

电网技术

POWER SYSTEM TECHNOLOGY

5
2020

第44卷5期
Vol.44 No.5



防止电缆火灾 选赫兹曼电力!

提高选线正确率 选赫兹曼电力!

“相不对称” PAM高精度 单相小电流接地故障检测

产品优势

- 只需取样三相CT电流, 可不停电安装不需PT等辅助设备, 安装简便快捷
- 适用中性点不接地、经消弧线圈接地电缆网、架空线路及混合配电网
- 8000欧姆及以下高阻接地故障检测准确 (通过国网漯河真型试验站检测)
- 拥有多项行业国际发明专利(证书号 第2082045号; 证书号 第2406020号; 证书号WO2011/159248 A1)

应用案例

案例一: 2017年8月, 国家电网一行领导到现场考察沈阳自贸区自动化示范项目, 分布式配电自动化系统与“相不对称”小电流接地故障检测技术得到国网领导关注。

案例二: 2019年4月, 国网辽宁省朝阳供电公司66kV西郊变18套“相不对称”小电流接地故障检测装置投入运行 (见“辽宁电网”公众号6月13日)

选型配置

- IPS2 基础型 环网柜型
- HMed-O系列 架空线型
- HMed-P系列 变电站型



IPS2 基础型
(环网柜型)



HMed-O系列
(架空线型)



HMed-P系列
(变电站型)



想要了解更多有价值的信息, 欢迎扫描下方二维码, 我们只展示您想看的!



官网二维码



微信二维码

赫兹曼电力(广东)有限公司
HMPower(Guangdong)Co.,Ltd
<http://www.hmpower.com.cn>

地址: 广东省佛山市顺德区大良五沙科技工业园科颐园(新悦路20号)
电话: 400-806-1138 13904016817 传真: 0757-29991639

ISSN 1000-3673



万方数据



国家电网有限公司 主办

编辑委员会

主任：周孝信

委员（按姓氏笔画排序）：

丁明 卫志农 王成山 王伟胜
王益民 王海风 韦化 文劲宇
文福拴 艾芊 毕天姝 吕运强
刘健 刘广一 刘开培 刘玉田
刘明波 刘建明 汤涌 孙华东
孙宏斌 严正 李卫东 李亚楼
李成榕 杨胜春 肖先勇 别朝红
何正友 张东霞 张乔根 周浩
周泽昕 段献忠 姚良忠 袁小明
徐政 郭剑波 梅生伟 曹一家
曹均正 盛万兴 康重庆 董新洲
程浩忠 谢小荣 路书军 廖瑞金
穆钢 鞠平

青年委员（按姓氏笔画排序）：

丁一 王蓓蓓 冯双磊 吕泉
刘友波 刘敦楠 齐波 汤奕
孙国强 李勇 李斌 李卫星
李生虎 李建林 吴学智 张宁
张波 张志劲 陆超 易俊
胡伟 胡泽春 郭庆来 涂春鸣
崔杨 焦在滨 裴玮 魏晓光

顾问委员会

主任：郑健超

委员（按姓氏笔画排序）：

马伟明 王锡凡 卢强 朱英浩
刘吉臻 汤广福 杨奇逊 严陆光
吴复立 邱爱慈 余贻鑫 汪櫟生
沈国荣 宋永华 陆佑楣 陈清泉
陈维江 罗安 郑宝森 顾国彪
唐任远 黄其励 韩祯祥 程时杰
舒印彪 薛禹胜

目次

· 面向能源互联网的储能系统集成控制及运行规划关键技术
(特约专栏主编 李相俊、梅生伟) ·

含干热岩增强地热系统的微能源网容量优化配置	司杨, 陈来军, 张学林, 梅生伟 (1603)
区域综合能源系统电/热云储能综合优化配置	郭亦宗, 王楚通, 施云辉, 郭创新, 商佳宜, 杨翺 (1611)
基于蒙特卡洛模拟和频谱分析法的孤岛微电网储能容量配置	黄金鑫, 李华强, 陆杨 (1622)
基于电池健康度的微电网群梯次利用储能系统容量配置方法	颜宁, 李相俊, 张博, 马少华, 王海鑫 (1630)
基于初始工作点选取的级联多电平混合储能系统功率分配控制	胡卫丰, 侍红兵, 李官军, 袁伯军, 刘钊, 陆一言 (1639)
三相储能型准 Z 源并网逆变器有限开关序列模型预测直接功率控制	程俊, 肖先勇, 马俊鹏, 杨翔宇, 游云峰, 曹子恒 (1647)
应用于储能变流器的虚拟同步发电机阻尼特性分析与改进	许崇福, 李菀茹, 徐宁一, 王弋飞, 刘永慧, 宁改娣, 王跃 (1656)
基于快速充电曲线的退役锂电池模块快速分选技术	郑岳久, 李家琦, 朱志伟, 来鑫, 周正 (1664)
链式储能系统储能单元能量均衡控制策略	郑征, 王永帅, 张国澎, 陶海军, 张茜 (1673)
基于交替方向乘子法的超大规模储能系统分布式协同优化	李相俊, 盛兴, 闫士杰, 王上行 (1681)
抑制超低频振荡的储能控制策略	刘文龙, 耿光超, 陈义宣, 江全元, 赵源筱, 李玲芳 (1689)
分散式储能自趋优经济运行的强化学习算法	邵明明, 刘友波, 陈婧婷, 王潇笛, 左坤雨, 刘俊勇 (1696)
采用一致性算法的自治微电网群分布式储能优化控制策略	张步云, 王晋宁, 梁定康, 韩肖清 (1705)
超导磁储能系统自适应分数阶滑模控制设计	杨博, 王俊婷, 王景博, 钟林恩, 束洪春, 余涛 (1714)
计及储能出力水平的平滑风电功率模型预测控制策略	刘颖明, 王晓东, 彭朝阳 (1723)
基于组合双向拍卖的共享储能机制研究	孙偲, 郑天文, 陈来军, 谢毓广, 高博, 梅生伟 (1732)
考虑共享模式的市场机制下售电公司储能优化配置及投资效益分析	刘继春, 陈雪, 向月 (1740)
电力市场环境下储能使用权出清模型及定价方法	杨骏伟, 夏云睿, 王一, 段秦刚, 陈青, 朱建全, 刘明波 (1750)
光储系统参与实时能量-调频市场的运行策略	谢云云, 谷志强, 王晓丰, 卓一, 王珂, 耿建 (1758)
· 国家重点研发计划 ·	
基于交互能源机制的产消者群分布式调度方法研究	艾欣, 王坤宇, 胡俊杰, 李柄樟 (1766)
基于两阶段集成深度置信网络的电力系统暂态稳定评估	邵美阳, 吴俊勇, 李宝琴, 张若愚 (1776)
基于结构相似度与平方误差的新能源场站送出线路纵联保护综合判据	郑黎明, 贾科, 毕天姝, 任龙飞, 杨哲 (1788)

基于等值阻抗相位特征的带并补电抗线路单相自适应重合闸故障识别方法.....邵文权, 刘朋跃, 王斌, 宋国兵 (1796)

基于直流电流过零特征的柔性直流配电网保护方案研究.....郑涛, 吴琮, 吕文轩, 王兴国, 曹虹 (1806)

大容量直流换相失败后功率恢复速率对送端系统暂态稳定的影响分析.....王增平, 胡加伟, 王彤, 时伯年 (1815)

HVDC 馈入及其换相失败对交流电网选相元件的影响分析.....李永丽, 杨子荷, 宋金钊, 陈晓龙 (1825)

基于鲁棒残差观测器的分布式电网动态补偿控制.....胡长斌, 陆珩, 罗珊珊, 史运涛, 马瑞, 温春雪, 周京华, 朴政国 (1834)

改进的单相脉冲整流器模型预测电流控制策略.....宋智威, 黄路, 熊成林, 关振宏 (1845)

基于多尺度思想的模块化多电平变流器可靠性分析综述.....谢阳腾, 丘东元, 谢帆 (1852)

混合式高压直流断路器内部组件电气状态仿真与分析.....杜林, 严涵, 吴学光, 谭亚雄, 常莎, 欧阳文敏 (1863)

· 可再生能源发电与综合消纳技术 ·

考虑调峰权交易提高风电二次消纳能力的热电联合经济调度.....杨丽君, 梁旭日, 王心蕊, 韩旗, 李慧翔 (1872)

计及大规模新能源接入的电-气耦合综合能源系统稳定性评估.....秦文萍, 逮瑞鹏, 高蒙楠, 景祥, 郑惠萍, 程雪婷 (1880)

计及风光出力相关性的配电网多目标无功优化.....刘梦依, 邱晓燕, 张志荣, 赵长枢, 赵有林, 张楷 (1892)

基于有功自适应调整的光伏电站无功电压控制策略.....俞智鹏, 汤奕, 戴剑丰, 易俊 (1900)

基于半监督机器学习法的光伏阵列故障诊断.....李光辉, 段晨东, 武珊 (1908)

基于奇异摄动理论的微电网降阶建模方法与对比研究.....谈赢杰, 黄莹, 袁智勇, 彭也伦, 马溪原 (1914)

· 电力系统 ·

DDS 在自动需求响应系统中的适用性分析及应用设想.....李彬, 叶筠英, 祁兵, 张晶, 李德智, 杨斌, 奚培锋 (1922)

级联恒功率负载情况下三相并网 PWM 整流器基于 TS 模糊模型的稳定性分析.....聂金铜, 赵争鸣, 袁立强, 文武松, 张颖超 (1931)

基于 FSOM 神经网络的电能质量数据缺失修复算法.....杨挺, 何周泽, 赵东艳, 盆海波, 姜含, 蔡绍堂, 原义栋, 蔡玉朋 (1941)

基于集对分析与可变模糊集的电能质量综合评估.....程志友, 刘荡荡, 吴吉, 陈亮 (1950)

牵引网谐振特性与治理方案.....骆冰祥, 解绍锋, 李群湛, 苏鹏 (1957)

基于电流信号稀疏滤波特征融合的齿轮箱故障诊断方法.....何群, 赵婧怡, 江国乾, 贾晨凌, 谢平 (1964)

基于 SVM-神经网络融合反馈的触电电流检测方法.....刘永梅, 杜松怀, 盛万兴 (1972)

· 高电压技术 ·

±500 kV 同塔三回柔性直流输电线路的电磁环境.....马晓倩, 何堃, 谢莉, 陆家榆, 鞠勇 (1978)

一种无源无直流偏磁的交流电流检测装置.....郭欣然, 于歆杰, 楼国锋 (1985)

· 工程应用 ·

张北柔性直流电网盈余功率问题的耗能方法.....梅念, 周杨, 李探, 苑宾 (1991)

电网热稳定输送能力辅助决策系统.....张怡, 项中明, 马超, 张锋, 李有春, 马翔, 唐律, 莫建国 (2000)

《工程索引》(EI) 收录核心期刊
2015 和 2017 年度中国“百强报刊”
中国最具国际影响力学术期刊
中国百种杰出学术期刊
中国精品科技期刊
全国中文核心期刊
RCCSE 中国权威学术期刊
《科学文摘》(SA) 收录期刊
《文摘杂志》(AJ) 收录期刊
中国科学引文数据库 (CSCD)
中国期刊方阵双效期刊
电力行业优秀科技期刊

《电网技术》(月刊)

第 44 卷 第 5 期 (总第 438 期)

主 管: 国家电网有限公司

主 办: 国家电网有限公司

编 辑: 中国电科院期刊中心
《电网技术》编辑部

出 版: 《电网技术》杂志社有限公司

主 编: 郭剑波

副主编: 汤 涌、康重庆、孙华东

编辑部副主任: 李兰欣 010-82812543

广告部经理: 李慧东 010-82812429

发 行: 闫 頔 010-82812465

编 辑: 010-82812523/2672/2981/2982

网上投稿: <http://www.dwjs.com.cn>

电力系统内部电话: 91862+后四位

传 真: 010-82812980

地 址: 100192 北京清河小营东路 15 号
中国电力科学研究院有限公司内

印 刷: 北京科信印刷有限公司
北京市昌平区七北路马连店甲 6 号

总发行: 北京报刊发行局

国外发行: 中国国际图书贸易总公司

订 阅: 全国各地邮局

邮发代号: 国内 82-604 国外 1474M

中国标准连续出版物号: ISSN 1000-3673
CN 11-2410/TM

广告经营许可证号: 京海工商广字第 0168 号

POWER SYSTEM TECHNOLOGY

2020, Vol. 44 No. 5 (Ser. 438)

Contents

▪Key Technologies of Integration, Control and Operation Planning of Energy Storage Systems for Energy Internet ▪

Capacity Optimization of Micro Energy Network With Hot Dry Rock Enhanced Geothermal System

.....SI Yang, CHEN Laijun, ZHANG Xuelin, MEI Shengwei (1603)

Comprehensive Optimization Configuration of Electric and Thermal Cloud Energy Storage in Regional Integrated Energy System

.....GUO Yizong, WANG Chutong, SHI Yunhui, GUO Chuangxin, SHANG Jiayi, YANG Xuan (1611)

Energy Storage Capacity Configuration of Isolated Microgrid Based on Monte Carlo Simulation and Spectrum Analysis

.....HUANG Jinxin, LI Huaqiang, LU Yang (1622)

Energy Storage Capacity Allocation Method With Cascade Utilization Based on Battery Health in Microgrids

.....YAN Ning, LI Xiangjun, ZHANG Bo, MA Shaohua, WANG Haixin (1630)

Power Distribution Control for Cascaded Multilevel Inverter With Hybrid Energy Sources Based on Initial Operation Point Selection

.....HU Weifeng, SHI Hongbing, LI Guanjun, YUAN Bojun, LIU Zhao, LU Yiyan (1639)

Finite Switching Sequence Model Predictive Direct Power Control of a Three-phase Energy-stored Quasi-Z-source

Grid-connected Inverter

.....CHENG Jun, XIAO Xianrong, MA Junpeng, YANG Xiangyu, YOU Yunfeng, CAO Ziheng (1647)

Analysis and Improvement of Damping Characteristics of Virtual Synchronous Generator Control Applied to Energy Storage Converter

.....XU Chongfu, LI Wanru, XU Ningyi, WANG Yifei, LIU Yonghui, NING Gaidi, WANG Yue (1656)

Rapid Classification Based on Fast Charging Curves for Reuse of Retired Lithium-ion Battery Modules

.....ZHENG Yuejiu, LI Jiaqi, ZHU Zhiwei, LAI Xin, ZHOU Zheng (1664)

Study on Energy Balance Control Strategy of Energy Storage Unit in Chain Energy Storage System

.....ZHENG Zheng, WANG Yongshuai, ZHANG Guopeng, TAO Haijun, ZHANG Xi (1673)

Distributed Cooperative Optimization for Ultra-large-scale Storage System Based on Alternating Direction Multiplier Method

.....LI Xiangjun, SHENG Xing, YAN Shijie, WANG Shangxing (1681)

Control Strategy of Energy Storage System for Ultra-low Frequency Oscillation Suppression

.....LIU Wenlong, GENG Guangchao, CHEN Yixuan, JIANG Quanyuan, ZHAO Yuanxiao, LI Lingfang (1689)

Reinforcement Learning Driven by Self-optimizing Operation for Distributed Electrical Storage System

.....SHAO Mingming, LIU Youbo, CHEN Jingting, WANG Xiaodi, ZUO Kunyu, LIU Junyong (1696)

Optimization Control Strategy of Distributed Energy Storage in Autonomous Microgrid Cluster on Consensus Algorithm

.....ZHANG Buyun, WANG Jinning, LIANG Dingkan, HAN Xiaoqing (1705)

Adaptive Fractional-order Sliding-mode Control Design of Superconducting Magnetic Energy Storage Systems

.....YANG Bo, WANG Juntong, WANG Jingbo, ZHONG Lin'en, SHU Hongchun, YU Tao (1714)

Model Predictive Control Strategy for Smoothing Wind Power With Energy Storage Output Level

.....LIU Yingming, WANG Xiaodong, PENG Chaoyang (1723)

Energy Storage Sharing Mechanism Based on Combinatorial Double Auction

.....SUN Cai, ZHENG Tianwen, CHEN Laijun, XIE Yuguang, GAO Bo, MEI Shengwei (1732)

Optimal Sizing and Investment Benefit Analysis for Energy Storage of Electricity Retailers Under Market Mechanisms

Considering Shared Mode

.....LIU Jichun, CHEN Xue, XIANG Yue (1740)

Clearing Model and Pricing Rules of Energy Storage Rights in Electricity Market

.....YANG Junwei, XIA Yunrui, WANG Yi, DUAN Qingang, CHEN Qing, ZHU Jianquan, LIU Mingbo (1750)

Optimal Operation Strategy of Combined Photovoltaic and Storage System in Real Time Energy and Regulation Market

.....XIE Yunyun, GU Zhiqiang, WANG Xiaofeng, ZHUO Yi, WANG Ke, GENG Jian (1758)

▪ National Key Research and Development Program of China ▪

Study on Distributed Scheduling Approach of Aggregated Prosumers Based on Transactive Energy Mechanism

.....AI Xin, WANG Kunyu, HU Junjie, LI Bingzhang (1766)

Transient Stability Assessment of Power System Based on Two-stage Ensemble Deep Belief Network

.....SHAO Meiyang, WU Junyong, LI Baoqin, ZHANG Ruoyu (1776)

Comprehensive Criteria of Pilot Protection Based on Structural Similarity and Square Error for Outgoing Line from Renewable Power Plants

.....ZHENG Liming, JIA Ke, BI Tianshu, REN Longfei, YANG Zhe (1788)

Single-phase Adaptive Reclosure Fault Identification for Transmission Lines With Shunt Reactors Based on Equivalent

Impedance Phase Property

.....SHAO Wenquan, LIU Pengyue, WANG Bin, SONG Guobing (1796)

Research on Protection Scheme of Flexible DC Distribution Grids Based on DC Current Zero-crossing Characteristics

.....ZHENG Tao, WU Qiong, LÜ Wenxuan, WANG Xingguo, CAO Hong (1806)

Analysis of Impact of Power Recovery Speed on Transient Stability of Sending-side System After Large Capacity HVDC

Commutation Failure

.....WANG Zengping, HU Jiawei, WANG Tong, SHI Bonian (1815)

Influence Analysis of HVDC and Commutation Failure on AC Phase Selector

.....LI Yongli, YANG Zihe, SONG Jinzhao, CHEN Xiaolong (1825)

Dynamic Compensation Control of Distributed Power Network Based on Robust Residual Observer

.....HU Changbin, LU Heng, LUO Shanna, SHI Yuntao, MA Rui, WEN Chunxue, ZHOU Jinghua, PIAO Zhengguo (1834)

Improved Model Predictive Current Control Strategy for Single-phase Pulse Rectifier	SONG Zhiwei, HUANG Lu, XIONG Chenglin, GUAN Zhenhong (1845)
Review of Reliability Analysis of Modular Multilevel Converter Based on Multiscale Theory	XIE Yangteng, QIU Dongyuan, XIE Fan (1852)
Simulation and Analysis of Electrical States of Internal Components of Hybrid HVDC Circuit Breaker	DU Lin, YAN Han, WU Xueguang, TAN Yaxiong, CHANG Sha, OUYANG Wenmin (1863)
▪ Renewable Energy Generation and Integration ▪	
Combined Heat and Power Economic Dispatching Considering Peak Regulation Right Trading to Improve Secondary Accommodation Capability of Wind Power	YANG Lijun, LIANG Xuri, WANG Xinrui, HAN Qi, LI Huixiang (1872)
Stability Assessment of Electro-gas Coupled Integrated Energy System Considering Large-scale New Energy Access	QIN Wenping, LU Ruipeng, GAO Mengnan, JING Xiang, ZHENG Huiping, CHENG Xueting (1880)
Multi-objective Reactive Power Optimization of Distribution Network Considering Output Correlation Between Wind Turbines and Photovoltaic Units	LIU Mengyi, QIU Xiaoyan, ZHANG Zhirong, ZHAO Changshu, ZHAO Youlin, ZHANG Kai (1892)
Voltage/var Control Strategy of PV Plant Based on Adaptive Adjustment of Active Power	YU Zhipeng, TANG Yi, DAI Jianfeng, YI Jun (1900)
Fault Diagnosis of PV Array Based on Semi-supervised Machine Learning	LI Guanghui, DUAN Chendong, WU Shan (1908)
Modeling Method and Comparison of Order Reduction for Micro-grid Based on Singular Perturbation Theory	TAN Yingjie, HUANG Ying, YUAN Zhiyong, PENG Yelun, MA Xiyuan (1914)
▪ Power System ▪	
Applicability Analysis and Prospect of DDS in Automated Demand Response System	LI Bin, YE Yuning, QI Bing, ZHANG Jing, LI Dezhi, YANG Bin, XI Peifeng (1922)
Stability of Three-phase Grid-connected PWM Rectifier Cascaded With Constant Power Loads Based on TS Fuzzy Models	NIE Jintong, ZHAO Zhengming, YUAN Liqiang, WEN Wusong, ZHANG Yingchao (1931)
Power Quality Data Loss Repair Algorithm Based on FSOM Neural Network	YANG Ting, HE Zhouze, ZHAO Dongyan, PEN Haibo, JIANG Han, CAI Shaotang, YUAN Yidong, CAI Yupeng (1941)
Comprehensive Evaluation of Power Quality Based on Set Pair Analysis and Variable Fuzzy Sets	CHENG Zhiyou, LIU Dangdang, WU Ji, CHEN Liang (1950)
Harmonic Resonance Characteristics of Traction Network and Treatment Scheme	LUO Bingxiang, XIE Shaofeng, LI Qunzhan, SU Peng (1957)
Current-based Gearbox Fault Diagnosis Based on Sparse Filtering Feature Fusion	HE Qun, ZHAO Jingyi, JIANG Guoqian, JIA Chenling, XIE Ping (1964)
Prediction Method of Electric Shock Current Based on SVM and Neural Network Fusion Feedback	LIU Yongmei, DU Songhuai, SHENG Wanxing (1972)
▪ High Voltages ▪	
Study on Electromagnetic Environment of ± 500 kV Triple-circuit Flexible DC Transmission Line on Same Tower	MA Xiaoqian, HE Kun, XIE Li, LU Jiayu, JU Yong (1978)
A Passive AC Current Sensor Without DC Magnetic Field Bias	GUO Xinran, YU Xinjie, LOU Guofeng (1985)
▪ Engineering Applications ▪	
Energy Consumption Method for Power Surplus in Zhangbei VSC-Based DC Grid	MEI Nian, ZHOU Yang, LI Tan, YUAN Bin (1991)
Design of Aided-decision System to Improve Thermal Stability Transport Capacity of Power Grid	ZHANG Yi, XIANG Zhongming, MA Chao, ZHANG Feng, LI Youchun, MA Xiang, TANG Lü, MO Jianguo (2000)

Sponsor: State Grid Corporation of China
In Cooperation with: China Electric Power Research Institute (CEPRI)
Chairman of Editorial Committee: Zhou Xiaoxin
Editor-in-Chief: Guo Jianbo
Editor and Publisher: Power System Technology Press
Associate Director of Editorial Board: Li Lanxin
Publication Number: ISSN 1000-3673
CODEN: DIJIES **Devey#:** 621.31

Address: China Electric Power Research Institute, Qinghe, Beijing 100192, China
Tel/Fax: 86-10-82812980
E-mail: pst@epri.sgcc.com.cn <http://www.dwjs.com.cn>
Agent of Subscriptions Abroad: China International Book Trading Corporation (GUOJISHUDIAN) P.O.Box 399, Beijing, China

Improved Model Predictive Current Control Strategy for Single-phase Pulse Rectifier	SONG Zhiwei, HUANG Lu, XIONG Chenglin, GUAN Zhenhong (1845)
Review of Reliability Analysis of Modular Multilevel Converter Based on Multiscale Theory	XIE Yangteng, QIU Dongyuan, XIE Fan (1852)
Simulation and Analysis of Electrical States of Internal Components of Hybrid HVDC Circuit Breaker	DU Lin, YAN Han, WU Xueguang, TAN Yaxiong, CHANG Sha, OUYANG Wenmin (1863)
▪ Renewable Energy Generation and Integration ▪	
Combined Heat and Power Economic Dispatching Considering Peak Regulation Right Trading to Improve Secondary Accommodation Capability of Wind Power	YANG Lijun, LIANG Xuri, WANG Xinrui, HAN Qi, LI Huixiang (1872)
Stability Assessment of Electro-gas Coupled Integrated Energy System Considering Large-scale New Energy Access	QIN Wenping, LU Ruipeng, GAO Mengnan, JING Xiang, ZHENG Huiping, CHENG Xueting (1880)
Multi-objective Reactive Power Optimization of Distribution Network Considering Output Correlation Between Wind Turbines and Photovoltaic Units	LIU Mengyi, QIU Xiaoyan, ZHANG Zhirong, ZHAO Changshu, ZHAO Youlin, ZHANG Kai (1892)
Voltage/var Control Strategy of PV Plant Based on Adaptive Adjustment of Active Power	YU Zhipeng, TANG Yi, DAI Jianfeng, YI Jun (1900)
Fault Diagnosis of PV Array Based on Semi-supervised Machine Learning	LI Guanghui, DUAN Chendong, WU Shan (1908)
Modeling Method and Comparison of Order Reduction for Micro-grid Based on Singular Perturbation Theory	TAN Yingjie, HUANG Ying, YUAN Zhiyong, PENG Yelun, MA Xiyuan (1914)
▪ Power System ▪	
Applicability Analysis and Prospect of DDS in Automated Demand Response System	LI Bin, YE Yuning, QI Bing, ZHANG Jing, LI Dezhi, YANG Bin, XI Peifeng (1922)
Stability of Three-phase Grid-connected PWM Rectifier Cascaded With Constant Power Loads Based on TS Fuzzy Models	NIE Jintong, ZHAO Zhengming, YUAN Liqiang, WEN Wusong, ZHANG Yingchao (1931)
Power Quality Data Loss Repair Algorithm Based on FSOM Neural Network	YANG Ting, HE Zhouze, ZHAO Dongyan, PEN Haibo, JIANG Han, CAI Shaotang, YUAN Yidong, CAI Yupeng (1941)
Comprehensive Evaluation of Power Quality Based on Set Pair Analysis and Variable Fuzzy Sets	CHENG Zhiyou, LIU Dangdang, WU Ji, CHEN Liang (1950)
Harmonic Resonance Characteristics of Traction Network and Treatment Scheme	LUO Bingxiang, XIE Shaofeng, LI Qunzhan, SU Peng (1957)
Current-based Gearbox Fault Diagnosis Based on Sparse Filtering Feature Fusion	HE Qun, ZHAO Jingyi, JIANG Guoqian, JIA Chenling, XIE Ping (1964)
Prediction Method of Electric Shock Current Based on SVM and Neural Network Fusion Feedback	LIU Yongmei, DU Songhuai, SHENG Wanxing (1972)
▪ High Voltages ▪	
Study on Electromagnetic Environment of ± 500 kV Triple-circuit Flexible DC Transmission Line on Same Tower	MA Xiaoqian, HE Kun, XIE Li, LU Jiayu, JU Yong (1978)
A Passive AC Current Sensor Without DC Magnetic Field Bias	GUO Xinran, YU Xinjie, LOU Guofeng (1985)
▪ Engineering Applications ▪	
Energy Consumption Method for Power Surplus in Zhangbei VSC-Based DC Grid	MEI Nian, ZHOU Yang, LI Tan, YUAN Bin (1991)
Design of Aided-decision System to Improve Thermal Stability Transport Capacity of Power Grid	ZHANG Yi, XIANG Zhongming, MA Chao, ZHANG Feng, LI Youchun, MA Xiang, TANG Lü, MO Jianguo (2000)

Sponsor: State Grid Corporation of China
In Cooperation with: China Electric Power Research Institute (CEPRI)
Chairman of Editorial Committee: Zhou Xiaoxin
Editor-in-Chief: Guo Jianbo
Editor and Publisher: Power System Technology Press
Associate Director of Editorial Board: Li Lanxin
Publication Number: ISSN 1000-3673
CODEN: DIJIES **Devey#:** 621.31

Address: China Electric Power Research Institute, Qinghe, Beijing 100192, China
Tel/Fax: 86-10-82812980
E-mail: pst@epri.sgcc.com.cn <http://www.dwjs.com.cn>
Agent of Subscriptions Abroad: China International Book Trading Corporation (GUOJISHUDIAN) P.O.Box 399, Beijing, China