

2022 2nd International Conference on Electrical Engineering and Control Science (IC2ECS 2022)

**Nanjing, China
16-18 December 2022**

Pages 1-660



**IEEE Catalog Number: CFP22DI8-POD
ISBN: 979-8-3503-9917-2**

**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:	CFP22DI8-POD
ISBN (Print-On-Demand):	979-8-3503-9917-2
ISBN (Online):	979-8-3503-9916-5

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

CURRAN ASSOCIATES INC.
proceedings
.com

Table of Contents

Application of Activated Carbon based on High-sulfur Petroleum Coke in Potassium-ion Batteries	1
Jie Shan, Haitao Sun, Jiquan Liu, Zhiwei Yan, Kun Zhu, Xiangdong Yu, Yinke Dou	
Analysis of the Impact of Incorporating Electricity Consumption of NEV into CAFC Accounting on Different Technical Routes	5
Yizhe Cao, Jiankui Yang	
Model and Comprehensive Evaluation of Sharing Mechanism Based on Energy Data	10
Dongge Zhu, Rui Ma, Jia Liu, Jiangbo Sha, Dunnan Liu, Zhiyuan Cai	
Flexible load regulation margin evaluation method considering virtual energy storage characteristics	14
Yongli Wang, Xiangyi Zhou, Hao Liu, Feng Zhu, Jiyan Liu, Yijuan Liu, Jinrong Zhu	
Design and simulation of ball-based triboelectric nanogenerator for harvesting energy from rolling tires	18
Songyi Zhong, Shaoxiang Zhang, Zhongjie Li, Ying Gong, Yan Peng	
Review of power user importance assessment methods	23
Xiaohan Zhang, Weimin Sun, Lin Li, Luyu Ji, Jingzhe Tu, Jian He	
Optimum selection of the new energy power station planning scheme based on the prospect theory	30
Zheyong Piao, Dongwei Guo, Tao Peng, Yangsiqi Zhang, Xue Li, Hao Liu	
Resilience Assessment Method of Integrated Electricity and Gas System Based on Hetero-functional Graph Theory	34
Chen Zhang, Zhouyang Wu, Xianghua Li, Jian Liang, Zhongyao Jiang, Ceheng Luo, Fangjun Wen, Guangda Wang, Wei Dai	
Study on Cost of Transmission Line in Sichuan Province Based on Cointegration Theory	40
Jie Yang, Kuiyun Zhao, Ping Zhou, Hanjing Liu, Lin Hu	
Research on Photovoltaic Amplifier Circuit based on Filter Module	45
Peijian Xu, Zhanpeng Xu, Dan Peng	
Innovative Micro-power Consumption Difference Amplification Circuit	50
Zirong Zhang, Fuanyuan Zhu, Qiwen Xie, Guitang Wang	
Comparative Analysis of Wind Load of Transmission Lines at Home and Abroad	55
Xin Ye, Jingfeng Guo, Xiaoxu Fu, Kaiwang Chen, Yixian Sun, Bijian Chen, Ming Xie	
Temperature Error Compensation Method for FBG Sensor in Electric Power System Based on Fireworks Algorithm	60
Yan Guo, Weiheng Kong, Lihui Wang	
Geological disaster monitoring technology along transmission line based on InSAR	64
Jian Zhang, Bocheng Li, Jun Chen, Chuyu Cai, Xiaolong Li	

Research on the Construction of China's Electricity Spot Market(II): Analysis of Problems and Challenges	68
Yun Xu, Jiayu Yang, Yunwei Yang, Jianhang Liu, Fang Liu	
Electrical and Thermal Performances of IGCT in High Voltage DC Circuit Breaker	75
Hua Mao, Huaping Jiang, Li Ran, Haoyu Chen, Yuting Xie, Minxiang Yang	
Research on Churning Power Losses for laser welded Hypoid Gear of Vehicle Rear Axle	80
Jianming Li, Xiaoge Hu	
Mechanism Analysis of Sub-synchronous/Super-synchronous Oscillation in Wind Farms Integration Through Flexible HVDC	86
Xiao Wang, Linlin Wu, Yunhong Li, Tianyu Su	
Research on reactive power and voltage coordinated control strategy of wind power cluster in AC/DC hybrid sending end system	91
Man Xu, Linlin Wu, Yanchen Yang, Yunhong Li	
Research on Electrical Wiring Design and Verification of Civil Aircraft	96
Xuan Hu	
Simulation Analysis of Sensorless Control of Synchronous Reluctance Motor Based on Optimal Current Distribution Strategy	101
Yifeng Peng, Xiuhe Wang, Lixin Xiong, Xin Zhang	
A Study on Robust Design of a comb MEMS Driver	106
Xiang Ban, Xiaolan Tan, Yueqin Wang, Liding Yue	
Research on Evaluation Indicators System for Electricity Market Serving Green Power Trading	111
Si Wu, Caixia Wang, Zhiyong Shi, Ning Chen, Xiaoliang Dong	
A Monolithic Optical Sensor for IoT Devices Proximity-Detection	118
Qianfan Ran, Yuan Li, Zhihong Lin, Xudong Zhang, Chaoyang Song, Yin Chiang	
Research and Analysis on Measurement Error of Three-phase Electricity Meter with Magnetic Field Interference	123
Maoning Zhu, Penghe Zhang, Cong Wang, Yiwei Qin	
Time Series Prediction of Dissolved Gas Concentrations in Transformer Oil using ARIMA-NKDE Method	129
Tonglei Wang, Peng Wu, Jinggang Yang, Jinshan Lin, Jiansheng Li, Jiabi Liang, Yuan Li	
An Investigation on Maximum Power Region for Distributed Maximum Power Point Tracking in PV Systems	134
Zhihong Ge, Xingshuo Li, Ruichi Wang, Tangwu Yang, Shuye Ding	
Health state prediction of plunger pump based on belief rule base	139
Yu Zhao, Zhijie Zhou, Hongdong Fan, Zhichao Ming	
Reliability Analysis and Risk Warning Strategy of Power Communication Network Based on SG-EA Architecture	144

Tai Zhang, Desheng Wu, Shaolei Chen, Xiaolei Zhang, Lin Guo	
Effect of Thermal Bubbles on Partial Discharge and Breakdown Characteristics of Oil-Immersed Pressboard	149
Hao Wu, Can Guo, Jing Wang, Rui Zhang, Xiaoang Li, Qiaogen Zhang	
Multi-sensor Fusion Framework for Obstacle Avoidance via Deep Reinforcement Learning	153
Peng Jiang, Jiafeng Ma, Zhiwen Zhang, Jianming Zhang	
Research on Green Electricity Trading Mechanism Based on Spot Market	157
Bo Ning, Hao Zhang, Junhong Guo, Shengnan Zhang, Zhen Liu, Han Zhang	
Electrical Design of Transmission Line Crossing Scheme	161
Xiaoli Xu, Xiaoyu Huang, Xue Chen, Minquan Ye, Xuemei Zhu, Lichuang Chen, Xin Ye, Qingquan Lin	
Comparison of PECVD Temperature Control Methods	165
Yajie Huang, Donglai Zhang, Bin Zhang, Anshou Li	
Theoretical and experimental study of the nuclear electromagnetic pulse coupling to cables	170
Shanyi Jiang, Jie Cui, Yubing Han, Xinliang Pang, Yunfen Chang	
Research on cost analysis method of power transmission and transformation project based on index theory	174
Huiying Wu, Fangshun Xiao, Cong Zeng, Xuemei Zhu, Ye Ke	
Application and development direction of 3D digital design technology in transmission line engineering	179
Jianhao Lin, Jianping Cheng, Kejian Nie	
Comparative Study on Power Big Data Asset Pricing Models	183
Chen Wang, Tao Xu, Xiaoman Qi, Lian Liu, Yanan Zhang	
Research and Test on 50% Load Rejection Method of 170MW Supercritical Reheat Double Extraction Heating Unit	187
Deyun Zhang, Xiu Liu, Yanchang Long, Liangjun Zhu, Yong Wang, Yan Zhang	
Research on the Constant Temperature Warm Clothing Based on DC Brush Less Motor Speed Control System	191
Chunquan Chen, Hongfang Lv	
Research on the Settlement Mechanism of Electricity Market Considering Imbalance Funds	196
Dan Cheng, Xiaoqing Zhang, Yujie Li, Lina Zhu, Lei Tang, Xuwei Ye, Wei Xu	
Research on the necessity and construction path of ramping auxiliary service market	200
Yue Zhao, Qiuna Cai, Long Wang, Jue Yu, Hui Song, Xiaojuan Dai, Zelin Wang, Yuguo Chen	
Facilitating Renewable Energy Developments in Northern Hebei through Power Purchase Agreements	206

Hao Zhang, Qingfeng Tang, Du Xu	
Fire operation common mode analysis in nuclear power plants	211
Zhenying Wang, Yu Huang, Haiqing Liu	
Current status and development trend of battery changing technology for electric passenger vehicles	215
Xin Cai, Liangliang Chen, Mingshen Wang	
Research on the optimal bidding strategy for coal-fired enterprises in the spot market of electricity under the carbon emission rights auction mechanism	222
Peng Yu, Qiuna Cai, Long Wang, Hui Song, Yue Zhao, Chao Gong, Xue Xia, Jiaxin Zhao	
Research on the Clearing Model of Regional Reserve Auxiliary Market Considering Wind Power Consumption	230
Chuang Liu, Lei He, Tie Bao, Jian Xing	
Research on China's Electricity Spot Market: Model Selection Inherent Logic and Feature Analysis	235
Yun Xu, Jianhang Liu, Peng Gao, Wei Lu, Fang Liu, Ru Pan	
Research on lead-acid battery activation technology based on " reduction and resource utilization "	243
Yunqian Gong, Jinxing Yu, Peng Yang, Chongming Chen, Siming Zeng, Minglei Wei	
Research on comprehensive utilization technology of lead-acid battery based on the principle of " reduction and resource utilization "	248
Peng Yang, Yunqian Gong, Jinxing Yu, Siming Zeng, Minglei Wei	
Research on coal price risk management methods based on option clauses in power trading contracts	252
Qingchun Li, Nan Liu, Ye Zhang, Yang Qi, Qianqiao Zhao	
Accurate comparison method of load data of power outage events of users	257
Chenyong Yi, Yangjun Zhou	
Analysis of Influence of Magnetic Field Distribution of HVDC Relays on Restriking	261
Xin Huang, Jingxuan Lin, Liang Wang	
Research on energy storage technology of lead-acid battery based on " reduction and resource utilization "	267
Jinxing Yu, Peng Yang, Yunqian Gong, Kai Che, Siming Zeng, Minglei Wei	
Treatment of abnormal pressure recovery of high temperature and high pressure gas well	271
Xian Peng, Dong Hui, Tao Li, Jiaman Chu, Zihan Zhao, Xixiang Liu	
Techno-Economic Comparison between Power Transmission and Hydrogen Production and Transportation for Offshore-Wind	275
Xiaoyan Hu, Xiaoyun Yuan, Bingjie Li, Yi Ge, Ruixiao Lin	
Study on the Economic Evaluation Method of Distributed PV Microgrid System Based on Production Simulation	282

Jing Lu, Hao Jia, Xinyu Xu, Liang Tang, Xiaobo Cui	
Research on the application of power grid asset LCC in power grid planning stage	286
Guanlei Dong, Kai Huang, Lili Zhang, Shibiao Zhang, Hongwei Wang, Wen Zhang, Xuedi Xu, Yang Yu, Hongliang Liu, Pengchao Miao	
Multi-stage planning of integrated energy systems considering external carbon trading	293
Shiyu Ji, Dongdong Su, Qianqian Song, Yibo Li, Pengxu Dong, Yongli Wang	
A correlation analysis-based security event processing system for power networks	298
Xingjie Huang, Jinmeng Zhao, Zhijie Shang, Chan Wang, Xinyu Liu, Jinsong Li	
Research on Technology of Energy Storage under the Dual-Carbon Target	302
Xiuqi Zhang, Wei Xing, Kai Guo, Yu Cong	
A study on carbon emission forecasting in the power industry under the background of new power system	306
Feng Yuan, Lijia Su, Shangjin Wang, Junheng Yu, Yongli Wang, Yue Teng, Tianyi Feng	
Multimodal Fusion Authentication Method for Handheld Operation and Maintenance Terminal Considering Multi-factors	312
Congli Li, Pan Zhang	
Carbon emission forecasting method considering the combination of energy demand and economic exogenous factors	317
Da Li, Ziming Li, Wei Qie, Bin Wang	
Distribution network load prediction based on deep reinforcement learning	321
Jian Zhang	
Research on Medium and Long-term Time-phased Power Energy Block Trading based on the evolutionary	325
Kun Fan, Qin Le, Haoyong Chen, Jingjing Gu, Gang Chen, Yanjin Zhu	
Comprehensive benefit evaluation of rural energy internet in different application scenarios	331
Hengtian Wu, Weizheng Kong, Xiaoyu Wu	
Construction of Power Marketing Inspection Model Based on Data Mining Technology	337
Meng Miao, Weijiang Wu, Gaojun Xu, Xuancheng Zhang, Ke Chen	
A Modified Power System Information-Physics Cooperative Attack Model and Its Influence	341
Maosheng Ding, Xutao Li, Tan Xu, Yanghan Zhou, Xin Ma, Zhanwen Tang, Lei Zhou, Chunyan Li, Bo Hu	
An integrated electricity-gas energy system planning method that takes into account the reliability of energy supply	347
Zheng Wang, Xuxia Li, Yao Wang, Yan Liang, Yingying Hu, Jia Li, Hongli Liu, Xiaoming Zheng	
Overview of Power System Planning under Uncertainty	352

Yuanshang Zhao, Weifang Lin	
Survey on Isolated Microgrid Prognostics and Health Management	361
Chunyan Zhang, Jialin Wang, Xuanfang Yang	
Design of real-time information security monitoring system for power grid	366
Huabing Zhang, Hang Yang, Xiaoming Cao	
Research on remote analysis technology and system development of distributed photovoltaic power generation operating status	372
Nan Wang, Yan Cheng, Wenjie Ju, Yuejiao Wang, Yifei Guan, Yiyuan Liu, Guangqi Zhou	
Research on interacted response technology of cyber security protection devices based on deep reinforcement learning oriented to new generation of power system	377
Yaofu Cao, Xiaomeng Li, Junwen Liu, Junlu Yan, Jingcheng Zhao, Huimin Li	
Attribute Reduction Method of Power Big Data Based on Rough Set	382
Fan Jiang, Wei Xing, Tong Wu, Xiujie Shi, Wei Liu	
Economic Evaluation of Hydrogen Energy Storage for New-type Power System at Energy Sending End	386
Hao Jia, Xinyu Xu, Liang Tang, Xiaobo Cui	
Low carbon energy consumption management in distributed photovoltaic Station Area	390
Xinran Liu, Muxin Zhang, Lina Sun, Yudong Zhao, Liyan Kang, Ying Shang, Wenyu Cheng, Liying Liao	
Evaluation Method of DC Transmission Terminal Power Grid with Large-scale New Energy	395
Lin Zhou, Yu Lu, Jing Wang, Hongye Liu, Fan Feng, Wenfang Yu	
Research on Technical Path of Metauniverse Promoting Construction of Digital Power Grid	399
Wenju Quan, Jinzhao Liang, Qiuling Yu	
XGBoost based fake data injection attack detection method for power grid	404
Feng Guo, Shenghong Yao, Neng Zhang, Yuchao He	
CNN-GRU based fake data injection attack detection method for power grid	408
Yuchao He, Lirong Li, Huimin Qian, Shenghong Yao	
Analysis of the Impact of Weather Temperature on Industrial and Residential Load	412
Ke Chen, Yuanliang Rao, Teng Sun, Xiangxiang Liu, Yajie Wu, Xiangyu Kong	
Outgoing Line Fault Characteristics of Battery Energy Storage System in Power System	416
Wenke Li, Wenbin Yu, Guoqin Zhang, Caiyun Mo	
Multi-mode Tracking Strategies for Wind-Solar-Storage Hybrid Power Generation System	421
Yuan Wei, Zheng Cheng, Huanchang Zhang, Yerui Xia, Qi Gao, Qinxing Tian	
Research on power grid anomaly detection based on high-dimensional random matrix theory	427

Xianguo Yan, Haoliang Xu, Yudong Gao	
Parameter Identification of MIMO Objects Based on Attenuation Factor Recursive Least Squares	432
Jiong Shao, Xinchun Jie, Zhishuai Zhai, Meng Wu	
Comprehensive Evaluation of Power Quality Based on Combination weighting and grey correlation technique for order preference by similarity to an ideal solution	437
Guangde Dong, Xuechun Zhao, Yongtao Chen, Xiaojun Zhu, Fuchun Shu, Bai Xiao	
A Sample Data Augmentation Method for EMG Gesture Recognition	442
Yuexing Gu, Tongyou Liu, Yuanjing Xu, Yuling Shen, Hang Ren, Jinwu Wang	
Comparison of Driving Performance and Fault-tolerant Capability of Two SWMDs With Different Winding Connections	447
Hongyang Liu, Lei Zhou, Guang Yang, Jiewei He, Zicheng Liu	
EV Aggregation Method Considering Flexibility of Multiple Charge-discharge Modes	453
Daiyu Xie, Shengyuan Li, Peikai Li, Hongzhou Li, Wei Dai	
A Wind Turbine Control Parameter Optimization Strategy for Improving Power System Transient Stability	459
Wei Zhao, Peng Xu, Yanchen Yang, Man Xu	
A Aircraft Circuit Protection Design Tool Logic Based on the New EWIS Design Data Structure	463
Jianfei Sun, Fang Xie, Sainan Yang	
Low-Carbon Economic Dispatching of Park Integrated Energy System Considering Carbon Accounting	468
Lingyu Guo, Zeqi Liang, Yang Du, Zhongguang Yang, Donghan Feng, Yun Zhou	
The way benefits are distributed in the power tower sharing market	474
Chengjie Wang, Peng Wu, Yu Zhang, Qingkun Tan, Zhenkun Wang, Zhaozheng Zhou	
Comprehensive evaluation index system of new urban power grid	479
Yueheng Wang, Bicheng Tan, Yuwei Wang	
Economic analysis of energy storage power station applied to distribution network	487
Kun Wang, Sheyu Zhou, Sai Lu, Ziming Li	
New Electricity Market Mechanism for High Proportion of New Energy	492
Jun Yao, Xu Wang, Ligong Xing, Yadi Chang, Zhu Li, Tian Sun, Menghua Fan	
Research on Accurate Control Strategy of Shandong Power Grid Integrated Load	496
Naiyong Li, Jian Zhang, Yuqiang Chou, Jian Chen	
Coordination Mechanism of Electricity Market and Carbon Market	500
Yadi Chang, Shengnan Zhang, Li Song, Chang Liu, Jie Liu, Liya Yu, Xiaotong Zhang	
Environmental economic dispatch of power system based on multi-objective improved hybrid leapfrog algorithm	504

Dingxuan Xu, Jianmei Xiao, Xihuai Wang	
Technical Indexes and Construction Path of New Power System in Sichuan Province	511
Hongen Tan, Liang Luo, Dingpu Tang, Yongsheng Liu, Dongan Gong	
Evaluation method for security and economic operation of power system with high penetration of renewable energy	518
Yue Zhao, Guobing Wu, Qiuna Cai, Long Wang, Jue Yu, Hui Song, Yujun Sun, Zelin Wang, Xiaojuan Dai	
Integrated Power Quality Control Strategy for Microgrid Based on Energy Storage Converter	523
Jinghua Zhou, Haoyu Liu	
A 99.22% Energy-saving and 86.91% Area-reduction Capacitor Switching Scheme for SAR ADCs	528
Lifeng Xiang, Guoxian Zhang, Minghui Cui, Junwen Sun, Xiaobin Xu, Ji Zhao, Xing Wang	
Optimum Design of Transmission Line Crossing without Crossing Frame	533
Xiaoli Xu, Xiaoyu Huang, Xue Chen, Guanrong Zhang, Xin Ye, Qingquan Lin, Wei Zhang	
Research on the Method of Evaluating the Electricity Market's Service for Utilization of New Energies	538
Ning Chen, Caixia Wang, Shizhi Yong, Si Wu, Xiaoning Ye, Xiaoliang Dong, Chao Zhang	
Parameter Optimization of Low Order Inertia System Controller Based on PSO Algorithm	546
Tengyu Zhang	
Research on the Optimal Setting Scheme of Gateway Metering Point of Power Plant	551
Yinong Cai, Yan Guan, Qiutong Wu	
Research on Power Supply Control Technology Between Multiple Spacecraft	555
Xiaomai Meng, Xiong He, Junbiao Shi, Wang Li, Liang Ren, Mi Liu	
Construction of Abnormal Power Consumption Inspection Model Based on Line Loss Fluctuation Analysis	560
Xuancheng Zhang, Weijiang Wu, Meng Miao, Gaojun Xu, Ke Chen	
Research on power grid integrated regulation authority setting method based on role security control	564
Hongyu Shi, Haiying Huang, Sisi Ye	
Research on multi-subject transaction optimization of integrated energy system based on coordinated operation	573
Yongli Wang, Boxin Du, Yumeng Qin, Tianyi Feng, Nan Li, Wei Yan, Minda Shi	
Research on the optimal configuration of user-side PV&ES and the marketing pricing of power grid enterprises	580
Shunchao Wang, Hui Luo, Yun Pan	
Periodic Sample Based Event-Triggered Control for Linear Systems with State Observer	587

Shiwang Wan	
Optimization of thrust fluctuation of 2D permanent magnet synchronous linear motor based on ANSYS Maxwell	593
Yabin Su, Xudong Wang	
Research on Performance Improvement Method of Real-time Power Market Optimization Engine	597
Xu Zhang, Bike Xue, Le Zhao, Yuyao Feng	
Research on Multi-objective Optimization of Economic Performance of Solar Thermal Power System	601
Jidong Li, Guoshan Yang, Yanhui Ren, Tingting Yang, Lei Shi	
Comprehensive energy system optimization strategy based on stepped carbon trading mechanism	605
Zhensong Zeng, Xianan Huang, Yu Shen, Dingfei Que, Kejun Dong	
Indoor main transformer heat dissipation performance optimization and enhancement scheme design	611
Qian Li, Dekai Chen, Xianze Liu, Yuefeng Zhang, Guojian Liu	
Low Energy Consumption Power Inspection Solution Based on Cloud-Fog-Edge Ladder Collaboration Technology	615
Qingxian Zhao, Shaotong Pei, Ying Zou, Xiaoyan Zhao, Rui Yang, Chenlong Hu, Xueting Bai, Peiyao Wu	
Design and implementation of UAV autonomous inspection system for UHV dense transmission channels	619
Guoliang Jin, Peng Zhang, Yunfeng Zhang, Zheng Zhou, Haoyan Li	
Model-free Voltage Control for Flexible Distribution Networks With Measurement Uncertainty	623
Chuanhang Yu, Mei Miao, Yanda Huo, Xin Jin, Tieyan Zhang, Yuntao Zhang, Ruixian Zhu	
Multi - objective Optimization Design of Coupling Mechanism Based on LCC-LCC Compensation Topology	629
Chenlu Ji, Fei Lin, Zhongping Yang, Xiaobo Wu, Chao Wang, Donglei Sha, Dushuo Han	
Simulation study on coal consumption and peak regulating characteristics of industrial extraction steam power supply for 300 MW unit	635
Junhua Xu, Lihua Ao, Yuejun Yang, Zhonghai Wan, Fuyuan Zhan, Yongliu Shen, Xiaoliang Zhang, Wei Zou, Jian Zhou	
PSU energy coordination control method based on sag control	639
Lipeng Wang, Gang Wang, Chuxiang Feng, Ling Qin, Guowei Xie	
Analysis of motor energy feedback strategy for electric vehicles	645
Chongkai Liu, Dan Wang	
Research on a Cross-talk Suppression Method for Avionics PCB Board	651
Chunping Zhu	

Real-time 3D Reconstruction of Aerial Transmission Lines	655
Mingbo Yang, Hongjie Liang, Qifeng Wu, En Li	
Design of Non-contact Low-voltage Distribution Cable Inspection System	661
Yankun Lin, Xin Zheng	
Research on the function and testing of electric vehicle charging pile testing device	666
Qingming Lin, Wen Sun, Wenhui Zhang, Xiaocun Wang, Junquan Piao, Yun Zhou	
A Compliance Study on Thermal Runaway of a Nickel Cadmium Battery for Civil Aircraft	671
Juan Wei, Jianxin Yuan	
Stochastic Optimal Scheduling of Electric-Thermal-Hydrogen Integrated Energy System Based on Seagull Optimization Algorithm	676
Zhenhua Jin, Xiaopei Wang, Ziping Hu, Yuwei Hua, Shiduo Jia, Anxiang Hou	
A Hybrid Micro Energy Harvester based on Photovoltaic and Vibration Energy	681
Yeguo Yu, Qin Nie, Feifei Peng	
New Method of Voltage Sag Detection Based on Hilbert Transform	686
Kai Cui, Kai Hou, Fei Song, Junhui Wang, Zhongbin Zhu, Haiyang Sun	
A Compliance Method of Applying the Built in Software of Microcontroller Chip for Civil Aircraft Airborne System	690
Juan Wei, Jianxin Yuan	
Lithium Battery Pole Piece Defect Detection Method Based on Mean Shift and Gray-level Co-occurrence Matrix	695
Yifan Tao, Weisheng Mao, Linsheng Li, Wenyi Zhou	
A real-time arc acoustic detection and early warning system for civil Aircraft Power Panel Box fault arc	700
Chunping Zhu, Dianliang Yang	
Pulse Frequency Modulated Three-Phase Interleaved Boost-Integrated LC Series Resonant Converter	705
Guangfu Ning, Yu Deng, Ben Dai, Mei Su	
Research on High Efficiency and High Boost Ratio DC Converter for Fuel Cell	710
Lei Yang, Huijun Li, Ke Zheng, Tao Ding	
Research on Temperature Control Method of Variable Structure Thermoelectric Furnace Based on Fuzzy PID Optimized by Genetic Algorithm	716
Lingyan Hu, Weizhuang Wang, Zumin Wang	
Analysis and Modeling of Isolated Weinberg Converter	721
Ying Shen, Tao Liu, Zirui Zhu, Congrang Jiang	
Research on Speed Loop PI Oscillation Detection Method	729
Jianshan Wang, Wei Ding, Xu Liu, Yunjing Liu, Sihan Li, Hong Wang	

See Insulator in the Dark: Insulator Defect Detection under Low-light Condition based on SliD	733
Zhiyuan Ma, Ruoyu Wang, Jialu Xu, Yinuo Cui, Zixiang Wei, Chenruiyuan Yu	
Research on Voltage Sag Source Identification Based on Improved HHT and Optimized DB	737
Biling Luo, Ke Zhang	
Integrated Planning of Cyber Physical Distribution System Considering High-Proportion Photovoltaic Access	743
Chao Cai, Song Gao, Jun Han, He Huang	
Development of On-Line Gas Monitoring Technology in Transformer Oil	747
Bangfa Chen, Xianxi Chen, Baiquan Chen, Jing Huang	
Scheduling optimization of regional low carbon integrated energy system based on multi agent master-slave game	753
Yongli Wang, Boxin Du, Sichong Jiang, Yiran Liu, Nan Li, Wei Yan, Minda Shi	
Design of Louver Shading System for Glass Dome Based on Fuzzy Control	760
Jiangping Liu, Yang Shen, Liyun Zhuo	
Design and implementation of PLC control system software for a nitrogen gas distribution station	767
Pan Chen, Yiyong Lin, Shuguo Ran	
Research on the Rolling Channel Control of Micro Tactical Missile Based on Auto-coupling PID	773
Lin Liu, Tao Zhao, Peng Zhang, Juanzhi Lu, Fei Ma	
The Control of the Clutch Half Joint for AMT Truck in the Starting Process Based on Load Identification	779
Xiaoyan Cong, Chunpeng Wang, Hongxuan Zhu, Chunyuan Liu	
IGBT Peak Voltage Suppression Considering Stray Inductance of Mine-used Inverter	786
Yue Wang, Han Shi, Xiang Rong, Youwan Xu	
Research on Energy Management Contract Model Based on Energy Saving Revenue Sharing	791
Yue Liu, Jia Sun	
Design and implementation of SPWM output based on STMF407	796
Chao Li, Guoguang Zhang, Chunhua Jiang	
Practical stabilization of multi-delay positive linear systems with control inputs	801
Zhuhao Shao	
Development and Dynamics Simulation on a Countercurrent Lifting and Follower Support Mechanism of Radar Antenna with Feeble Rigidity	805
Guopeng Peng, Huawei Lou, Tong Liu	
Reliability assessment analysis of a cruise ship electric propulsion system pods	812

Chen Cong, Wang Lu, Zeyu Zhang, Liu Fan	
Analysis of deformation of monitoring water tank in a nuclear power plant	817
Zixin Xu, Shibei Cheng, Lihua Wang	
Research on cost value accounting method under typical scenarios of rural integrated energy system	821
Yanqing Liu, Jiayue Sun, Xuehua Li, Wenlin Liu, Zhigen Xu, Jianling Zhang	
A Compliance Risk Assessment Model for Power Exchange Centers Based on Analytic Network Process and Fuzzy Comprehensive Evaluation	826
Wenyuan Ning, Jin Xing, Zhongkang Wei, Tianbo Zhu, Gongyu Wei, Jing Chen	
Evaluation Method of New Energy Distribution Network Operation Based on Security Level	834
Peng Liu, Tianchi Xu	
Analysis and Research on Deviation Settlement Mechanism of Medium and Long Term Electricity Transaction under Spot Environment	838
Shiyi Zhao, Yidan Zhang, Jipeng Kuai, Kai Zhang, Nannan Xia	
Power Load Forecasting Based on COA-Bi-LSTM Method	842
Gang Chen, Dian Zhang, Wei Xiang, Zhenqi Guan, Jing Huang	
Electric vehicles charging load prediction based on Monte Carlo method	846
Jiaxin Cheng, Na Liu	
Study on functional positioning evaluation system of pumped storage in different areas	851
Jie Yang, Bihai Yao, Fuqiang Zhang, Fengkui Luan, Hao Fan	
A fault diagnosis method of distributed photovoltaic power generation equipment based on big data mining	857
Shumin Sun, Yan Cheng, Nan Wang, Wenjie Ju, Yuejiao Wang, Yifei Guan, Yiyuan Liu, Guangqi Zhou, Shibo Wang	
Design and Simulation of Fin Stabilizer PID Controller	863
Lu Jiang	
Research on Inverter Control System of Flip Fixture	869
Shangang Wang, Shuang Zhang, Hudai Fu, Wan Yi, Ye Wang	
Application of Micro Thermal conductivity detector for Transformer Fault Analysis	873
Tianye Zhou, Jianhai Sun, Chao Xiang, Tingting Chen, Hao Quan, Kaisheng Jiang, Yan Zhao, Ning Zhang	
Research on refrigerator electronic nose monitoring system based on Raspberry Pi	877
Yuyi Zhai, Jiahui Huang, Chuang Liu, Yunjia Liu	
Wind Power System Operation Risk Assessment Method Based on Power Flow Transfer	881
Danli Xu, Kemeng Liu, Xiqi He	

Fault-tolerant Docking Control for Autonomous Aerial Refueling of Unmanned Aerial Vehicle	885
Jie Chen	
UAV Autonomous Aerial Partner Refueling Fuel Delivery Section Anti-Disturbance Control	891
Jie Chen	
Conservative level controllable robust economic dispatch considering wind power	896
Danwen Yu, Qingqing Zhang, Song Gao	
A switch open-circuit fault diagnosis method for three-phase inverters based on voltage patterns	901
Xiaojian Xu, Fei Yu	
Electrical Error Proofing Design Technique of Civil Aircraft Based on Safety Analysis	909
Xuan Hu, Mailing Liu	
Identification Method of Transformer Winding Material Based on Support Vector Machine	913
Runhua Wang, Zhiyao Zheng, Zhongdong Yin, Yawei Wang	
Adaptive fuzzy state feedback periodic event-triggered control for uncertain switched nonlinear systems	918
Shi Li, Ronghao Wang	
Research and Implementation of Intelligent Recovery Technology for Fault Routing in Power Communication Networks Based on Deep Learning	924
Tai Zhang, Chuanwen Ding, Shaolei Chen, Xiaolei Zhang, Lin Guo	
Research on Day-ahead Marginal Electricity Price Prediction Based on WOA-LSTM	929
Pan Duan, Ben Zhang, Fengyi Liu, Xueyuan Liao	
Research on Transient Overvoltage of New Energy Collection System after Short-Circuit Fault Removal	934
Siqi Yu, Dawei Sun, Linlin Wu, Yunhong Li, Xiao Wang, Xiaoyang Deng	
An Ant Colony Genetic Algorithm for Fault Location and Monitoring of Power Transmission and Transformation System	938
Guangya Zhang	
Improved Yolov5S normative identification algorithm of power place operators	942
Jishen Peng, Wenkun Shi, Haiming He, Liye Song	
An Improved Adaptive Genetic Algorithm for Robot Path Planning	951
Yimin Xiao, Mingming Zhao	
Analysis Method of Fault Characteristics Considering Coupling Degree between Large-Scale Rectifier Load and Renewable Energy	955
Fei Kong, Jie Li, Deyang Chen, Shuyong Li, Jiang Yu, Xiaobing Ding	

Design of Control System for Rotating LED Display Based on Single Chip Microcomputer	960
Jieshi Luo, Liang Zhou, Hongyi Wu, Jinliang Luo	
Design of Civil Aircraft Lithium Battery Management System and Study of Common Failure Countermeasures	965
Jianfei Sun, Sainan Yang, Xu Zhang	
Fault Diagnosis of Parallel Grid Connected Inverters in Power Conversion System Based on the Neural Network	970
Li You, Manjia Liu, Liangli Xiong, Zhenyu Li, Yongming Ding, Zhuo Huang, Shunfan He	
Quantitative Evaluation of System Safety Assessment Considering EWIS Failures	975
Ma Biao, Xuan Hu	
Research on Virtual Power Plants Participating in Ancillary Service Market	979
Guohui Lan, Zitao Zhang, Minxing Guo, Li Lan, Ran Lyu, Su Wang	
FL-CNN-LSTM: Indoor Air Quality Prediction Using Fuzzy Logic and CNN-LSTM Model	986
Ruiming Bao, Yulong Zhou, Wenrong Jiang	
Research on Permanent Magnet Structure of Permanent Magnet Synchronous Motor for Electric Vehicle	990
Maowei Wang, Zhengxian Chen	
A Smooth Grid-connected Strategy for Photovoltaic-storage Virtual Synchronous Generator Based on Adaptive Model Predictive Control	994
Yiming Zhao, Linlin Wu, Xiaoyi Zhang, Xin Wen	
Analysis of Fault Characteristics of Rural Distribution System with High Proportion Distributed Photovoltaic	1003
Weichen Liang, Bo Liu, Yajuan Wang, Xuan Li	
Regional Energy Storage Configuration Analysis Based on Timing Simulation System	1008
Xianmiao Huang, Linlin Wu, Yu Gong, Yuan Ma, Kai Liang, Yiming Zhao	
A Fuzzy Adaptive PID System of DC Brush Motor for Snake Arm Robot	1012
Haotian Zeng, Junjie Yuan	
The design of optional two-part tariff for electricity transmission and distribution service based on the load factor	1018
Shaolin Zhu, Yaru Han, Di Ruan, Shiming Zhang	
Analysis of Typical Cases of Transformer Internal Faults	1022
Yanping Li, Jianjun Fang, Yaoyao Zhang, Yingjie Xu	
Research on fault diagnosis method of hydraulic end of fracturing pump based on improved clustering	1026
Jinfeng Huang, Liang Tan, Bo Ning, Wanli Wang	

Fault Diagnosis of Track Circuit Based on KELM Optimized by SSA Algorithm	1030
Yuefan Zhang, Yunshui Zheng	
Automatic chicken house control system based on STM32	1035
Dehao Zhao, Yueyang Li, Qing Chang, Yongqi Xian, Yanli Zhao, Chao Xiang	
Effect of simplified waveforms of pipe-to-soil potential fluctuation on pitting behavior of pipeline steel	1039
Xin Yu, Ruiyu Zhang, An Yuan, Gan Cui, Jianguo Liu, Xiao Xing, Zili Li	
A Method of Passive Localization Based on Unscented Kalman Filter	1043
Jirong Ma, Chenlu Duan, Shuaiwei Wang, Shunjun Yang	
Research on Short-Term and Medium-Term Power Load Forecasting Based on STL-LightGBM	1047
Zihao Fang, Jianjun Zhan, Jiaping Cao, Lu Gan, Haosen Wang	
Kinematics Simulation Analysis of Power Transmission System of Wind Power Plant	1052
Jinxia Zhou, Shanshan Tang, Haixia Niu, Wei Wei	
Path tracking control of agricultural tractor in paddy field based on disturbance rejection sliding mode	1060
Anzhe Wang, Xin Ji, Xinhua Wei, Shaocen Zhang	
Research on the Intelligent Dispatching, Storage Power Construction and Green Electricity Utilization of Xiong'an Regulating Engineering	1067
Fengtian Neng, Yadong Jin, Xiubo Tang, Tingting Wang	
Research on Power Grid Big Data Short-Term Feature Mining Method Based on Convolution Neural Network	1074
Xing Wen	
Ontology model of inspection record of low-voltage equipment in distribution Internet of things based on semantic segmentation	1079
Ting Yang, Pan Zhang, Shaotang Cai	
Research on auxiliary dialysis equipment control system based on intelligent control algorithm	1083
Zhaoming Liang	
Numerical analysis of water droplet impact on the curved surface of wind turbine blades	1088
Wenping Zhou, Dongyou Zhang, Maoli Yang	
Power trading mechanism of virtual power plant considering multiple entities cooperative participation	1092
Fang Li, Jingzhao Guo, Nan Li, Hongxia Li, Ji Zhou, Wenjing Tang	
Transformer Purchase Price Prediction Method Based on Long Short Term Memory Model with Complex Factor Input	1096
Xiaolong Chou, Bidan Liu, Hongliang Cao	

Power Terminal's Identity Authentication Method Based on Unclonable Fingerprint for Electric Vehicles to Smart Grid	1102
Haining Zhang, Yue Zhao, Shuang Hao, Guoqiang Zu, Shaoxiong Li, Jian Zhang	
Comparative Analysis of Mineral Insulated Cable Heating Schemes in Ultra-deep Heavy Oil Wells	1106
Hongwei Zhang, Jintong Hu, Chang Shu, Tiancheng Yang, Yiping Cao, Yang Yu	
Research on a wiring detection method of physical terminal blocks in converter station based on artificial intelligence	1110
Decheng Wang, Yan Li, Qun Zhang	
Research on Electricity Customer Behavior Prediction Based on Improved Time Convolutional Network	1116
Mingjie Zhang, Jian Gong	
Charging and Discharging Load Aggregation Operation Mode of Electric Vehicles Based on Smart Contract	1122
Junwei Han, Pu Guo, Ye Yang, Wen Wang, Shanshan Shang, Xiaofeng Peng, Wenjun Duan, Dunnan Liu	
Emission accounting model and source network load storage coordination technical study	1126
Xiang Li	
Application of Hyperchaotic Digital Circuits in Digital Supply Chain	1130
Yue Li, Zhiguang Zhang	
Research on the Technology of Building Heating System based on Complementary Electric and Heat Energy	1135
Qi Yu, Baiyue Song, Ce Zhou, Xiaobo Wang, Yufei Hu, Lirong Ma, Peng Liu	
Online Monitoring of Power Internet of Things Based on 3D Point Cloud Line Construction	1140
Jianing Shang, An Chang, Zhenzhen Zhou, Haohui Su, Meng Sun	
Improvement and application of MobileNetV3-small model in the field of smart grid	1144
Pengyong Yi, Weixi Gu, Kai Zhang, Hao Luo	
Optimization Configuration Method of Wind-Solar and Hydrogen Storage Capacity of 5G Base Station Based on Game Theory	1149
Jiahao Jing, Xiuchun Wu, Yue Huang	
The "N-1+1" Distribution Reconstruction Method Based on the Discrete Monkey Algorithm	1156
Kun Deng, Lin Zhang, Hao Yang, Bin Huang, Zhen Xiang	
Design of intelligent cooking machine based on stm32f407zgt6	1161
Jianbao Zhang, Shiping Bao, Bing Luo	
Simulation of the Stress Characteristics of Shared Towers for Power Transmission and 5G Communication	1167

Huan Huang, Yanhong Xiao, Bin Li, Lei Liu, Siwu Yu, Xianyin Mao, Chi Peng, Hao Du	
Research on robustness technology of power algorithm model in non confrontational scenarios under power grid business	1171
Xiangzhou Chen, Xiaoyan Li	
A federated learning-based method for class imbalanced power big data fusion	1177
Zhengxiong Mao, Chuanxu Yang, Rong Chang, Fu Bao, Yuan Tian, Hang Zhang	
Prospects for Decentralized Identity in the Energy Internet	1181
Hong Xie, Yi Luo, Jing Wang, Bin Qian, Yuming Zhao, Jianlin Tang	
Planning and Design of Autonomous Inspection of UAVs for UHV Dense Transmission Channels Based on 5G Technology	1190
Pingping Liu, Long Li, Shichao Ji, Song Wu, Daling Xu	
Simulation study on constant power variable pressure operation of ultra-supercritical steam turbine unit	1194
Lihua Ao, Xiaoliang Zhang, Xiaolei Zhang, Zhonghai Wan, Fuyuan Zhan, Yuejun Yang, Yongliu Shen, Wei Zou, Jian Zhou	
Research on Operation and Maintenance Cost Prediction Method of Power Grid Enterprises Based on Improving BP Neural Network	1199
Xiaoyong Yang, Fuyan Liu, Qi Ying, Xuebin Jiang	
Intelligent Lighting Management Platform Based on Micro-service Architecture	1203
Yiyang Liu, Xun Qiao, Cheng Zhang, Zhao Wang, Shaoguo Zhang	
Distributed Energy Computing Task Allocation Scheme Based on Blockchain and Edge Computing	1208
Chao Zhou, Zhongdong Wang, Fan Gao, Yu Zhou, Gaoying Cui, Zhuowen Mu	
Study on Intelligent Sensing Method of Transformer Non-Electrical Protection	1212
Xiangyu Lin, Xiaoming Wang, Liangyuan Chen, Boya Peng	
Predictive Control of Nonlinear LS-SVM Inverse System Based on MFAC Compensation	1216
Xiaofang Wang, Fang Su, Huan Zhang	
Load Library Construction and Self-learning Method Based on Cloud-Edge Collaboration	1221
Zhuojun Wang, Xingnan Jia, Yang Lu, Liang Chen, Zhewei Du, Qing Liu	
Research on Control Method of Substation Intelligent Inspection Robot	1226
Tiebin Guo, Fei Xiong, Ligang Quan, Wei Ding, Xiaozhuo Guan, Guangpu Wang	
Simulation Analysis of Temperature PID Controller Based on Iterative Algorithm	1230
Haobin Yuan, Yan Wang	
Design and Implementation of Animal Laboratory Environmental Monitoring System Based on Internet of Things	1235
Chao Wang, Hongli Liu	

Design of Redundant Robot Control System Based on TwinCAT3	1239
Chang Zhang, Junjie Yuan, Haodong Zeng, Jiangyu Jia, Dacong Zuo, Fengxiang Shen, Baoyuan Liu, Sitong Niu	
Forecasting of Ship Power Load based on EMD-GA-LSTM Algorithm	1244
Shuai Yu, Zhengqing Zhang, Jing Chen, Yunfan Wang	
Infrared Detection Technology Based on IoT and Intelligent Cloud Computing	1248
Chuan Cui	
Distance measurement technology of transmission line tree based on satellite remote sensing image	1252
Xiaoguang Qiao, Lanlan Liu, Wen Li, Yao Xiao, Wusheng Quan	
Research on Quadraped Robot Inspection System Based on Digital Twin Technology	1256
Wei Ding, Xiaofeng Zhu, Tiebin Guo, Xu Liu, Yuxin Zhang	
An Intelligent Processing Method for Power Supply Quality Control of Electricity Distribution Networks	1261
Yuhong Wu, An Wen, Muhammad Noman Hasan, Guohua Xu, Penghui Shang, Tao Ji	
Research and application of key technologies for intelligent operation of coal slurry water circulation system in coal preparation plan	1267
Lingyue Li	
Research and Application of Visual Operation and Maintenance Technology of Secondary Virtual Circuit in Smart Substation	1271
Zhicheng Zhao, Donghai Lu, Liang Wang, Chengwei Zhang, Hanjun Chen, Yangsen Li	
Blockchain and CES Based Optimal Pricing Decision for P2P Energy Transactions	1278
Yuqing Yang, Yang Shi	
Control strategy of distributed generations integration systems based on robust virtual synchronization	1283
Jiangdong Liu, Jian Zhu, Bojun Kong, Shengbo Wang, Le Wang, Yin Feng	
Research on the application of artificial intelligence technology in power metering condition monitoring	1287
Liang Zhang, Xiaoyan Yuan, Chunguang Yang, Hanxiang Jing	
Research and Application of Dynamic Intelligent Evaluation Method for Power Grid Material Quality	1294
Xiaoxiao Zhao, Yuxin Yun, Xi Wang, Aijing Li, Xin Lin	
Design and Simulation for High-pressure Solenoid Valve	1300
Yuanyuan Li, Guofei Du, Jian Zhao, Jianfeng Liu, Yingwei Wang	
Real-time classification of transmission line inspection images based on edge computing system	1306
Xiaobing Guo, Wu Yan, Jiaying Wang, Hongbo Sun, Junsong Guo, Zhongxian Qi	

Research on the construction of a tariff mechanism for microgrid trading based on cooperative game analysis	1312
Hao Chen, Zhaoyang Liu, Binbin Wang, Yan Liang, Yongli Wang, Wenhui Guo, Ziyue Yang	
Research on blockchain-based carbon emission early warning method	1317
Zhenhua Yan, Yongliang Li, Shengtao Li, Gao Bo, Ma Rui	
Discussion on the path planning method of China's electric energy alternative development oriented to carbon neutrality	1321
Jing Wang, Yuwei Wang, Peiguang Chen, Yong Wang	
Review on the Participation of Renewable Energy in Power Regulation Control	1329
Yun Zhao, Wei Wang, Xiaoning Liu, Yanbo Wang, Dawei Wang, Yajun Zou	
Author Index	