沙广林, 盛万兴, 段青, 孟晓丽, 马春艳, 赵彩虹 (4226)

基于频域特性测试的 VSG 功频传递函数辨识方法..... 颜湘武, 贾焦心, 王保珂, 李晓宇, 李铁成 (4239)

基于动态相量法的电网换相换流器谐波传递研究..... 陈代忠, 王顺亮, 焦宁, 孟锦豪, 刘天琪 (4250)

计及直流侧大电感的 MMC 建模与控制..... 史先强, 蔡旭, 姚为正, 吕敬, 董鹏, 吴金龙, 方梓熙, 饶芳权 (4261)

考虑控制时滞和参数不确定的虚拟同步电机并网系统稳定性分析..... 乐健, 赵联港, 廖小兵, 周谦, 郎红科 (4275)

准 Z 源逆变器级联模型预测控制..... 吴春, 杨佳磊, 陈强 (4286)

### · 电机与电器 ·

基于静止轴系脉冲信号注入的永磁同步电机无传感器控制策略..... 张国强, 项润华, 王高林, 张鸿鹏, 徐殿国 (4297)

高速电机定子单槽绕组交流损耗近似解析建模及验证..... 许欣, 邓智泉, 张忠明, 庞古才, 彭聪 (4306)

直流偏磁下单相变压器铁心实验模型局部磁致形变测量与模拟..... 王振, 张艳丽, 张殿海, 任自艳, 谢德馨, 白保东 (4316)

### · 高性能绝缘电介质 ·

连续极性反转电场下 XLPE 中空间电荷特性研究..... 曹俊, 周桂月, 张洪亮, 缪林鑫, 尹毅, 吴建东 (4325)

核壳结构纳米纤维掺杂 PMMA/PVDF 基复合介质的储能特性研究..... 迟庆国, 殷超, 张天栋, 张昌海, 冯宇, 张月, 陈庆国 (4333)

微米氮化硼对有机硅改性环氧树脂基轻质绝缘材料热特性及电气性能影响研究..... 刘云鹏, 李乐, 刘贺晨, 周松松, 解卓鹏, 刘磊, 唐力, 黎小林 (4342)

界面态对聚酰亚胺/TNSs 纳米复合材料介电和绝缘性能的影响..... 朱聪聪, 殷景华, 李佳龙, 赵贺, 李彦鹏, 岳东, 刘晓旭, 冯宇 (4354)

### · 英文概述见论文电子版 ·

期刊基本参数: CN11-2107/TM \* 1964 \* S \* A4 \* 376 \* zh \* P \* ¥84.00 \* 4000 \* 32 \* 2021-06 版权所有 未经许可不得转载及上网

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

Vol.41 No.12 (Ser. 671)

Jun. 20, 2021

CONTENTS

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

- **Key Technologies of Power and Energy Systems for Supporting Peak Carbon Dioxide Emissions and Carbon Neutrality** •  
Low Carbon Transition Pathway of Power Sector Under Carbon Emission Constraints  
..... LI Zheng, CHEN Siyuan, DONG Wenjuan, LIU Pei, DU Ershun, MA Linwei, HE Jiankun (3987)
- **Large Power Grid Planning and Operation** •  
Review on District-level Integrated Energy System Planning Considering Interconnection and Interaction  
..... LYU Jiawei, ZHANG Shenxi, CHENG Haozhong, HAN Feng, YUAN Kai, SONG Yi, FANG Sidun (4001)  
Technology Portfolio Selection and Optimal Planning of Power-to-hydrogen (P2H) Modules in Active Distribution Network  
..... LI Jiarong, LIN Jin, XING Xuetao, QIU Yiwei, SONG Yonghua, DENG Zhanfeng, XU Guizhi, SONG Jie (4021)  
Enlightenment of 2021 Texas Blackout to the Renewable Energy Development in China  
..... WANG Weisheng, LIN Weifang, HE Guoqing, SHI Wenhui, FENG Shuanglei (4033)  
Distributed Robust Unit Commitment Considering the Whole Process of Inertia Support and Frequency Regulations  
..... GE Xiaolin, LIU Ya, FU Yang, JIA Feng (4043)  
Power Flow Jacobian Matrix Based Static Voltage Stability Forecast by CNN Considering Extremely High PV Penetration  
..... WU Qianhong, HAN Bei, LI Guojie, WANG Keyou (4058)
- **Power Transmission and Transformation Technologies** •  
Small Signal Stability Analysis and Optimization Control of Offshore Wind Power Generation MMC-HVDC Grid-connected  
System Based on Zero-sequence Circulating Current Controller ..... LIU Kai, YAO Jun, WANG Jun, LIU Yuming,  
CHEN Shiyue, HUANG Sen, XIA Hanlin (4068)  
Research on Electrical Design of Novel Flexible DC Energy Consuming Device for Offshore Wind Power DC Grid  
Connection Project ..... ZHANG Jing, GAO Chong, XU Bin, WANG Zhixiang, ZHOU Jianhui (4081)  
A Novel Whole-line Fast Protection Scheme Based on Single-ended Current Accumulation for HVDC Transmission Lines  
..... CAO Hong, ZHOU Zexin, LIU Huanzhang, RUAN Siye, WANG Xingguo, DU Dingxiang, LI Yong (4091)
- **Smart Grid** •  
Review of Power Quality Disturbance Detection and Identification Methods ..... WANG Fei, QUAN Xiaoqing, REN Lintao (4104)  
Harmonic State Estimation Based on Asynchronous Power Quality Monitoring System  
..... XIAO Xianyong, HU Yurong, WANG Yang, XU Qunwei (4121)  
Research on the Modeling of Single-phase Grid-connected System Based on the Harmonic Transfer Function Matrix  
..... QIAN Qiang, ZHANG Li, XIE Shaojun, XU Jinming (4132)  
Modeling and Analysis of Bottom Fixed Platform Offshore Wind Turbine Under Ice Loads  
..... SONG Ziqiu, LIU Jizhen, HU Yang, FANG Fang, YU Zhaoguo (4144)  
An Event-based Day-ahead Energy Optimization Method to Smooth Ramp Events of Combined Wind Storage Systems  
..... LI Jiang, MA Haotian, SONG Tianyu (4153)
- **Power Generation** •  
Research Progress of Ammonia Combustion  
..... ZHOU Shangkun, YANG Wenjun, TAN Houzhang, WANG Yibin, WANG Jinhua, WANG Xuebin, YANG Fuxin (4164)  
Review of Characterization Techniques for the Combustion Behavior of Individual Fuel Particles  
..... LI Shan, LI Fengjie, YAN Yong, QIAN Xiangchen (4182)  
Dynamic Modeling of Energy Flow in Heat supply Network Considering Working Fluid and Heat Conduction  
..... HU Xianfa, ZHANG Shuqing, TANG Shaopu, PENG Zhen (4198)  
Effect of Inlet Preswirl and Hole Arrangement Patterns on the Dynamic Characteristics of Honeycomb Seals  
..... GU Chengjing, ZHANG Wanfu, YANG Xingchen, CAO Hao, LI Chun (4208)  
Vibration Test Research of Steam Turbine Generator Foundation Jointly Configured on Higher Floor  
..... WANG Shumin, LYU Zhiqiang, SONG Chang, ZHANG Yi, LI Yanbing, HAO Wei, LI Hongxing, GAO Feng (4217)
- **Power Electronics and Drives** •  
A Unified Modelling and Analytical Method for Fixed-frequency Phase-shifted Isolated Bidirectional DC/DC Converter  
..... FAN Hong, SHA Guanglin, SHENG Wanxing, DUAN Qing, MENG Xiaoli, MA Chunyan, ZHAO Caihong (4226)  
A VSG Power Frequency Transfer Function Identification Method Based on Characteristic Test in Frequency Domain  
..... YAN Xiangwu, JIA Jiaoxin, WANG Yuke, LI Xiaoyu, LI Tiecheng (4239)  
Research on Harmonic Transfer of Line Commutated Converter Based on Dynamic Phasors Method  
..... CHEN Daizhong, WANG Shunliang, JIAO Ning, MENG Jinhao, LIU Tianqi (4250)  
Modeling and Control of the MMC With Consideration of Large Reactors on its DC Side  
..... SHI Xianqiang, CAI Xu, YAO Weizheng, LYU Jing, DONG Peng, WU Jinlong, FANG Zixi, RAO Fangquan (4261)  
Stability Analysis of Grid-connected Inverter System Containing Virtual Synchronous Generator Under  
Time Delay and Parameter Uncertainty ..... LE Jian, ZHAO Liangang, LIAO Xiaobing, ZHOU Qian, LANG Hongke (4275)  
Sequential-model Predictive Control for Quasi-Z-source Inverter ..... WU Chun, YANG Jialei, CHEN Qiang (4286)
- **Electric Machines and Apparatus** •  
Pulse Signal Injection in Stationary Reference Frame for Sensorless PMSM Drives  
..... ZHANG Guoqiang, XIANG Runhua, WANG Gaolin, ZHANG Hongpeng, XU Dianguo (4297)  
Approximate Analytical Modeling and Verification of AC Loss in Stator Single Slot Windings of High Speed Motor  
..... XU Xin, DENG Zhiqian, ZHANG Zhongming, PANG Gucai, PENG Cong (4306)  
Measurement and Modelling of Local Deformation Caused by Magnetism in the Single-phase Transformer Core Experimental Model  
Under DC Bias ..... WANG Zhen, ZHANG Yanli, ZHANG Dianhai, REN Ziyan, XIE Dexin, BAI Baodong (4316)
- **Advanced Insulating Dielectrics** •  
Study on Space Charge Characteristics of XLPE Under Continuous Polarity Inversion Electric Field  
..... CAO Jun, ZHOU Guiyue, ZHANG Hongliang, MIAO Linxin, YIN Yi, WU Jiandong (4325)  
Study on Energy Storage Properties of PMMA/PVDF Based Composites Filled With Core-shell Nanofibers  
..... CHI Qingguo, YIN Chao, ZHANG Tiandong, ZHANG Changhai, FENG Yu, ZHANG Yue, CHEN Qingguo (4333)  
Effect of Micro Boron Nitride on Thermal and Electrical Prosperities of Silicone Modified Epoxy Based Light-weight  
Insulated Materials ..... LIU Yunpeng, LI Le, LIU Hechen, ZHOU Songsong, XIE Zhuopeng, LIU Lei, TANG Li, LI Xiaolin (4342)  
Influence of Interface States on Dielectric and Insulating Properties of Polyimide/TNSs Nanocomposites  
..... ZHU Congcong, YIN Jinghua, LI Jialong, ZHAO He, LI Yanpeng, YUE Dong, LIU Xiaoxu, FENG Yu (4354)
- **For Extended Summaries, Please See the Electronic Journals** •