

# **2022 12th International Conference on Power and Energy Systems (ICPES 2022)**

**Guangzhou, China  
23-25 December 2022**

**Pages 1-492**



**IEEE Catalog Number: CFP22N69-POD  
ISBN: 978-1-6654-5146-8**

**Copyright © 2022 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:	CFP22N69-POD
ISBN (Print-On-Demand):	978-1-6654-5146-8
ISBN (Online):	978-1-6654-5145-1
ISSN:	2767-7303

**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](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# 2022 the 12th International Conference on Power and Energy Systems (ICPES 2022)

## Table of Contents

Preface.....	xvii
Conference Committees .....	xviii

---

### \* HVDC Transmission System and Line Protection

An Intelligent Cable Core Temperature Abnormal Data Cleaning Method Considering Current-Carrying Temperature Rise Characteristics .....	1
---	---

*Hu Ran, Li Bing, Wang Jinyang, Huang Siyong, Lu Yihang, Li Xianghao, Yang Ling, Wang Zhidong*

Transient Voltage Stability Assessment Method for the UHVDC Power Grid with High Proportion of New Energy Based on Artificial Intelligence .....	6
--	---

*Wei Hu, Rongfu Sun, Yunchao Sun, Ran Ding, Yiming Yao, Kexi Qian*

Development of Probability Estimation Method for Transmission Line Overload due to Forecast Errors of Renewable Energy Sources .....	11
--	----

*Sichen Li, Kenichi Kawabe, Taisuke Musuta*

Design and Hardware-in-the-Loop Experiment of Robust Fractional-Order Control for VSC-Based HVDC Transmission Systems .....	17
---	----

*Chenxi Fan, Wei Du, Xingye Xu, Kaishun Xiahou*

Research on Operating Overvoltage Measurement Based on Capacitive Current Method.....	24
---	----

*Xiao Guan, Jiandong Duan, Fengyi Li, Ming Zhao*

Research on AC/DC Harmonic Transfer Characteristics of Hybrid HVDC System.....	29
--	----

*Fei Kong, Dongxiao Cai, Jie Li, Zhu Guo, Jiang Yu, XiaoBing Ding*

Combined Frequency and Voltage Support by Wind Farm with Linear Quadratic Regulator under Converter Blocking .....	35
--	----

*Xudong Li, Hua Li, Yichen Yan, Peng Kou*

Study on Grading Standards and Replacement Strategies for Rust Defects of Overhead Ground Lines of Transmission Lines.....	40
--	----

*Hou Jun, Wang Yuanjun, He Sen, Zhao Gang, Ding Weifeng, Wei Peicai, Li Shouxin*

### \* Distribution Network and Distribution System

Analysis of Harmonic Overvoltage Caused by Inrush Current of Closing No-load Transformer .....	47
--	----

*Han Yanan, Zhou Peipeng, Xiang Zutao, Shen Lin, Xiang Weihua, Du Ning*

Analysis of Vibration Characteristics of Dry-Type Transformer Iron Core and Windings Based on Multi Physical Field .....	52
<i>Zaihua Wang, Shulian Liu, Ling Zhang</i>	
Design of Dynamic Password Authentication Scheme Based on SM Algorithm.....	57
<i>Xiaoqi Liang, Yong Wang, Xichao Yue</i>	
Active Distribution Network Flexibility Evaluation Method Considering Flexibility Resource .....	62
<i>Juncheng Zhang, Jing Tan, Zhiwen Liu, Min Li, Yigang Tao, Tianlu Luo</i>	
Optimal Calculation of Current Carrying Capacity of Cables in Distribution Network by Probability Method Considering Parameter Uncertainty .....	67
<i>Tengfei Li, Liming Wang, Qingming Lin, Yang Zhao, Aiqing Ma, Mingyang Zheng</i>	
Optimal Scheduling Method for the Distribution Network Integrated with Multi-energy Systems Considering Flexible Regulation Ability .....	71
<i>Hui Hui, Rui Li, Yang Zhao, Ming Wang</i>	
Topology Identification of Medium Voltage Distribution Network Based on Copula Entropy.....	79
<i>Yingjie Tian, Fan Li, Yi Wu, Haoran Chen, Chengze Li, Xiu Yang</i>	
Coordinated Voltage Control Strategy of Active Distribution Networks with Consideration of Power to Hydrogen.....	84
<i>Yongxiang Zhang, Jian Chen, Leiqi Zhang, Qiliang Wu</i>	
A Novel Adjustment Strategy for Reducing Three-Phase Unbalance in Low-Voltage Distribution Area .....	89
<i>Jun Lai, Jianliang Shen, Yi Zhang, Zan Zhong, Guangsheng Liu</i>	
<b>* DC Transmission and Distribution System</b>	
Modeling and Application of Dynamic Compensation Devices in Active Distribution Networks with Energy Storage Facilities.....	94
<i>Zhuoming Deng, Yong Mei, Yinsheng Su, Wenfeng Yao, Zhifei Guo, Baoye Tian, Qian Ma, Baorong Zhou, Chao Hong</i>	
Broadband Measurement Scheme Based on Positive Sequence Instantaneous Power Algorithm.....	100
<i>Lai Zihan, Dai Yuhan, Wen Fuguang</i>	
Molecular Dynamics Simulation of the Decomposition Mechanism of Alkylbenzene Insulating Oil.....	106
<i>Jianping Liao, Zhifeng Liu, Mingchun Hou, Fan Gao, Yufei Chen, Yongye Xu, Huaqiang Li, Chen Zhang</i>	
Influence of Structural Characteristics for Optical Fiber Composite Overhead Ground Wire on Current Density Distribution under Lightning Strikes .....	111
<i>Xinzhan Liu, Zhan Shi, Ying Zeng, Zhengfeng Zhang, Yuping Luo</i>	
Application of Thermal Resistance Dynamic Characteristics on High-Voltage Cable Ampacity Based on Field Circuit Coupling Method .....	116
<i>Han Zhang, Ruirong Ding, Peng Lin, Yanqi Zeng, Dongze Lyu, Gang Liu</i>	

Research on Low-Carbon Economic Dispatch of Active Distribution Network Considering V2G and Demand Response.....	123
<i>Che Bin, Zhang Zelong, Yang Yan</i>	
A Power Flow Control Measure of Across Voltage Levels Based on TCPST in a Distribution Network with DG.....	129
<i>Weitian Lu, Yongchang Chen, Kaijun Zeng, Jiale Li, Nanxing Chen, Zhaobin Du</i>	
An Intelligent Optimal Location Method for Booster Transformer of Offshore Wind Power System Based on GIS Geometric Algorithm.....	135
<i>Xiaojiang Guo, Xiaofeng Pan, Caixin Sun, Dunwen Song, Kaixin Liu, Xiangtao Xiao, Xuetao Yang, Hegege Guan</i>	
Numerical Analysis of Terminal of Armor Rods for Ground Wire Based on Electromagnetic-Thermal-Structural Coupling under the Short-Circuit Current.....	140
<i>Jiangang Lu, Xinzhan Liu, Zhan Shi, Ying Zeng, Yuping Luo</i>	
Scheme Comparison of Substation Expansion and Energy Storage Station Co-construction Based on Improved AHP-FCE.....	147
<i>Jianhua Huang, Haohui Xie, Huilin Ouyang, Zhanyu Sun, Nanxing Chen, Zhaobin Du</i>	
Robust Control of Full Bridge Inverter Based on Improved High-Order Sliding Mode Controller.....	152
<i>Huaying Zhang, Yan Li, Zhenzi Wang, Jie Yang, Junwei Cao</i>	
<b>* Fault Analysis and Protection in Power System</b>	
NTP-Based Precision Time Synchronization Scheme for Differential Networks.....	158
<i>Xiaohui Li, Zhigang Ni, Siting Lv, Wei Han, Feng Zhang, Deyu Cai</i>	
Fault Feature Parameter Extraction Method for Wind Turbine Based on Relief Algorithm .....	163
<i>Wang Zhengyu, Gong Chao, Gong Yu, Zhang Yangfan, Yang Weixin</i>	
Pilot Protection for Transmission Line of Offshore Wind Power Based on Directions of Fault Current Variation and Cosine Distance .....	169
<i>Naihao Liu, Houlei Gao, Bin Xu, Yunchi Zhang, Haoran Song</i>	
Research on Distribution Network Topology and Fault Planning Knowledge Graph Fusion and Reasoning Based on Graph Database .....	174
<i>Zhuang Tang, Bo Chai, Mingyue Wei, Feng Sai</i>	
A Design of Crossover Protection Device for Corroded Overhead Ground Wire Tension Replacement.....	179
<i>Zhao Gang, He Sen, Wei Peicai, Ding Weifeng, Huang Jinling, Hou Jun, He Ningan</i>	
Research on Terminal Layout Method of Lightning Current Distributed Monitoring for Multi Branch 10kV Distribution Lines.....	184
<i>Ruifa Feng, Yang Zhang, Minchuan Liao, Xiaomeng He, Lu Qu, Huapeng Li, Longgui Li, Qingyuan Jin, Xinyi He</i>	
An Optimized Power System Stability Control Structure Based on Breaker Failure Protection as Backup .....	190
<i>Yiqi Dang, Hua Wang, Lei Liu, Wenzhe Chen, Hongxiang Xu, Wei Han, Weidong Ma</i>	

## \* **Fault Location and Diagnosis in Power System**

A Prediction Model Towards the Cascading Failure of Power Grids.....	198
<i>Beibei Li, Aohui Jia, Linfeng Chen</i>	
Detection of Decomposition Products of SF6/N2 Gas Based on Laser Spectrum Detection and ACISODATA-SA Fault Clustering Algorithm .....	204
<i>Zhang Shiling, Jiang Xiping</i>	
Influence of Distributed Generation on Power Frequency Overvoltage Characteristics of Transformer Neutral Point.....	210
<i>Changhao He, Rui Qin, Baojun Xu, Yuyin Zhan, Haifeng Li</i>	
Single-Pole Ground Fault Location Method for Multi-terminal Flexible DC Transmission Lines Based on LSSVM.....	214
<i>Ke Wei, Sheng Lan, Zhichuan Li</i>	
Local Interlock Control System with Fail-Safe PLC for PF Converter System Based on CODAC Core System .....	219
<i>Shiyang He, Liansheng Huang, Xiaojiang Chen, Xiuqing Zhang, Zejing Wang, Lingpeng Li, Ying Zuo</i>	
NILT-Based Transient Traveling Wave Calculation Method for Lightning Stroke on Coupled Transmission Lines in DC Systems .....	224
<i>Ziqiang Ouyang, Zheng Yan, Tonghua Wu, Wei Dai, Xindong Li, Xiaofan Hou</i>	
Single Pole Ground Fault Location Method for LCC-MMC Hybrid DC Transmission Lines Based on Extremely Randomized Trees .....	230
<i>Zhichuan Li, Sheng Lan, Ke Wei</i>	
Modeling Method of the Overhead Power Line Failure Rate Based on Meteorological Factors.....	235
<i>Zhanlei Zheng, Baoyu Hou, Xiao Hua, Yang Yu, Hui Zheng, Yuxuan Ren</i>	

## \* **Power Control System and Intelligent Monitoring**

Design of Emergency Control Decision System for New Power System with Strong Uncertainty.....	240
<i>Zhao Ming, Dai Yuchen, Zhou Rui, Sun Zelun, Zhang Jiabin</i>	
A HVRT Control Strategy for DFIG Considering Dynamic Changes of Stator Flux and Dynamic Reactive Power Compensation .....	247
<i>Jie Chen, Jiandong Duan, Zhenghao Qi, Tong Gao, Yang Zhang</i>	
Design of Power Supply System of Asteroid Exploration Spacecraft .....	252
<i>Lei Yingjun, Han Yue, Yang Yi</i>	
Calculation of Characteristic Parameters of Short-Circuit Current of Power Transformer Based on MPM.....	257
<i>Qin Yan, Xianqiang Li, Kang He, Qi Wang</i>	
Design and Application of Intelligent Management and Control System of the Installation of UHV Oil-Immersed Main Transformer Based on Internet of Things .....	261
<i>Ran Dong, Xiaosong Wang, Yan Wang, Zhen Liu, Lei Hou, Xuan Dong, Sha Yang, Donghong Cao, Chengwei Zhang</i>	

Research on Transformer Saturation Mechanism and Restraining Measures in VSC-HVDC Black Start Process .....	267
<i>Fei Kong, Jie Li, Mengjun Liao, Shuyong Li, Xuehua Lin, XiaoBing Ding</i>	
The Principle and Prospect of AC Power Standards .....	271
<i>Bai Jingfen, Meng Jing, Zhao Dongfang, Li Shisong, Duan Meimei</i>	
Staged Solution Strategy for Reducing Active Network Loss Based on Transmission Switching .....	276
<i>Zhengwei Shen, Huadong Sun, Wuzhi Zhong, Guangru Zhang, Changsheng Chen</i>	
Experimental Study on Vibration Characteristics of Iron Core under Harmonic Excitation .....	281
<i>Guowei Zhou, Hong Zheng, Xishan Jiang, Jiayu Liu, Jing Zheng</i>	
Accurate Position Sensorless Control for Switched Reluctance Machines Based on Data Fusion with Kalman Algorithm .....	287
<i>Dongpeng Zang, Yixin Sun, Lefei Ge</i>	
<b>* Power System Dispatching and Maintenance Management</b>	
A Two-Stage Annual Dispatch Model of Multiregion System Considering Daily Typical Periods Calibration .....	292
<i>Ziqiang Wang, Luyao Ye, Wei Wang, Jinbing Liang, He Huang, Lizhang Cong</i>	
Evaluation Methods for the Development of New Power Systems Based on Cloud Model.....	298
<i>Yongping Wang, Weiting Xu, Chang Liu, Ke Xu, Yang Liu, Minqi Cao</i>	
Research on Whole Process Quality Control Technology of UHV Main Equipment Based on GIM and Internet of Things .....	304
<i>Baoliang Fu, Lei Hou, Xiaosong Wang, Haitao Jiang, Fangyi Xie, Bo Liu, Chengwei Zhang</i>	
Distributed Operation Strategy of Electricity-Gas Integrated System Based on Improved ADMM.....	310
<i>Bo Pan, Yun Tian, Kuangwei Chen, Weimeng Li, Xing Tang</i>	
An Economic Dispatch Model of Wind Power for Optimal Reserve Capacity of Electric Power System.....	315
<i>Wenyuan Xu, Qi Wu, Yuan Tao, Siqi Qiu, Zhifeng Qiu</i>	
Study on the Selecting Closing Resistance Method of 1000 kV ac Filter Break Circuit Breaker .....	321
<i>Xueyou Zhang, Xiangyu Dong, Peipei Fan, Wei Ruan, Yuxiang Chen, Pingping Han</i>	
Multi-time Scale Coordinated Optimal Scheduling for Power Balance Capability Enhancement.....	326
<i>Lili Li, Li Chang, Rongzhang Cao, Bingxiang Wu, Zhongming Xiang, Si Zhang</i>	
Transmission Congestion Management with Generalized Generation Shift Distribution Factors .....	331
<i>Shutong Pu, Guangchun Ruan, Xinfei Yan, Haiwang Zhong</i>	
Dynamic Characteristic Analysis of a Pump-Turbine Unit under the High Pressure Pulsation Operating Condition — Fluid Dynamics Analysis .....	336
<i>Dehao Zhang, Yunfeng Xiao, Xingxing Huang, Qiang Quan, Zhen Jia, Zhengwei Wang</i>	

✱ **Power System Condition Monitoring and Parameter Optimization**

Methods for the Tower Fatigue Loads to Cumulative Based on Wind Direction Probabilistic..... 342  
*Hongwu Jiang, Dan Luo, Siyao Deng*

A Novel Electrothermal Combined Aging Test System for High-Power Thyristor in the Converter Valve of HVDC Power Transmission..... 347  
*Longchen Liu, Yuexiao Yu, Kang Zhang, Lei Pang, Fenglian Liu, Chenmeng Zhang*

Migration Dynamics of Gas Bubble Excited by External AC Electric and Mechanical Vibration Stresses ..... 352  
*Niyomugabo Emmanuel Ladislas, Qingmin Li, Qiushi Liu, Yunpeng Li, Wu Jie, Huang Weimin*

Research on Evaluation Method of Composite Insulator Shed Aging State Based on Terahertz Time Domain Spectroscopy ..... 359  
*Yibin Cheng, Zhensheng Wu, Yuping Yang, Haitao Yang*

Inverse Problem of Oil Pipeline Dynamic Operation Based on Model-Free Adaptive Control Theory ... 367  
*Lei He, Ming Zhang, HuaLei Yi*

Human Reliability Analysis in Probabilistic Safety Assessment of Multi-unit Nuclear Power Plants under External Impact ..... 372  
*Liu Dalin, Wang Shuting, Zhou Yiquan, Yan Zhen, Zhao Ling, Wang Zhuangye*

Identification of Construction Vehicles under High Voltage Transmission Line Based on Improved YOLOv5s ..... 377  
*Shaojun Liu, Yitian Sha, Yuhang Yang, Hanlin Guan, Yue Wu, Jingya Li*

Intelligent Substation Equipment Condition Detection Method Based on Infrared Thermal Imaging Technology and Temperature Probability Density..... 383  
*Lin Yang, Changle Yu, Wenwen Li, Su Zhang, Zhanpeng Jiang, Ao Xiao*

Object Detection of Overhead Transmission Lines Based on Improved YOLOv5s ..... 388  
*Juping Gu, Junjie Hu, Ling Jiang, Zixu Wang, Xinsong Zhang, Yiming Xu, Jianhong Zhu*

✱ **Microgrid Configuration Optimization and Management**

Resilient  $H_\infty$  Load Frequency Control for Uncertain Isolated Microgrid under Stealth Attack..... 393  
*Yiwei Feng, Wen Jia*

Optimized EMS Real-Time Simulation and Validation for Singapore Pulau Ubin Microgrid ..... 401  
*Ziyuan Qian, Shuyu Cao, Hao Jiang, Sivaneasan Bala Krishnan, Kuan Tak Tan, King Jet Tseng*

Stability Analysis in the Stabilization-Free DC Microgrids with CPLs..... 407  
*Kaimao Zhou, Zhangjie Liu, Jiawei Li, Mei Su*

Interval Coalition Game-Based Peer-to-Peer Energy Trading Method for Multi-microgrids ..... 412  
*Kai Zhang, Luhao Wang, Shengnan Zhao, Shiyuan He, Fengchen Song, Xiuhan Lin*

Comprehensive Energy Planning Method Based on Multi-energy Complementarity of User Side ..... 417  
*Yun Zhao, Wei Wang, Yanbo Wang, Xinhe Chen*



Static Risk Assessment Method for Smart Microgrid Considering False Data Injection Attacks.....	424
<i>Zhicheng Han, Shufeng Dong, Weifeng Liu, Guangsen Shi, Xinan Guo</i>	
A Local Energy Transaction Strategy for Networked Microgrids under Coalitional Game Theory .....	429
<i>Yanbin He, Qian Yu, Zengxin Cao, Yuncheng Chen, Ziyin Shen, Kai Zhang</i>	
Research of Intelligent Solution Method for Microgrid Cluster Operation Optimization Problem under Multi-agent Game.....	434
<i>Jie Tian, Sheng Chen, Xinying Wang, Qi Zhao, Jiarui Wang</i>	
<b>* Design and Performance Simulation of Intelligent Electrical Equipment</b>	
Feasibility Analysis of Full Power Variable Speed Operation of Pumped Storage Power Station Based on M3C Converter.....	440
<i>Youzong Jian, Lei Zhong, Feng Yi, Haishan Guo, Hemin Yang, Wei Xu, Jing Hu, Yanfei Wu</i>	
Recognition of Partial Discharge in Medium Voltage Switchgear via Gray-Scale Diagram and Support Vector Machine.....	445
<i>Xutao Wu, Lei Jin, Weifeng Liu, Bo Niu, Zecheng Li, Yunlong Ma</i>	
Charging Behavior Analysis Based on BIRCH Clustering .....	450
<i>Dong Yan, Chong-Yang Luo, Yulan Li, Bin Zhu, Miao-Long Yan, Shu-Li Yao</i>	
Optical E-Field Sensor Based on the Pockels Effect of LiNbO <sub>3</sub> .....	455
<i>Shangpeng Sun, Feiyue Ma, Bo Wang, Bo Niu, Hui Ni, Lei Chen</i>	
Study on Anti-pollution Flashover Durability of Superhydrophobic Insulating Coating Surface .....	460
<i>Jinyu Chen, Wenxin Chen, Hanxing Lin, Zihan Chen, Simin Chen, Guansan Chen</i>	
ITER PF in Series AC/DC Converters Starting Mechanism Assisted by External Bypass.....	466
<i>Xiuqing Zhang, Liansheng Huang, Xiaojiao Chen, Shiyong He, Zejing Wang, Ying Zuo, Ya Li, Lingpeng Li</i>	
Performance and Emission Characteristics of a Diesel Engine Using Ammonia/Diesel.....	471
<i>Wenxuan Ying, Hua Xiao, Aiguo Chen, Zhaochun Lyu, Yushi Lin, Xiuhua Ma</i>	
Image Processing and Deep Learning Technology Help Power Equipment Intelligent Operation Inspection .....	476
<i>Zhang Shiling, Jiang Xiping</i>	
<b>* Control and Reliability Analysis of Smart Grid</b>	
Optimal Coordination of Distance Protection Considering Multiple Setting Groups Strategy Based on Sideline Current Addition Coefficient .....	483
<i>Kangjie Ren, Yinhong Li</i>	
Research on Reactive Power Planning for Power Grid with the Integration of UHV AC System.....	488
<i>Tao Luo, Dezheng Zhang, Kui Wang, Zhenchuan Ma, Wenbo Xuan, Haozhong Cheng</i>	

Break-Even Analysis of Reactive Power Compensation in Power Grid Enterprises.....	493
<i>Haijing Zhang, Xiaohui Liu, Chang Cheng, Ranran Li, Shen Xiao, Zhicheng Sun, Ran Zhang, Hongjian Ding</i>	
Emergency Control of Power Grid under Topology Changes Based on Graph Reinforcement Learning .....	498
<i>Hanxing Ling, Jinyu Chen, Wenxin Chen, Zihan Chen</i>	
Research on the Automatic Control of Grid Peak Regulation Units to Improve the New Energy Consumption Level.....	504
<i>Kaihui Feng, Chenhui Song, Bibin Huang, Jing Hu, Hu Yan, Zihan Meng</i>	
Modeling and Simulation Verification of Broadband Oscillation in Actual Grid of Doubly-Fed Generator Based on PSCAD.....	509
<i>Junjie Zhang, Tong Wu, Yan Hao, Ruxin Zheng, Anmin Cai, Chong Jiao</i>	
Transient Stability Analysis of AC-DC Hybrid Power Grid under Topology Changes Based on Deep Learning .....	514
<i>Hanxing Lin, Zihan Chen, Jinyu Chen, Wenxin Chen</i>	
Current Secondary Circuit Anomaly Detection Based on ROD Algorithm .....	520
<i>Longmin Bu, Rendong Zhang, Hong Chen, Shengwei Yang</i>	
<b>* Smart Grid Operation and Dispatching</b>	
Research on Smart Grid Policy and Technical Support.....	524
<i>Hongli Su, Mengjie Zhao, Ziwei Hong, Zhifeng Wei, Haiyang Liu</i>	
Grid Security Constraints Based Bidding Strategy Using DDQN on Generation Side.....	529
<i>Yun Li, Yu Gao, Yiyu Xia, Yuanzheng Hu, Hui Sun, Ru Jia</i>	
Research on Carbon Emission Optimization Strategy of Regional Power Grid Based on Interior Point Optimization Algorithm .....	539
<i>Cong Ji, Zhiying Zhong, Fei Yin, Quan Sun, Zuo Chen</i>	
Large-Scale EV Integrated Multi-energy System Optimal Dispatch and Carbon Flow Analysis .....	543
<i>Hongyi Wei, Qihuan Dong, Peng Wang, Ye Wu, Shuyang Li, Ning Zhang</i>	
Research on Intelligent Extraction Technology of Key Information in Power Grid Operation .....	549
<i>Chenyong Feng, Fei Chang, Yuanyuan Wang, Ran Xu, Yuan Gu</i>	
Research on Energy Storage Type of Uninterruptible Power Supply Technology in Internet Data Center.....	553
<i>Peng Peng, Man Chen, Yuxuan Li, Yuxin Zhao, Ningning Li, Hao Liu, Bing Wang, Yushu Sun, Xisheng Tang</i>	
A Multi-dimensional Division Decision Model of Power Grid Management Based on Fuzzy Matching...	559
<i>Chenyong Feng, Xiaodong Xu, Jinsong Jia, Chen Shen, Zehua Chen</i>	
Dynamic Equivalent Impedance Calculation Method for the Collector Network of the Renewable Power Plant.....	565
<i>Xiaobiao Fu, Baoju Li, Lei Guo, Yao Wang</i>	

✧ **Load Forecasting and Calculation in Power System**

Medium and Short-Term Power Load Forecasting Based on Parallel Temporal Convolutional Neural Network .....570

*Zhang Yue, Hu Chunguang, Zhao Gang*

Analysis and Prediction of Bus Load Flexibility in Demand Side Substation .....575

*Hao Xue, Hui Huang, Yanjun Li, Ying Zhang, Tao Yue, Rui Ma*

Under Frequency and Under Voltage Load Shedding Criterion for High-Penetration New Energy Power System .....580

*Li Zhukun, Yan Yunsong, Chen Yonghua*

Residential Load Forecasting Based on CNN-LSTM and Non-uniform Quantization .....586

*Qiyao He, Yongxin Su*

Research on Aggregation Motor Model Based on Statistical Synthesis Method .....592

*Hao Xue, Hengxiang Gou, Yanjun Li, Ying Zhang, Tao Yue, Hu Cheng*

Multi-objective Optimal Scheduling Strategy of Microgrid Based on V2G Technology .....597

*Lingxin Zhang, Yang Liu, Lichao Hao, Xiyue Zheng, Xiaozhen Liu, Jialu Li*

Current Situation and Development Suggestions of Load Side Resources Participating in Electricity Market Trading Mechanism .....602

*Huaiyu Zhang, Jianyu Lu, Li Chang, Linlin Liu, Jing Zhu, Fan Xu*

Optimal Regulation of 'Source-Grid-Load-Storage' Interaction Based on State Based Potential Game .....607

*Bo Li, Weinian Ouyang, Tianlun Wang, Zhirui Tang, Tingwei Chen, Zefu Wang*

Study on the Influence of Frequency Regulation Control on Load of Wind Turbine .....613

*Kai Liang, Yangfan Zhang, Yaohan Wang, Linlin Wu, Weixin Yang, Yu Wang, Yuan Ma, Xianmiao Huang*

✧ **Power System Operation and Energy Management System**

Evaluation of Minimum Safety Inertia of New Energy Power System Considering Rate of Change of Frequency .....618

*Weiguo Xia, Zhengfeng Wang, Jiwen Wang, Jialin Guo, Kaipeng Wang, Pingping Han*

Multi-region Decomposition-Coordination Robust Optimization Model Considering New Energy Uncertainty .....623

*Chunxiao Liu, Quan Yuani, Wei Wang, Yinsheng Su, Xiangyang Su, Ziqiang Wang*

A Data-Driven Scenario Screening Method Considering Peak Shaving and Reserve Contribution of Power Systems with High Penetration Renewable Energy .....630

*Honglin Chen, Zhuoming Deng, Zhengmin Zuo, Zhifei Guo, Zhihua Gao, Hao Yu*

The CCHP Pluripotent Complementary Optimization Strategy —— Takes the Demand Response as an Example .....637

*Guo Yue, Wang Yunfei, Liu Yanru, Bai Yu, Ding Yudi*

A Coordinated Control Scheme of Wind-Storage Combined Unit for Frequency Support .....	642
<i>Tianxia Jia, Yunyi Wu, Lei Chen, Fangzheng Wang, Yong Min, Yong Sun, Yong Sun, Fei Xu, Xuyan Zhou</i>	
Business Operation Optimization of Electricity Hydrogen Integrated Station Based on Multi-agent Game Analysis .....	648
<i>Xiaoqiang Jia, Guixiong He, Haijing Liu, Yangyang Ge, Xintong Ma</i>	
Performance Analysis of Gas Turbine Using Hydrogen-Added Natural Gas .....	653
<i>Hua Xiao, Aiguo Chen, Shini Lai, Syed Mashruk, Agustin Valera-Medina, Xi Deng, Weiqiang Ye, Shaowei Xu, Zhendong Chen</i>	
Spatial-Temporal Inertia Oriented Operation Scheduling of Power System with Offshore Wind Farms .....	657
<i>Gu Miaosong, He Yanhua, Zhu Chao, Wu Ying, Li Guoqiang, Bian Rong, Ma Zekai, Mo Weike, Qi Xiao</i>	
<b>* Power Demand Forecast and Market Analysis</b>	
Containerized Power Data Center with Multi-station Integration .....	662
<i>Tan Xionghua, Luo Jinman, Yi Chunjie, Wang Xiangnv, Xu Zhongxin</i>	
Regional Spot Market Clearing Model for Multi-terminal High Voltage Direct Current Tie-Line with Bidirectional Transmission.....	667
<i>Yaping Hu, Huafeng Zhou, Shuhao Sun, Yubin He, Jialei Wang, Cheng Dong, Jie Liu</i>	
Sichuan Power Ancillary Services Market Demand Analysis and Construction Plan Research .....	676
<i>Liang Guo, Yi Lu, Chang Xiao, Zihua He</i>	
Analysis on the Evolution of Industrial Structure Based on Industrial Electricity Correlation Topology .....	681
<i>Junhong Tian, Junbo Wu, Lu Gao, Zixun Zheng, Bo Wu, Bingxu Hou, Zhuo Yang, Haobo Ma</i>	
BFFBM: A Bloom Filter Based Full-Link Blacklist Monitoring Method on AMI Microservice.....	687
<i>Chengfei Qi, Chaoran Bi, Tongjia Wei, Yaoyu Wang, Jiachen Zhong, Peisen Yuan</i>	
Economic Analysis of Hydrogen Production from Electrolytic Water Considering Carbon Emissions .....	692
<i>Qin Fang, Zhoubin Liu, Yuqing Pan, Danlu Xu, Tieyi Chen, Zhiliang Zhang, Bin Li</i>	
Application Scenario Analysis and Prospect of Electricity Emissions Factor .....	697
<i>Yang Yang, Guang Tian, Fan Li, Tian-xu Jia, Xin-hao Wang, Xiao-dan Huang</i>	
Demand-Side Response Crowdsourcing Model and Its Subsidy Allocation Optimization Method .....	704
<i>Tingyi Zhang, Rongheng Lin, Hua Zou, Wei Zeng</i>	
Research on the Scenario Design and Business Model Analysis of Source-Grid-Load-Storage Collaboration for Zero-Carbon Big Data Industrial Park .....	710
<i>Yunli Yue, Jianmin Ding, Dan Chen, Ruixue Fan, Yong Fang, Zhonghua Liu</i>	

※ **New Battery Design and Energy Storage Technology**

Research on Key Technologies of Large-Scale Lithium Battery Energy Storage Power Station .....715  
*Weihong Kuang, Yu Zhou, Gangxin Zhuo, Wei Zhang, Lingdian Zhang, Shanzhu Xu, Jinglin Zhou, Hai Pan, Huijin Lin*

Optimal Operating for Battery Energy Storage System in Both Energy Market and Regulation Market .....719  
*Qianli Ma, Huaihua Zheng, Weijie Qian, Wei Wei*

A SOC-Based Fast Charging Optimization Strategy with Coupled Electro-Thermal-Aging Model for Lithium-ion Batteries.....725  
*Wenxin Chen, Jinyu Chen, Zihan Chen, Hanxing Lin*

Real-Time Operation of Energy Storage Assisting Utilization of Offshore Wind Power: Improving the Lyapunov Policy via DDPG .....731  
*Yinguo Yang, Mingxuan Li, Qiuyu Lu, Pingping Xie, Wei Wei*

Frequency Regulation Control Strategy for Combined Wind-Storage System Considering Full Wind Speed.....737  
*Baoqiao Chen, Jiandong Duan, Jianhua Wang, Bo Qin, Zhifan Li*

Rapid Assessment of Lithium-ion Batteries' SOH Based on the Segment of Charge/Discharge Voltage Curve Using Convolutional Neural Networks.....743  
*Zhukui Tan, Bin Liu, Junwei Zhang, Yong Zhu, Zhaoting Ren*

Operating Performance Evaluation and Improvement Method of Reconfigurable Battery Energy Storage System .....748  
*Helin Xu, Lin Cheng, Shengming Xu, Caiqiu Liu, Daniyaer Paizulamu*

Optimization Configuration of Shared Energy Storage Users Considering Demand Response Based on Blockchain.....753  
*Yifan Sun, Lin Wang, Yaoxian Jiang, Ziyun Xu, Wenbin Xu*

Configuration and Optimization of Energy Storage Capacity of Zero Carbon Big Data Park with Multi-power Supply Coordination.....758  
*Yi Zhou, Hao Yue, Bingqing Wu, Ruixue Fan, Zhonghua Liu, Yong Fang*

※ **Wind Power Grid Connected System and Power Generation Forecast**

Influencing Factors and Mechanism of AC Fault Transient Overvoltage in Wind Power Grid-Connected System .....763  
*Jiaying Yan, Xin Tian, Zhenhua Yuan*

Application Prospects of Flexible Low-Frequency AC Transmission in Offshore Wind Power Integration .....769  
*Yimu Fu, Wensheng Li, Mu Li, Zhenhua Yuan, Yuyue Zhang, Xiangfei Meng*

A Data Driven Method for Wind Power Curve Simulation under Typhoon Influence in Large Power Grid .....773  
*Xun Lu, Qihang Zhou, Jiayang Wang, Zhihua Gao, Xinmiao Liu, Yuxuan Tang*

Optimal Dispatch of CHP Units at the Plant Level with Wind Power Access .....	780
<i>Hong Hu, Libin Wen, Jun Li, Zhiyuan Sun, Kun Zheng, Jinzhao Li</i>	
Wind Power Cluster Probability Prediction Based on Statistical Up-scaling Method and Neural Network .....	785
<i>Chen Xinyi, Liu Lu, Peng Xiaosheng, Cai Yizhu</i>	
GPR-Based Wind Power Probabilistic Prediction Model Considering Multiple Meteorological Factors .....	790
<i>Song Cheng, Jing Ren, Xin Zhou, Min Gao, Meilun Guo, Peng Kou</i>	
A Novel Control Strategy for the PMSG Wind Turbine Integration with Battery Storage System.....	795
<i>Decai Li, Yalou Li, Yiyang Zhu, Guangheng Pang, Shangjin Yang, Tao Hu</i>	
Coordinated Voltage Control for Offshore Wind Farm Equipped with SVG and Energy Storage .....	800
<i>Lin Li, Chun Yang, Hui Xu, Quanchun Yan, Shuwei Zhou, Hongyu Yang</i>	
<b>* Distributed Photovoltaic Power Generation and Grid Connected Photovoltaic System</b>	
Optimal Design of Household Electricity Consumption with Distributed Photovoltaic System Based on User Demand Response .....	805
<i>Hanjun Deng, Xing He, Rui Huang, Mingqi Yu, Yeqin Ma, Wenwei Zeng, Suihan Zhang, Rui Ma, Jiale Li</i>	
Impact Analysis of High Proportion of PV Access on Distribution Network.....	810
<i>Zhizhuo He, Ying Zhang, Gang Zheng, Fang Zheng, Wenguang Jin</i>	
Prediction of Distributed Photovoltaic Users' Electric Energy Data Based on BP Neural Network Algorithm .....	816
<i>Yu Xiao, Xing He, Rui Huang, Yuping Su, Suihan Zhang, Mouhai Liu, Wenwei Zeng, Ruixian Wang</i>	
Long Short-Term Memory Network PV Power Prediction Incorporating Extreme Gradient Boosting Algorithm .....	821
<i>Xingnian Chen, Yalian Wu, Xieen He</i>	
Research on the Influence of Low-Voltage Riddethrough Strategy of Distributed Photovoltaic Power Supply on the Relay Setting Calculation of Distribution Network .....	826
<i>Yang Yuan, Han Wu, Xiaolong He, Chao Wu, Fenghao Wang, Xincheng Tian</i>	
Grid-Connected Photovoltaic LVRT Strategy Based on Improved DDSRF-PLL and Reactive Power Control.....	831
<i>Wanshuo Ma, Houlei Gao, Haoran Song, Yunchi Zhang</i>	
Research on Meteorological Modeling Point Selection Method for Distributed PV Power Prediction.....	838
<i>Han Wu, Liping Zhang, Zehan Lu, Chao Wu, Ling Zhou, Xincheng Tian</i>	
Clustering and Equivalent Method for Renewable Power Plants Based on Dynamic Active Power Response Characteristics.....	842
<i>Baoju Li, Xiaobiao Fu, Yao Wang, Guanqun Zhuang, Lei Guo</i>	

✧ **New Energy Power Generation and Grid Connection Technology**

The Grid Voltage Sensorless VSG Control Strategy Based on Static Coordinate System..... 849  
*Chunsong Liu, Ruixun Ma, Bing Li, Xueguang Zhang*

An Assessment Method of New Energy Real-Time Accommodation Capacity Considering Uncertainty and Power System Security Constraints..... 854  
*Guannan Wang, Tian Zhou, Taishan Xu, Shaofeng Liu, Jun Zhang, Kang Chang, Haitao Liu, Maxiang Wang, Haotian Zhang*

Statistical Analysis on the Power Energy Adequacy of the PV Generation in South China..... 860  
*Hongtao Liu, Bingying Lin, Huifan Xie, Ligang Zhao, Hongyue Zhen, Xiaowei Song*

Research on Influence and Parameter Optimization of Voltage Ride through Control Strategies of Energy Storage in Renewable Energy Power Sending System ..... 866  
*Wu Junling, Dai Hanyang, Su Lining*

Ultra Short Term Distributed Photovoltaic Power Prediction Based on Satellite Cloud Images Considering Spatiotemporal Correlation ..... 871  
*Ma Yuan, Ding Ran, Yao Yiming, Geng Yan, Shao Yinchu, Wang Xiaoxiao*

Research on Flexible Control Technology of Photovoltaic and Energy Storage System..... 876  
*Jinhao Hu, Kun Zhang*

Research on Quantitative Comprehensive Evaluation Method of Regulation Ability of Low-Voltage Distributed Renewable Energy Aggregators..... 880  
*Jinrong Chen, Xiang Li, Guozhang Li, Feijin Peng, Jingyao Zeng*

Research on New Energy Probability Prediction Technology Based on Ensemble Weather Forecast..... 886  
*Han Wu, Yang Yuan, Wei Yu, Chao Wu, Hao Huang, Annan Dong*

✧ **PV Module and Power Generation System**

Fast Open-Switch Fault Diagnosis Based on Model Reference Adaptive Theory Applied to Inverter System..... 890  
*Haoran Yin, Qing Chen, Xing Guo, Xinyuan Qiu, Xuxing Duan, Xiangji Zhao*

Adaptability Evaluation Method of Distribution Network Considering Flexibility Resource ..... 896  
*Yao Duan, Ye Huang, Peidong Chen, Qiang Luo, Chong Gao, Zhiwen Liu, Yi Cao*

A K-NN Clustering Based Method to Generate PV Power Series for Power System Analysis under Typhoon..... 902  
*Xun Lu, Yuxuan Tang, Zhifei Guo, Zhihua Gao, Xinmiao Liu, Qihang Zhou*

Robust Evaluating Approach of Distributed Photovoltaic Hosting Capacity in Uncertain Environment ..... 907  
*Shaofeng Cui, Lin Mou, Wei Li, Junjiao Wang, Gang Li, Yuzhen Li, Xiaojun Yan, Chengguang Liu*

Solar Power Generation System Based on Signal Search Artificial Bee Colony Optimization Algorithm for Maximum Power Point Tracking..... 912  
*Akwasi Amoh Mensah, Haoyong Chen, Duku Otuo-Acheampong, Tumbiko Mbuzi*

✱ **Electric Energy Storage System and Energy Management**

Probabilistic Production Simulation of Multi-Energy System and Practice in Transnational Energy System .....917  
*Runzhao Lu, Qian Dai, Dian Chen, Libo Zhang*

Economic Assessment of Energy Storage System Frequency Regulation in Thermal Generation Station .....923  
*Tianyu You, Huaye Huang, Ziming He, Sixian Yu, Haiyu Zhu, WeiKe Mo*

Optimal Allocation Method of PV-Storage System in Clustered Distribution Network with Balanced Economy and Reliability .....930  
*Hui Hui, Rui Li, Yang Zhao, Ming Wang, Ziyao Ma, Xiaoran Wang*

Optimal Configuration of Hybrid Energy Storage System Catered for Low-Carbon Smart Industrial Park .....938  
*Sun Yifan, Wang Lin, Yang Cenyu, Zhu Ye, Jin Yi, Dong Weijie*

Frequency Shaping Control of Deloaded PV System Coordinated with Synchronous Generators .....944  
*Aolin Jian, Yong Sun, Lei Chen, Yong Min, Ruikuo Liu, Fangzheng Wang*

Research on Key Technology of Digital Twin and Its Application in Integrated Energy System.....950  
*Qi Zhao, Sheng Chen, Xinying Wang, Jie Tian, Rixiao Zhao, Jun Yang*

✱ **Integrated Energy System and Optimal Allocation**

Study on Master-Slave Game Strategy of Integrated Energy System Considering Users Demand Response and Energy Balance .....957  
*Fangzhao Deng, Dexin Meng, Zhenli Deng, Hujun Li, Jianan Si, Junpeng Zhu*

Optimal Scheduling of Electricity-Gas Integrated Energy System Based on Conditional Value at Risk Theory .....962  
*Qinxing Tian, Jiandong Duan, Fan Liu*

Distributed Renewable Energy Cluster Configuration Based on Improved Bare-Bones Multi-objective Particle Swarm Optimization .....967  
*Jinrong Chen, Bo Li, Weinian Ouyang, Tianlun Wang, Tingwei Chen*

Deep Reinforcement Learning Based Approach for Real-Time Dispatch of Integrated Energy System with Hydrogen Energy Utilization .....972  
*Yi Han, Yuxian Zhang, Likui Qiao*

A Bi-level Planning Method of Distributed Renewable Energy Based on Cluster Division .....977  
*Xiang Li, Gaoming Li, Zefu Wang, Zijia Kuang, Tingwei Chen, Tianlun Wang*

**Author Index**