2021 6th Asia Conference on Power and Electrical Engineering (ACPEE 2021)

Chongqing, China 8 – 11 April 2021

Pages 1-589



IEEE Catalog Number: CFF ISBN: 978-

CFP21E58-POD 978-1-7281-9160-7

Copyright © 2021 by the Institute of Electrical and Electronics Engineers, Inc. All Rights Reserved

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

*** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.

 IEEE Catalog Number:
 CFP21E58-POD

 ISBN (Print-On-Demand):
 978-1-7281-9160-7

 ISBN (Online):
 978-1-7281-9159-1

Additional Copies of This Publication Are Available From:

Curran Associates, Inc 57 Morehouse Lane Red Hook, NY 12571 USA Phone: (845) 758-0400

Fax: (845) 758-2633

E-mail: curran@proceedings.com Web: www.proceedings.com



Table of Contents

Chapter 1: Protection and Risks & HV Technologies

Review of SiC Power Devices for Electrical Power Systems: Characteristics, Protection, and Application	1
Xue Wang, Huiqing Wen, and Yinxiao Zhu	1
Failure Mode Mechanism and Effect Analysis of High Voltage DC Arcs in Electric Vehicle Cable Yibo Liu, Jonathan Swingler, and David Flynn	6
Review of Risk Analysis Methods for Failure Scenario in Power System under Typhoon Disasters	14
Zhiwei Zhang, Hui Hou, Yongchao Liang, Yong Huang, Ruizeng Wei, and Shuqin Liu	14
Novel Differential Protection for Distribution Network with Inverter-Interfaced Distributed Generations	19
Chenghan Zhou, Guibin Zou, Lindong Zang, Xuhui Wen, Liangzhi Sun, and Xiaogong Du	
A Current Differential Protection Scheme Based on Q-Axis Component for Distribution Networks Lindong Zang, Guibin Zou, Chenghan Zhou, Liangzhi Sun, and Xiaogong Du	24
Calculation of Transformer DC-Bias Current in AC Power Systems Considering Metro Stray Current	29
Aimin Wang, Sheng Lin, Qi Zhou, Yang Huangfu, Jianzhou Wu, and Zhengyou He	
State Estimation of Combined Heat and Power Systems Considering Thermal Dynamics and Different Time-Scale Measurements	34
Research on Faulty Section Location Method for Active Distribution Network	41
Xuhui Wen, Guibin Zou, Chenghan Zhou, Liangzhi Sun, and Xiaogong Du	
A Fault Diagnosis Method for Photovoltaic Modules Based on Transfer Long Short-Term Memory Neural Network	46
Shan Ĥu, Fei Wang, Hui Guo, and Wenhao Zhu	
Establishment and Research on UHV GIS Lightning Wave Discharge Loop Model Teng Fuli, Chen Tianxiang, and Meng Jiadong	52
Single-Ended Protection Scheme for MMC-HVDC System Based on Transient First-Wave of Voltage	50
Jinliang Zhang, Guibin Zou, and Jinchuan Song	50
Resonant Based Overvoltage Restraining Strategy for MMC-HVDC Wind Power Transmission System under Sending End Grid Fault	63
Xiaohe Wang, Wenbin Yang, Zhaohui Shi, Chunxiang Fu, Bin Lin, and Lingang Yang	
Conventional Method for Electrical Transmission System Fault Location Detection	69
Single-Phase Grounding Fault Line Selection Method Based on the Difference of Electric Energy Information between the Distribution End and the Load End	77

A Novel Non-Intrusive Arc Fault Detection Method for Low-Voltage Customers
Metal Corrosion Assessment Method of Power Equipment Based on Multi-Feature Fusion and PCA Dimensionality Reduction Analysis
Saturation High Light Removal of Pressure Plate Image Based on Feature Matching
Comparative Analysis of the Effects of Different Resistance Reduction Measures Based on CDEGS Calculations
Research on Strategic Reserve Mechanism and its Enlightenment to China
Anomaly Detection Method for Substation Equipment Based on Feature Matching and Multi-Semantic Classification
Mechanism Study on the Allometric Scaling Laws of Power Grid Scale Based on Community Detection
Control and Protection System Design of Zhangbei VSC-HVDC Grid
Electrical Model and Structure Parameters of a New 500kV Current Limiting Device
Fault Diagnosis Analysis and Application of DC-DC Power Supply Based on FMEA and FTA 130 Dalian Wang, Siqi Li, Congcong Li, and Yingying Zhang
Bipolar Fault Analysis and Protection Method of AC/DC Power Electronic Transformer in Microgrid
Research on Measures to Reduce the Lightning Breakdown of 10kV Distribution Lines
Research on Screening Method of Operating Risk Points for Power System Pre-Dispatch
Application of Comprehensive Evaluation for Lightning Protection Scheme in Distribution Line on Analytic Hierarchy Process
Fault Distance Measurement Based on Active Waveform Disturbance
Impact of Measurements Placement on Fault Location using Compressive Sensing

Fault Location on Multi-Branch Network using Traveling Wave and Graph Theory	168
Research on Lightning Protection of 220kV Substation with Long Cable Inlet Wire	173
Summary of Research on Cascading Failures under the New Circumstances	178
On the Fatigue Reduction of WTs via Coordinating Inertial Response and Pitch Angle Regulation	183
Analysis of AC/DC Mutual Interaction in Low Voltage Multi-Terminal DC System under Fault State	188
Changing Rules of Multi-Infeed Short Circuit Ratio of AC/DC Power System against Multiple Factors	194
Design of Transient High Impact Multi-Typical Device Failure System	201
Experimental Study on Electro-Impulse De-Icing of Wind Turbine Blades Tingfan Huang, Xingliang Jiang, Yu Chen, and Maozheng Wang	205
The Impact of Series Capacitor on Transmission Line Current Differential Protection	210
Research on Early Warning and Location Method of Distribution Network Line Fault	215
Risk-Constrained Multi-Period Planning for Park-Level Integrated Energy System Based on CVaR Method	220
Traveling Wave Signal Extraction and Fault Identification for HVDC Based on Time-Domain Integration	226
Study on the Application of Four-Terminal Flexible High Voltage Direct Current Transmission Technology in Nanjing Power System	232
The Simulation Research on Propagation Characteristics of Acoustic Signal Generated by Buffer Layer Ablation Defects in High Voltage Cable	237
Electrical Properties of Surface Insulating Coating for Wind Turbine Generator	242

Research on Synchronous Condensers to Suppress Subsynchronous Oscillation Caused by New Energy Power Generation	. 247
Julia-Based High-Performance Electromagnetic Transient Simulation Method and Platform for Large Power Grid	. 252
Study on Emergency Control of Reactive Power after HVDC Blocking Fault with Large-Scale Renewable Energy	. 258
Accommodation Ability Evaluation of High Renewable Energy Penetrated Power System with Large-Scale Concentrating Solar Power	. 263
Study on Application of One Key Sequence Control in 750 kV Substation	. 269
Study on Controllable MOA in 750kV System to Cancel Closing Resistor of Circuit Breakers	. 275
Study and Engineering Application of Laser Removal Equipment for Foreign Bodies in Transmission Lines	. 280
Investigation of Progressing Low and Medium Voltage DC Standards to Acquire the Implementation Scenarios for Domestic/Commercial and Industrial Converters and Enabling Technologies	285
Chapter 2: Al Applications	
Short-Term Photovoltaic Power Prediction Based on Daily Feature Matrix and Deep Neural Network	290
Transmission Equipment Image Recognition Based on Ensemble Learning	. 295
A Power Data Reconstruction Method Based on Super-Resolution Generative Adversarial Network	. 300
The Staring Times Design for Biomass Power Generator Sets using Deep Learning Method	. 305
Electricity Price Forecasting Method Based on Quantum Immune Optimization BP Neural Network Algorithm	. 310
A Review of Machine Learning on Energy Management Strategy for Hybrid Electric Vehicles Qin Feiyan and Li Weimin	315

Load Recovery Optimization with Wind Farms Based on Uncertain Bi-Level Programming	. 320
A Self-Similarity-Based Approach of Learning Curve for Renewable Technology	. 325
FHMM Based Industrial Load DisaggregationFan Yang, Bo Liu, Wenpeng Luan, Bochao Zhao, Zishuai Liu, Xiao Xiao, and Ruiqi Zhang	. 330
An Unsupervised Non-Intrusive Electric Bicycle Charging Detection Method	. 335
Review of Load Forecasting Based on Artificial Intelligence Models	. 340
Real-Time Evaluation System of Transformer Winding Short-Circuit Withstand Capability Based on Symplectic Geometry Mode Decomposition and Extreme Learning Machine	. 345
An Intelligent Power User Data Analysis Platform Based on Spark	. 351
A Predictive Model of Electricity Resident User Payment Based on Transfer Learning	. 356
Numerical Correlation Analysis of Power Grid Construction Project Based on Apriori Algorithm Juhua Hong, Jinbo Li, Xiangjing Qiu, Shicheng Huang, and Chao Xun	. 361
Multi-Mode Big Data Mining and Analysis Based on Internet of Things on Power	. 365
Comprehensive Energy Online Service Recommendation Algorithm Based on Random Forest Peng Wu, Fubao Li, Jing Cai, Yongze Zhang, Zhangjian Kang, Zhao Luo, Zeyong Gao, and Zhendong Zhu	. 371
Intelligent Configuration of "Three Remote" Distribution Automation Terminals	. 378
Research and Application of Digital Twin Technology in Power Grid Development Business	. 383
Equipment-Oriented Intelligent Model and Implementation System Designed for Data Management in Power System Jingsong Li, Xin Hu, Xiaotong Luo, and Shaorong Wang	. 388
Research on Multi-Factorial Investment Decision of Distribution Network Based on Input-Output Assessment and Genetic Algorithm	. 394
Estimation of Chiller Electric Power of Central Air Conditioner using Feedforward Neural Network	. 399
Dingyi Cheng, Dong Yang, Huan Ma, Meng Liu, Yan Zhang, and Qiao Fang	

An Optimization Method Based on LM-GA for Parameter Identification of Photovoltaic Cell	405
A Partial Information Network Growth and Evolution Model Based on Power System Topology Dan Yang, Xiaoxiao Wo, Pei Wei, Long Li, Yang Chen, and Ye Cai	410
A Two-Stage Scenario Generation Method for Wind-Solar Joint Power Output Considering Temporal and Spatial Correlations	. 415
Construction Method of Virtual Power Plant Based on Landscape Theory	424
Workload Modelling Method of Edge Computing Terminals for Distribution Service under Power Internet of Things	. 430
AdaBoost-CNN: A Hybrid Method for Electricity Theft Detection	436
Research on Data Intelligent Retrieval Method Oriented to Unified Business Center of Power System	. 441
Optimal Time-of-Use Pricing for Solar Power Integrated Distribution Network Considering Random and Fuzzy Environment	. 446
A New Type of Substation Real-Time Detection System Based on Edge Computing and RAFT Consensus Algorithm	. 451
Feature Fusion Human Object Detection Algorithm	. 456
Substation Object Detection Based on Enhance RCNN Model	463
Rough Classification of Power Equipment Images Based on BP Algorithm	470
Typical Application Scenarios of Rural Energy Internet Platform	475
Cyber-Physical Power System Vulnerability Analysis Based on Complex Network Theory	482
Residential Photovoltaic Power Forecasting Considering Division of Weather Type Index Interval	. 487
Zhiyong Li, Jie Shao, Zhun Zhong, Xiaowei Yan, Ruonan Zheng, and Keyou Wang A Data-Driven Approach for Short-Term Electricity Consumption Forecast Based on Hybrid Intelligent Method	. 493

Research and Application of Deep Belief Neural Network for Distribution Transformer Feeding Area Line Loss Reduction Fan Yang, Wei Huang, and Shuqing Li	. 498
Feature Extraction for Non-Intrusive Load Monitoring System	. 503
Research on Icing Status Forecasting of Wind Turbine Blades Based on Machine Learning	. 508
Interval Prediction of Photovoltaic Output Based on WOA-LSTM-LSSVM Combined ModelYuxin Zhou, Jing Shi, Hongkun Chen, and Tong Ding	. 514
Prediction of Distribution Network Operation Trend Based on the Secondary Modal Decomposition and LSTM-MFO Algorithm	. 520
Electric Power Substitute End-Use Energy Evaluation Model Based on Deep Learning Longfei Ma, Hongwei Cai, Baoqun Zhang, Ran Jiao, Cheng Gong, YongXu Zhang, and Dongying Zhang	. 526
Real-Time FPGA-Digital Twin Monitoring and Diagnostics for PET Applications	. 531
Optimization of Radio Frequency Identification Reference Tag Location Algorithm Based on Back Propagation Neural Network	. 537
Research on Optimal Load Distribution of Power Plants Based on Chaos Genetic Algorithm	. 542
Early Warning of Abnormal State of Wind Turbine Based on Principal Component Analysis and RBF Neural Network	. 547
Research on Digital Construction Scheme of Distribution Network under the Background of Energy Internet	. 552
Load Transfer Analysis of Regional Power Grid Based on Expert System Theory	. 557
CoAP Protocol Communication Mapping for Power Distribution Internet of Things Based on IEC 61850	. 562
Chapter 3: Electricity Market & Electric Vehicles & Microgrid	
Coordinated Energy Trading Model for Cooperative Microgrids Considering Uncertainties	. 567

Optimal Scheduling of Micro-Grid Multi-Energy System Considering Two-Dimensions Price-Based Demand Response	572
Study on Peer-to-Peer Trading Mechanism in Local Distribution Network	578
Cross Border Energy Transactions in India: Present and Future	583
Energy Portfolio Mechanism for Hybrid Energy Sharing in Multimicrogrids Based on Coalitional Game	590
Congestion Management in Local Market Considering the Payback Effect	595
Improved Generation Right Trading for Self-Supplied Power Plants	601
Research on Market Mechanism of Self-Supplied Power Plants	606
Interactive Trading Model among Multiple Market Participants Based on Hierarchical Game Frame in Distribution Network	611
Design and Application of Operation Evaluation Index System for Spot Electricity Market	616
Research on the Synergy of the Electricity Prices Providing Location Signals under Electricity Spot Market Environment	625
The Coordination Mechanism of Forward Market and Spot Market under the Cost-Based Electricity Market Model for Yunnan	634
Yunnan Electric Power Market Framework and Operation Effect Analysis	640
Optimal Day-Ahead Dispatch of Virtual Power Plant with Aggregated Multi-Type Electric Vehicles via a Stackelberg Game Approach	645
Analysis of Peak Regulation Auxiliary Service Market under the Deepening Stage of the Spot Market Construction	651

of New Energy	658
Xiaoliang Dong, Yichuan Shi, Chenda Zhang, Kunyuan Xue, and Chuncheng Gao	
Day-Ahead Dispatching Model of Source-Load Coordination Considering Consumer's Response Behavior to Real-Time Pricing	664
Impact Analysis and Key Operating Parameters Identification of the Spot Market	670
Bidding and Offering Models in Generation-Grid-Load-Storage Transactions Based on Flexible Order Types	676
A Microgrid Topology Design and Evaluation Method based on Power Router	682
Coordination Control Strategy for Multi-Mode Photovoltaic and Energy Storage DC Micro-Grid Hu Jidong, Wu Haitao, and Jia Boyuan	688
Stochastic Electric Vehicle Charging Optimization in Distribution Network	693
Research on Evaluation Model of Electric Vehicle Post Service Business Operation in Online and Offline Integrated Mode	698
Game Theoretic Energy Management for Electric Vehicles in Smart Grid	703
An EVSE External Impedance Characteristic Measuring Method for Electric Vehicles Charging Resonance Risk Evaluation	709
Charging Navigation Strategy of Electric Vehicles Considering Time-of-Use Pricing	715
Regional Integrated Energy System Optimization Strategy Involving Electric Vehicle Clusters	721
Research on Intelligent Power Management and Control Technology of Electric Vehicle Based on Edge Computing	726
A Self-Scheduling Strategy for Electric Vehicles Participating in Power System Frequency Regulation	731
A Distributed Transaction Method for Mitigating Three-Phase Imbalance by Scheduling Electric Vehicle Charging	726
Chun Sing Lai, Zhaoxiong Huang, Dashen Chen, Ahmed F. Zobaa, and Loi Lei Lai	130

Chapter 4: Advanced Control Applications

Hybrid DC Circuit Breaker with Power Flow Control Function	741
Adaptive Reclosing Scheme for Flexible Multi-Terminal DC Distribution Grid	746
Estimating the Lifetime Model for the Commercial Concentrator III—V Triple-Junction Solar Cells using the Lognormal Distribution	751
Pressure Influence Analysis of Dissolved Gas in Insulation Oil Based on Molecular Simulation and Experimental Comparsion	756
The Equivalent Model for PMSG Offshore Wind Farm Based on Clustering Algorithm	761
A DC Line Protection Scheme Based on Current Traveling Wave for MMC-MTDC Grids	767
A Current-Slope-Based DC line Protection for MMC-MTDC Grid	772
Electric Power System Transient Stability Assessment Based on Bi-LSTM Attention Mechanism Nawaraj Kumar Mahato, Jie Dong, Chunyu Song, Zhimin Chen, Nan Wang, Hongliang Ma, and Gangjun Gong	777
Frequency Response Strategy of Wind-Storage-PEV Collaborated System	783
Distributed Energy Voltage Cooperative Control Strategy Based on Multi-Station Fusion System Shifeng Shi, Junyao Wang, Qingguang Yu, Le Li, Yuming Liu, Zhicheng Jiang, Xu Han, and Xiaolan Bai	789
Innovative Frequency Regulation Strategies for DFIG Based Wind Turbine Systems	794
Closed-Loop Test for AVC System of Wind Farm Based on Real-Time Simulation	799
Research on Source-Load Coordination Improving the Flexibility of Power System with High Proportional Wind Power	804
Research Progress of Calculation and Practical Calculation Methods of Power System with UPFC	810
Improved Resistive Droop Control Strategy for Power Sharing of Low-Voltage AC Microgrid	815

Research on Power Collection and Operation Control Technology Requirements of Deep Water Wind Farm	. 821
The Stator Flux Linkage Adaptive SVM-DTC Control Strategy of Permanent Magnet Synchronous Motor	826
Design of Frequency Control System for Excitation Synchronous Motor	832
Coordinated Utilization of Adaptive Inertia Control and Virtual Impedance Regulation for Transient Performance Increase of VSG under Different Faults	838
Distributed Control Strategy for Transient Overvoltage of DC Transmission-End Power Grid Based on New Energy	844
Application of Energy Storage Technology in Frequency Control of High Proportion New Energy Power System	853
Impedance-Based Analysis of Potential Stability Risk between Grid-Forming and Grid-Following Wind Turbine Systems	858
Research on Active Disturbance Rejection of High Dynamic Response Current Loop Control for Permanent Magnet Motor	863
Research on Active Magnetic Bearing Rotor System Based on Fractional PID Control	868
Research on Active Disturbance Rejection Control of Active Magnetic Bearing-Rotor System	873
Study on Output Voltage of Permanent Magnet Synchronous Generator under Fractional Order Control	878
Load Curve Clustering Based on Feature Engineering and Uniform Manifold Approximation	883
Assessment of Economic Losses of Natural Gas Systems Considering the Effects of Voltage Sag	. 888
Study on the Influence of the Number of Pole Pairs on Torque of Synchronous Reluctance Machines	893

Research on Torque Ripple Suppression Strategy of PMSM under Variable Speed Condition Hu Yansong, Yin Dejun, and Peng Yunhao	898
Research on Coordinated Frequency Regulation Control of Wind Turbines Hongfen Cui, Deshun Wang, Bo Yang, Jinhua Xue, Sheng Liu, and Ying Zhu	905
Current Loop Control Strategy of PMSM Based on Fractional Order PID Control Technology	910
High Frequency Resonance Damping Based on Complex Coefficient Controller for the Wind Farm Connected VSC-HVDC	915
Method for Coordinated Control of Combined Heat and Power System Incorporating the Whole Heating Process	921
Research on Damping Impedance Type Digital-Analog Hybrid Simulation Interface Based on R-L Impedance Matching	926
Research on Active Current-Limiting Control and Fault Characteristics of DC Distribution Network	932
Hybrid Electric Vehicle Starter/Generator Design Considering Operation States and Control Strategy	939
Research on Precise Voltage Regulation Control Strategy of High and Low Voltage Ride through Test Device of Inverter	944
A Critical Clearing Time Calculation Method Based on Enhanced Binary Search	949
Influence and Analysis of Urban Subway on DC Bias of Power Transformer	955
Damping Characteristics Improvement of a Wind-PV-Thermal-Bundled Power Systems by Coordinating Optimization of Controller Parameters	960
The Research of PET Based on the Improved Virtual Inertia Control Strategy	966
Passivity-Based Sliding Mode Control Method of Motors with PCHD Model	971
Coordinate Power Control of DFIGs Based on Virtual Synchronous Machine	977

Load Optimization and Control Strategy Research Based on Flexible and Controllable Load Characteristics
Jingyan Liu, Pu Zhang, Qing Fang, Defei Yao, Xuenan Li, Jiayin Song, Siqi Guo, and Ying Lian
Design of Adaptive Dimming Power Control System for Civil Aircraft Lightplates
Chapter 5: Energy Management and Storage
A Study Framework of Industrial Electricity-Consumption Correlation Clustering: Taking Xiaoshan Textile Industry as Example
An Approach to Cluster Electrical Load Profiles Based on Piecewise Symbolic Aggregation1000 Liangcai Xu, Yan Zhang, and Zhenguo Shao
A Research and Design of a Drive Circuit for Piezoelectric Ceramic Stack Actuator
Optimal Scheduling Strategies of the Virtual Power Plant Considering Different Development Stages of the Electricity Market
Peak Shaving Ancillary Service Market Model of CSP for Renewable Energy Accommodation1017 Hui Guo, Zhicheng Ma, Han Zhang, Linlin Liu, Geng Wang, Yanqi Zhang, and Xiuli Wang
Distribution System Congestion Management Based on Local Flexibility Market
Research of Hybrid Integrated Energy Station Based on Gas Turbine
Two-Stage Reserve Capacity Configuration Considering the Reserve Resources at Supply and Demand Side
A Two-Layer Coordinated Operation Optimization Model for Multi-Energy Complementary Systems Considering Demand Response
An Optimal Scheduling Method of Virtual Power Plant Cluster Considering Generation-Grid-Load-Storage Coordination
A New Combined Scheduling Method of Thermal-Wind Power Considering Grid Restrictions and Wind Power Consumption
Research on Optimization of Demand Response Characteristics Based on MCMC Sampling and Considering User Production Characteristics

A Power and Load Optimization Scheduling Model Based on Flexible Thermal Load Participating in Assisted Peak Regulation
Research on Multi-Source Environmental Micro Energy Harvesting and Utilization
Research on the Operation Mode of Energy Integrated Service Station under Multi-Station Integration
A Study on the Optimal Scheduling and Evaluation of Urban Hydropower Stations Based on Power Generation, Ecology and Shipping
Exploration of Ultra-High-Voltage Alternating Current Power Transmission Technology Standardization for Global Energy Interconnection
Research on Precise and Fast Self-Recovery Method of Dual-Core Smart Meter Management1092 Leping Zhang, Bensong Zhang, Xin Zhang, Wei Zhang, Guizhou Xu, Jinxing Jiao, Dongfang Wang, and Yujian Gong
Electricity-Gas Integrated Energy System Equipment Capacity Allocation Based on Multi-Scale Interval Planning
Application Cases of Building Central Air Conditioning Loads Participating in Power Grid Peak Shaving through Direct Control
Siting and Capacity of Distributed Power and Energy Storage Planning in Distribution Network1107 Jing Duan, Kewen Wang, Zhiyuan Li, and Chunming Zhao
Refining State-of-Charge Estimation for Battery Energy Storage System using Historical Operating Data
Optimal Dispatch Strategy for Advanced Adiabatic Compressed Air Energy Storage System Coupled with Concentrated Solar Power Station
A Bi-Level Planning Program of Microgrid Including Gravity Energy Storage
Chapter 6: Condition Monitoring & Reliability/Resiliency
Study on the Suppression of DC High Voltage Corona Discharge by Insulating Dielectric Film1129 Yuze Jiang, Qiying Li, Yan Jiang, Diwen Jiang, Shiqiang Liu, Bangfa Peng, and Jie Li
Measurement Method of Capacitance Value and Dielectric Loss Angle Based on Transient State of Capacitor Switching1134 Jianwei Yao and Ke Zhu

Simulation of Temperature Distribution Behavior of High Voltage Cable Joints with Typical Defects1139
Ashfaque Ahmed Bhatti, Bin Yang, Xiaosheng Peng, Zhanran Xia, Lei Dong, Hongyu Wang, and Qiyou Xu
Molecular Physical Properties Simulation and Dissociation Analysis of Transformer Insulation
Paper Cellulose
Brief Review: Characteristics and Applications of Homogeneous Atmospheric Pressure Dielectric Barrier Discharge
Study on Temperature Distribution of Box-Type Distribution Room under Different Load and Ventilation Conditions
Jiefu Zhang, Ziyang Ye, Peng Zhang, Ying Zhou, Peng Zhang, and Xianliang Zhang
Power Quality Monitoring and its Visualization Application Based on Graph Database1160 Fang Lin, Yan Lin, Huiyu Zhang, and Daoshan Huang
Research on Remote Monitoring and Early Warning System of New Energy Station Based on Multi-Source Information Fusion
An Abnormal Metering Monitoring Method Based on Transformer External Characteristics1174 Xia Taofang
Mechanical Condition Assessment of Transformer Winding Based on D-S Evidence Theory1179 Bin Zhang, Zhen Yang Zhao, Jin Liang Song, Hao Chen, Fei Ming Wang, and Dan Zhao
A Three-Phase Combined Transformer with Characteristics of Anti-Leakage Current and Anti- Electromagnetic Interference
Applicability Analysis of Dry Burning Test Method for Fire Pipe of Water Spray Fire Extinguishing System for UHV Transformer
Sha Ľuo, Rui Liu, Jiaqing Zhang, Jia Xie, Shenglong Zhu, Hui Wang, and Yabin Fan
Composition Characteristics Study on The Pyrolysis Gas Products of Substation Control Cables under Fire1194
Jia Xie, Jiaqing Zhang, Yi Guo, Shenglong Zhu, Daoyou Huang, Qiang Liu, and Shixiong Jiang
Experimental Study on Effects of Nozzle Explosion Damage on Performance of Water Spray Fire Protection System of Ultra-High Voltage Transformer
Numerical Studies of Fire Smoke Movement and Control in Typical Building Based on Different Boundary Configurations
Optimum Structural Design of Magnetic Field Concentrator on Leakage Current Sensor1216 Li Fuchao, Luo Ruixi, Liu Kun, and Liu SuJie

Analysis of Current and Potential Characteristics of UHVAC GIL Tunnel Project	222
Partial Discharge Diagnosis Algorithm for Multi-Source Ultrasound Detection Based on Time Series Integration	228
Low-Voltage Distribution Network Topology Identification Method Based on Characteristic Current	233
Design and Realization of a Lightning-Induced Surge Current Monitoring System	239
Mechanical Defect Field Detection for Operational GIS Equipment Based on Vibration Signal Analysis	244
Power Supply Scheme Design and Economic Analysis of Electric Drive Fracturing Equipment under the Background of Electrical Replacing Oil	249
Protection CT Polarity Checking Method for MMC-HVDC Converter Station Transformer	254
An Improved Thermal-Electric Analogy Model for Evaluating Loading Capability of Oil-Immersed Transformers	261
Design of Wide-Range Current Transformer Based on Improved Zero Magnetic Flux and Turns Compensation	267
Online Critical Load Restoration for PV-Storage Integrated Distribution Systems Considering Update of Forecast Uncertainty	272
Resilience Promotion Strategy of Distribution Network Considering Demand Response and Distributed Generation Uncertainty	278
Reliability Analysis of Wind Turbine Combined TBM and CBM	286
Reliability Characteristic Analysis of Wind Turbine Model Considered Different Work States	291
A Preliminary Study of Electric Power System Reliability Considering State Estimation in Cloud-Based Environment	296
Research on Security Region of AC/DC Hybrid Active Distribution Network	302

Waterlogging Sensor for Intelligent Power Distribution Room
Chapter 7: Optimization and Power Conditioning Techniques
Energy Consumption Optimal Design of Power Grid Inspection Trajectory for UAV Mobile Edge Computing Node
Research on Dynamic Fault Recovery Strategy of Distribution Network Based on Multi-Objective Optimization Considering Fault Hazard Degree
Research on Optimal Control of Switch Array State Switching in Photovoltaic Reconfiguration1328 Tianliang Huyan, Meiyi Hou, Lei Ding, Guofang Zhu, Zhen Zhu, and Hao Gao
A Multi-Objective Optimization Method for Utilizing Seawater Desalination Load to Consume Offshore Wind Power
Research on the Reconfiguration of Multi-Objective Distribution Network Based on Improved Newton Method
A Multi-Source Coordinated Spinning Reserve Capacity Optimization Considering Wind and Photovoltaic Power Uncertainty
Multi-Objective Optimization Planning of Distribution Network Topology Considering Total Supply Capability and Voltage Deviation
Optimal Modeling of Integrated Energy System Demand Response Operation Considering Wind Power Absorption
Optimal Design of Demand Response Model Considering Uncertainty
Scenarios Analysis and Energy Supply Optimization Configuration for Multi-Station Integration1367 Yan Li, Yazhong Ye, Hong Li, Haifeng Liang, Qun Zhang, Qingshan Wang, and Qiong Wang
Optimal Configuration of ESS and SVG for the Coordinated Improvement of Power Quality in Low Voltage Distribution Network with High Penetration PV
Two Stage Optimization Model Considering Demand Response Dispatch Value of Thermoelectric Load

Multi-Time Scale Coordinated Optimal Control Method for ADN Considering Source Load Prediction Error
A Novel Design of Automatic Tracking and Maximum Power Output Device for Silicon Photocell Array
Distributed Optimal Dispatching of AC/DC Hybrid Microgrid Based on Consensus Algorithm1398 Lingxiao Li, Xin Bai, Yaosong Guo, Jun Zhang, Cai Chen, Yapeng Yi, and Aiping Wang
Multi-Objective Optimization of ADRC Parameters for Constant Voltage Output in ICPT Systems Based on NSGA-II
Analysis and Mechanism of Turn-On Current Spike of SiC MOSFETs1408 Lijing Sun, Hui Yu, and Lulu Huang
A Hybrid PWM Strategy Based on SVPWM and SHEPWM for High-Power Drive System1413 Chang Liu, Yicong Wang, Jin Wang, Xiao Yu, Liang Zhou, and Jiangpei Xu
Research on Startup Control Strategy of Inverter Hybrid Cascade LCC-MMC UHVDC Transmission System1418 Junchao Zheng, Peng Li, Xiangping Kong, Jinjiao Lin, Chi Zhang, and Chenqing Wang
Multi-Group Fault Positioning Model of Modular Multilevel Converter Based on FOA-LSSVM1423 Yan Li, Zhen Yang, Xin Li, Di Jiao, and Wenchen Jiang
A New Framework for Handling Some Critical Issues on Neutral Point Clamped Three-Level Inverter with Unbalanced DC-Links
Synchronization Stability of PLL-Based Power Converters Connected to Weak AC Grid1436 Limin Mei, Lei Ding, Zhihao Wang, Deyu Cai, Ran Ding, Jingran Wang, and Haixiang Xu
Improvement Method of Operation Reliability for Modular Multilevel Converter
Research on Application of Low Voltage Ride through Technology of Auxiliary Equipment Inverter of Thermal Power Plant in Power Grid1446 Zhixuan Zhang, Xinhong You, Huan Ma, Kang Zhao, and Ning Zhou
The Steady State Limits Application of 18-Pulse Rectifier in Aircraft Radar Power Supply System
Optimization of Redundant Number of MMC Submodules in Flexible Control Device
Current Stress Analysis of Passive Devices and Switching Devices of Quasi-Z-Source Inverters1461 Bianbian Chen and Hongsheng Su

Design of Magnetic Coupling Mechanism with Gentle Excursion Performance for Wireless Power Transfer System
Cascaded Buck-Boost Converter Based on Energy Storage Unit and its Control Method1471 Bin Zhu, Shi Su, YiFan Zhou, and Cheng Sun
Analysis on the Saving Rate Test of the Frequency Converter in Power Plant1478 Ping Zhang, Tian Yang, and Hao-Rang Zhu
Chapter 8: System Analysis, Modelling and Planning
The Simulation Comparative Study of Traction Network Harmonic Characteristic of Three Kinds of at Power Supply Modes
Quancun Nie, Mingxing Tian, Lijun Sun, and Haiyan Wang
Influence of Harmonic Current on the Winding Loss and Temperature Distribution of AC Transformer1492
Jie Wu, Cong Liu, Xianliang Zhang, Jian Hao, Jiang Sun, and Zhiwei Li
Analysis on Low Secondary Voltage of a 220kV Bus CVT
Evaluation Method of Power Transformer Operation State and its Field Application
Design and Analysis of Miniaturized Motor Operating Actuator used in Vacuum Circuit Breaker in Distribution Network
Calculation of AC Short-Circuit Current at MMC-HVDC Converter Station
Simulating Waveforms of Electrical Loads via Current Superposition
Text Classification Method for Analysing Accidents in Power System Operation
Research on the Influence of Distributed Power Sources on Power Quality
A Parallel Two-Stage Sequential Operation Simulation Framework Based on MTUC and STUC1536 Hongrui Yin, Qian Yang, Xinyan Chen, and Tan Changshu
An Intelligent Assessment for Transient Stability of Power Systems Incorporating Grid Topology Characteristics
An Analytical Method for Optimal Frequency Regulation in Uncertain Multi-Area Interconnected Smart Grids

Power Quality Pre-Evaluation Method Considering the Impact of Electrified Railway
Transient Stability Emergency Control Based on Real-Time Power Angle Trajectory Fitting1560 Zhu Cunhao, Ma Shiying, Zheng Chao, and Li Penghua
Simulation Analysis of the Influence of Harmonics Current on the Winding Temperature Distribution of Converter Transformer
Identification Method of Voltage Sag Exposed Area Based on Golden Section
Frequency Characteristic Analysis of Power System Considering Deep Peak Load Regulation and Renewable Energy Injection
Dynamic Equivalent Modeling of Photovoltaic Grid-Connected Power Generation System1583 Lin Li, Lixia Zhang, and Yonghua Zhao
A Novel Energy Sharing Framework for a Residential Community
Reactive Power Optimization Model Based on PSASP and Sensitivity Analysis
A CT Power Supply Device based on New Three Coil Magnetic Coupling Resonant Radio Power Transmission
Research on SCADA Data Preprocessing Method of Wind Turbine
Topology Identification Method for Primary Distribution Network with Limited Smart Meter Data1611 Chen Qian, Wang Meiyan, Gao Ding, Hu Fei-Hu, and Sergon Sheila Jepchirchir
Key Techniques Study on Auto-Verification Line of External Circuit Breaker for Watt-Hour Meter1617 Zhi Zhang, Zhiru Chen, Yaqi Liu, and Xi Zhao
Yardstick Motivation Evaluation Method for Investment of Distribution Network
Operational Scenarios Oriented Aircraft Emergency Power Supply System Design and Integration
Research on Commercial Applications and Key Technical Barriers of Submarine Power Cables Technology for Global Energy Interconnection
A Learning-Assisted Dynamic Security Enabled Operational Planning with Transferable Load1639 Jing Ren, Chen Xue, Shuanbao Niu, Xiaowei Ma, Xiaodong Zhang, Gao Qiu, Tianxiang Wang, and Youbo Liu

Research on Modeling of Electro-Thermal Integrated Energy System based on Uniform Energy Metric	1644
Operation Duration Assessment of Isolated Island Considering DG Coordinated Control and Operation Risk Limitations	1649
Coordinative Optimization Operation on the Gas-Electricity Integrated Energy Systems	1656
Collaborative Expansion Planning for Power Grid and Generators Enabling Flexibility Enhancement	1661
Simulation Evaluation Method of Power Grid Operation Considering High Proportion New Energy Grid Connection	1666
Evaluation Index System of Power Grid Corporation's Operation Benefits Based on Future Low-Carbon Energy Framework	1672
Availability Evaluation of Electric Power Company Resources	1679
Identification of Key Communication Nodes of Low-Voltage Platform Topology for Terminal Service Fusion	1684
Cyber-Physical Power System Multi-Objective Planning Algorithm with NSGA-II	1689
Optimal Power Flow Calculation Method for AC/DC Hybrid Distribution Network Based on Power Router	1694
Research on Medium and Long-Term New Energy Consumption in Shanxi Province	1700
Integrated Energy System Planning Method Considering Energy Consumption Characteristics of Residential Users	1705
Economic Optimal Dispatch of Virtual Power Plant Considering Environmental Benefits	1710
Robust Security Constrained Unit Commitment Considering AC Power Flow Constraints	1716
Load Prediction of Electric Heating Cluster and its Influence on Rural Distribution Network	1722

Active Distribution Network Substation Planning Method Considering Complementation of Load Characteristic	1730
Fast Dispatch Method for Integrated Energy System Based on Time Clustering Algorithm	1735
Energy Production Element Planning of Integrated Gas and Power Systems Considering the Coordination between Economic and Reliability	1740
A Diversify Distribution Power Grid Planning Method Based on the Features of Areas in Smart Cities	1746
Cooling, Heating and Electrical Load Forecasting Method for Integrated Energy System Based on SVR Model	1753