

2024 3rd Asia Power and Electrical Technology Conference (APET 2024)

Fuzhou, China
15-17 November 2024



IEEE Catalog Number: CFP24CS8-POD
ISBN: 979-8-3503-6770-6

**Copyright © 2024 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:	CFP24CS8-POD
ISBN (Print-On-Demand):	979-8-3503-6770-6
ISBN (Online):	979-8-3503-6769-0

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

2024 3rd Asia Power and Electrical Technology Conference

(APET 2024)

Table of Contents

Preface.....	xiii
Conference Committee	xiv

➤ High-voltage Transmission Lines and Fault Detection

Method for Identifying Customer Relationship Changes Based on U-Shapelets Algorithm and Spectral Clustering Algorithm	1
---	---

Shuo Guo, Yan Lu, Bicheng Chen, Qingyu Zhang, Jing Wang, Jincheng Dai

Research on Inrush Current Suppression Technology Based on Remanence Equivalent.....	7
--	---

Tianyang Xu, Zhibing Li, Sheng Yin, Yilin Miao, Debin Huang, Enyuan Dong, Yongxing Wang

Absorption Characteristics of SO ₂ F ₂ and SOF ₂ in Mid-infrared Spectroscopy and Prototype Engineering Application Practice	12
---	----

Deng Baojia, Zhang Shiling, Li Long, Yang Huaxia

A Deep Learning-Dominated Stacked Machine Learning and Deep Learning Method for Electricity Theft Detection	20
---	----

Wanhao Wang, Qinyu Huang, Lang Ling, Tiejun Ma, Zheng Wang, Tao Jin

A Novel Low Loss Superjunction Reverse Blocking IGBT with an Optimized Field-stop Layer and Carrier Storage Layer.....	25
--	----

Yun Xia, Gang Chen, Yuxi Wan, Wanjun Chen, Ruize Sun, Chao Liu, Yan Wang, Xiaoping Wang

➤ Intelligent Electrical Equipment Modeling and Functional Analysis

A Dual-loop Parallel Power Control Technology with Fast Response Characteristics.....	31
---	----

Zhi Huang, Xiaoting Zhu, Xuan Zhang, Kang Li, Ziliang Zhang

Modeling and Analysis of Coupled Dynamics of Relay Considering Collision Bouncing	36
---	----

Muyang Yuan, Jierong Zhuang, Zhihong Xu

Topology and Control Research of MMC Energy Storage System Based on Supercapacitors	41
---	----

Jiahao Hu, Shunfeng Yang, Bowen Wang, Jixuan Luo, Zegeye Belete Sewunet, Yunshan Wang

Research on Flexible Power On/Off Technology Based on ARM Platform.....	46
---	----

Xigong Zhang, Yiheng Su, Jiawen Lin

Unweighted Model-free Predictive Control of Three-level NPC Rectifiers Based on Sliding Mode Observer.....	50
--	----

Chuanxin Feng, Yunzhi Lin, Lang Ling, Tiejun Ma, Zheng Wang, Tao Jin

➤ Control and Protection of Hybrid AC/DC Transmission Systems

Research on Simulation of Ice-Covered Galloping and Suppression Methods for Medium-Voltage Overhead Transmission Lines with Long Span Distances 56

Qiang Li, Yushun Zhao, Zhihua Feng, Mingming Dai, Guoqing Wang, Yixian Dai

Investigation of Breakdown Characteristics of Transmission Lines Under Different Vegetation Fire Conditions 62

Nan Xiao, Shengwen Shu, Jun Xu, Chaoying Fang

Pollution Flashover Pre-warning Method Based on Beluga Whale Optimization Algorithm 68

Chaoying Fang, Yunchu Cheng, Jun Xu, Xiaojie Wang, Jiafeng Lin, Wei Gong

A Wildfire Risk Assessment Based on Data Fusion and Hierarchical Analysis-entropy Weight Method 74

Shijie Tang, Shengwen Shu, Nan Xiao, Jun Xu

A MEMS Based Three Electrodes Ionization Sensor for Real-Time Detection of Transient Overvoltage in UHV Transmission Systems..... 79

Muhammad Waqas, Yong Zhang, Saif Aldeen Saad Alkadim, Yuqi Peng, Liu Changrui, Tianrui Ma, Chunqi Wang, Jia Xuefei

Effect of Hydrophobic Coating on the Flow-Rust Flashover Characteristics of Weathering Steel Transmission Line Insulators 85

Wenxue Zhang, Hao Zhang, Qiang Li, Yifang Wu, Jiajun Huang, Yushun Zhao

An Asymmetric Fault Distance Protection Method for Inverter-interfaced Renewable Energy Transmission Lines 90

Hongyue Ma, Zhiling Chen, Xinyu Fu, Tao Zhang, Tao Zheng

➤ Advanced Key Theory and Technology for DC Breaking

Sensorless Position Detection Strategy for Free-Piston Stirling Generators 95

Hongwei Gao, Chi Zhang, Tianyou Pei, Shuheng Qiu, Jinhua Chen, Zhe Jiang

Research on a Hybrid DC Circuit Breaker with Multi-stage Capacitor Commutation..... 100

Mingfei Wang, Peng Wang, Ziyue Yang, Tianpei Shan, Weiqi Li, Jun Wang, Yunhui Zhang, Yifì Wu

Surface Charge Accumulation Characteristics of HVDC GIL Insulator with the Different Horizontal Inclination Angles..... 105

Ruijian Lu, Jun Zou

Multivariate Regression Analysis and Rapid Prediction Formula Fitting for Three-Dimensional Total Electric Field Near Buildings Adjacent to UHVDC Transmission Lines 113

Tahan Wang, Li Xie, Kun He, Jiayu Lu

Stability Analysis of Remote Voltage Control for DC Converters with Long-cable 119

Xuan Zhang, Ziliang Zhang, Kang Li, Tian Zhao, Ze Zheng, Ye Wang

Hybrid DC Circuit Breaker Based on Liquid Metal Current Limiter 124

Jianning Yin, Jingjing Huang, Xiaojian Lang, Yaobo Guo

➤ Numerical Simulation of Partial Discharge, Online Insulation Monitoring and Fault Diagnosis for Electrical Equipment

A Fault Diagnosis Method for High-Voltage Cables Based on Envelope Analysis and SEL2-MobileNetV2 Model .. 129

Zhenzhen Xie, Yiting Zheng, Liwei Wu, Chenhao Huang, Hongcheng Nie, Caihong Guo

Investigation on the Evolution Mechanism and Faulty Characteristics Parameters of Breakdown Fault for Cable Terminal Tail Pipe.....	135
Yun Chen, Shuai Hou, Bingjie Huang, Jieru Zhang, Yanli Xin, Pengyu Wang	
Electricity Theft Detection Based on Multi-Scale Feature Fusion Parallel Convolution Model.....	140
Yu-Long Shen, Qinyu Huang, Tao Jin	
Simulation and Experimental Study on Temperature of 72.5kV 4000A GIS Isolation Switch for Offshore Wind Power	145
Shichao Xie, Kunpeng Huang, Haojie Dong, Jianwei Wei, Ping Zhao, Long Liu, Xiangyuan Li	
Mining Method for Defect Texts in Substation Equipment Combining FP-Growth with Association Rules.....	152
Weiqing Lin, Yanzhen Lu, Chuiding Zheng, Rui Zhao, Hao Jiang, Xiren Miao	
Simulation Analysis on Improving the Safe Current Carrying Capacity of Submarine Cable Landing Section.....	158
Hong Chen, Changming Cai, Xinya Fu, Yuanxiang Zhou, Weiwei Lv	
Research on Ablation Characteristics of Power Cable Buffer Layer.....	164
Fang Wu, Bing Liu, Yujia Li	
Electromagnetic Time Reversal Fault Location Based on Double-Ended Time-Domain Approach	170
Yuanbo Ye, Jiwen Wang, He Wang, Jianfeng Zhang	
Short Circuit Fault Localization Method Based on Improved OLS-RBF Neural Network Algorithm for AC Microgrids	175
Yibiao Huang, Longyang Zhu, Yifan Wang, Hang Cheng, Yunting Shao, Xin Zheng	
➤ Converter Structure Optimization and Functional Experiments	
A Light-Load Optimization Method for CLLC Resonant Converters Based on Asymmetric PWM Control Strategy	181
Yichen Wang, Bao Zhang, Yanze Wu, Jiachen Tian, Feng Wang	
LC resonant bidirectional DC-DC Converter with Fixed Frequency for House Storage Inverter.....	187
Tianyu Lv, Yisheng Yuan, Jiayi Liu	
Transient Stability Analysis of Grid-Forming Converter Based on the Active Power Control	193
Yiran Li, Dongwei Sun, Huaiyuan Wang	
A Novel Bidirectional Multi-Level Hybrid Modulation LCL-T Resonant Converter	198
Zhongyi Zhang, Shiying Yuan, Dongsheng Lai, Tao Jin	
Anomaly Detection for Dissolved Gases in Power Transformers Using Temporal Cluster Segmentation with Neural Prophet.....	204
Weiqing Lin, Yanzhen Lu, Rui Zhao, Chuiding Zheng, Hao Jiang, Xiren Miao	
Influence of Nanoparticles on the Diffusion Behavior of Furfural in Transformer Oil-Paper Insulation.....	209
Hao Zhang, Juntao Guo, Jue Zhang, Hexing Li, Gang Yin, Chao Tang	
Control Strategy Study and Simulation of MMC-based Modular Multilevel DC Solid-state Transformer	214
Chang Qiu, Lang Ling, Tiejun Ma, Zheng Wang, Chengxin Li, Tao Jin	
Novel Converter Transformer Topology for Line Commutated Converter based HVDC	220
Yu Wang, Xiaolin Shen, Yiming Ji, Shangan Du, Fangjie Wu, Ming Li	
Two-Capacitor EMI Characteristic Model for a Center-Tapped Transformer.....	226
Bingqin Lai, Jiqing Dong, Fangyan Wan, Weijun Yang	

A Transformer Encoder Model for Power System Reliability Evaluation.....	233
Yi Tang, Lian Geng, Tao Wu	
➤ Modular Control Model and Performance Optimization of Electrical Equipment	
Active Disturbance Rejection Control for Solid Active Magnetic Bearing System Considering Eddy Current Effect	239
Zhilei Xu, Aiwen Qu, Chunmin Yu, Longqiang Yi	
Statistical Machine Learning for Parameter Identification in Electrical Equipment Dielectric Models: Methodology and Experimental Validation.....	243
Jiangfeng Hu, Shengwei Cai, Si Ying, Guotai Yang, Dewen Zhang, Limin Qu, Peng Zhang, Xida Chen	
Design of Contactor Intelligent Control Module with DAC Output Function	250
Lujie Ouyang, Jierong Zhuang, Zhihong Xu	
Voltage Fluctuation Suppression Strategy for Electric Spring Based on Sliding Mode Control	254
Yong Chen, Jianbiao Li, Jianfu Chen, Ruixiong Yang, Hongyuan Wu, Zhen Mei	
Research on Motion Characteristics of AC Breaking Arc under Different Contact Reed Circuits.....	259
Peng Zhang, Yong Peng, Linliang Zhang, Jianyi Chen, Xubin Zheng, Xiangjun Liu	
Design of Circuit Breaker Breaking Synthesis Test Scheme Based on Energy Storage Test Power Supply.....	265
Hao Yang Li, Zhao Yang Pan, Zheng Niu, Guang Wei Liu, Zhen Hao, De Liang Cheng	
A Novel Sepic-Based High Gain DC-DC Converter Intergrating Coupled Inductor and Voltage Multiplier Cell.....	273
Jiaqi Lin, Xiaofeng Zhou, Wei Jiang, Sheng Zhou, Shunong Cai, Tao Jin	
➤ Sensor-based Power Electronic System Control and Optimal Scheduling	
On-site Calibration Method of Online Partial Discharge Sensors Based on Comprehensive Calibration Device	279
Huan Li, Zheng Niu, Deliang Cheng, Ting Mao, Chenguang Ai, Xin Qian, Fenghai Li, Dongmin Li	
An Optimized Scheduling Strategy for Electric Vehicle Charging and Discharging Considering Traffic Network Information	283
Huaming Chen, Yinggao Chen, Lang Ling, Tiejun Ma, Zheng Wang, Tao Jin	
Research on Magnetic Field Enhanced Microampere Insulator Leakage Current Sensor.....	289
Lanruo Wang, Qizhe Zhang, Rui Song, Chen Wang	
Research on Current-Following Power Factor Control Strategy Considering the Difference between Charge and Discharge	295
Longhai Li, Jierong Zhuang, Zhihong Xu	
Research on Gas Decomposition Characteristics of New Environmental Protection C5F10O and Its Engineering Application	299
Zhang Shiling, Deng Baojia, Li Long, Dai Liangjun	
Thermal Cross-coupling Effect Anaysis of Compliant Press-pack IGBT Submodule	306
Yang Xu, Jinggang Yang, Tianxi Xie, He Zhao, Yang Chen	
Application of SF6 Decomposed Gas Harmonic Data Analysis and HF Wavelength Absorption Experiment.....	311
Dai Liangjun, Zhang Shiling, Deng Baojia, Li Long	

➤ Modern Power Electronics and Power Transmission Technology

Study on GIS Digital Twin Modeling Method and Software Platform Development for Helping Operation and Maintenance.....	318
--	-----

Wei Wu, Tianbing Dong, Wenhong Chen, Qining Chen, Dongsheng Wen, Xianchao Zhang

Supervision Practice of 500kV Three phase Integrated Main Transformer Equipment for New Energy.....	322
---	-----

Zikun Cheng, Pingguo Zou, Xin Zhang, Xin Wang

Research of the Selection of the Insulation Gap Distance and the Contaminated External Insulation for the 220 kV Substation at the Altitude of 5300 Meters	328
--	-----

Wang Zhenhua, Gao Tengfei, Zhang Ruiqian, Ma Xiaoxu, Ding Yujian

Power Angle Prediction with Embedded Physics Knowledge Network.....	333
---	-----

Wenjin Jiang, Xianan Huang, Wei Lin, Xiaodong Yang, Mingfu Chen, Lingzhe Zhang

Complex Coefficient Droop Control with High Bandwidth Inner Voltage Loop	338
--	-----

Jinian Pang, Jian Du, Zhenghe Yang, Rui Xia, Sha Chen, Yu Ji

Modeling and Simulation of Modular Multilevel Converter.....	343
--	-----

Lingxiang Chen, Lang Ling, Tiejun Ma, Zheng Wang, Chengxin Li, Tao Jin

➤ Inverter Design Principles and Control

Kalman Filtering Based Quadratic Linear Extended State Observer for Model-Free Predictive Control of Three-Phase Grid-Connected Inverter.....	349
---	-----

Shuyi Fang, Chang Su, Tiantian Jiang, Dongxiao Huang, Xinhong Yu, Fengxiang Wang

Design for High Efficiency High Density Flying Capacitor Multilevel Inverter	355
--	-----

Chengyu Huang, Jiqing Dong, Zhenhai Zhu, Xinkle Wu

Improved Fault Ride-Through Control Strategy for Grid-forming Inverters to Enhance Adaptability of Distance Protection.....	361
---	-----

Ming Bu, Jianfeng Zhang, Hao Zhou, Tao Zheng

An Improved Sequential FCS-MPC for Four-Level Nested Neutral-Point Clamped (NNPC) Inverters	367
---	-----

Yihan Wang, Lang Ling, Tiejun Ma, Zheng Wang, Yin Chen, Tao Jin

A Model Free Data-driven Q-learning Algorithm with Its Application to Single-phase UPS Inverters.....	373
---	-----

Qingtong Xu, Weijie Sun, Kaijing Yuan, Jiayang Chen, Xunde Dong

An Optimized Control Method for a Single-Phase Flyback Photovoltaic Grid-Connected Micro-Inverter.....	379
--	-----

Qingyi Zhu, Wenxiang Song

➤ Load Control and Stability Assessment of Power System

An Evaluation Method of Power System Recovery Capacity Considering the Probability of Extreme Disaster Failure	385
--	-----

Yujie Han, Hongtao Wang

Transient Stability Assessment of Power System Based on Time-Adaptive RetNet	391
--	-----

Lingzhe Zhang, Zewen Xiao, Huaiyuan Wang

Lightweight Quantum-Key-Enhanced Security Scheme for Power Load Control Systems.....	397
--	-----

Wei Liu, Hai Wang, Gang Sun, Yong Zuo, Yong Wang, Chaoliang Wang

Modernization of the Speed Regulator: Benefits for Efficiency and Stability in Electrical Generation-electroperú S.A.	403
<i>Franco Julinho Payano Hinostroza, Gabriel Osiris Cairampoma Rodriguez</i>	
Data-Driven Approach for Power System Stability Assessment Incorporating Instability Pattern Information	409
<i>Yongbin Li, Jian Li, Guoqiang Lu, Shunxin Ren, Huaiyuan Wang</i>	
Transient Overvoltage Quantitative Analysis Based on Short-circui Ratio of New Energy Generation Stations	415
<i>Yuhan Wu, Yajie Li</i>	
A Novel Evaluation Method for Statistical Index System of New Power Systems Based on Multi-Expert Evidential Reasoning	422
<i>Chao Xun, Xiangyu Wu, Yuyou Weng, Handi Weng, Jinying Wu, Xun Xu, Shupeng Zhang, Changxu Jiang</i>	
Research on Efficient Load Control Authentication Technology for New Power System Based on ECC Fusion Quantum Key.....	430
<i>Wei Liu, Hai Wang, Gang Sun, Yong Zuo, Yong Wang, Chaoliang Wang</i>	
➤ Advances in Eco-Friendly Electrical Materials and Its Application in High Voltage Power Equipment	
Temperature Characteristic of High-field Conductivity Threshold Electric Field of Insulating Materials for Standard Devices	436
<i>Dongxing Yang, Yushun Zhao, Dengyun Li, Yin Gao, Ran Gao, Hao Shen</i>	
A Multi-Level LSTM-DAE for the Data Recovery of the Generators	440
<i>Yongbin Li, Jian Li, Guoqiang Lu, Huaiyuan Wang, Shiping Zhang</i>	
Study on the Conductivity Mechanism of Insulating Materials for DC Ultra-high Voltage Standard Devices at High Field Strengths.....	445
<i>Yin Gao, Ran Gao, Chao Wang, Zheng Chen, Dengyun Li, Kai Zhu</i>	
Measurement of Magnetostrictive Characteristics of Contactors' Core Silicon Steel Sheet	449
<i>Yanxia Zhong, Jierong Zhuang, Zhihong Xu</i>	
Design and Optimization of a Novel Full-P Encapsulated 4H-SiC Trench MOSFET with Extremely Compact Cell Pitch.....	453
<i>Jun Yuan, Zhijie Cheng, Fei Guo, Kuan Wang, Wei Chen, Yangyang Wu, Guoqing Xin, Zhiqiang Wang</i>	
Analysis and Research on Core Losses Model under PWM Waveform Voltage Excitation with DC Bias.....	457
<i>Haowei Yao, Jinghui Wang, Wei Chen</i>	
Design and Performance Analysis of Fe-based Nanocrystalline Materials for Underwater Wireless Power Transfer Systems	463
<i>Han Xu, Rong Zheng, Wei Ning</i>	
Droplet-Induced Discharge Characteristics of Porcelain Insulators under Sea Fog Environment	469
<i>Lina Zhang, Shengwen Shu, Jun Xu, Chaoying Fang</i>	
Research of Electric Characteristics with Plate-plate Electrode in Dielectric Barrier Discharge.....	474
<i>Ming Sun, Shuyan Wang, Shuzhou Huang</i>	
➤ Advanced Control and Optimal Management of Cyber-Physical Smart Grids	
A Unified Planning Model for Microgrids Considering Typical Scenarios and Operational Simulations	479
<i>Mengmeng Su, Jun Peng, Yong Zhang, Min Li, Zhenwei Li, Mingfei Ban</i>	

Knowledge Distillation Based Dueling DQN for Real-time Power Grid Dispatching Operation and Control.....	485
<i>Xiaopeng Wang, Na Lu, Yunpeng Song</i>	
Research on Carbon Emission Accounting of Power Grid Projects Based on Multi-voltage Level.....	491
<i>Fengnan Chen, Xiaofeng Wang, Xiaofa Zhou, Qian Hong</i>	
Coordination Control of Smart Electrolyzer and Grid Based on Current-Source Rectifier under LVRT.....	498
<i>Zhuoqun Wu</i>	
Automatic Adjustment of Power Grid Typical Operating Modes Based on Multi-section Control Method.....	503
<i>Jiecong Wang, Guangming Lu, Zhihong Yu, Bing Wang</i>	
Three Phase PWM Grid Voltage Estimation Rectifier Control with LCL Filter without AC Voltage Sensor	509
<i>Baichuan Ye, Lang Ling, Tiejun Ma, Zheng Wang, Chengxin Li, Tao Jin</i>	
Research on Voltage Stability Margin Control Strategy for Large Power Grids: A Deep Reinforcement Learning Approach	515
<i>Tao Li, Xue Gong, Yunfei Hong, Gang Bai, Yi Shi, Yiqiang Jiang, Tong Chen, Jingnan Huang</i>	
➤ Operation and Planning of Energy Storage in Active Distribution Networks	
Analysis of Distribution Network Voltage Optimization with Photovoltaic and Energy Storage	521
<i>Fan Xu, Wei Lou, Yijun Jiang, Licheng Sun, Yaxi Jin, Baoshuang Guo, Xianen Zong, Yue Yang</i>	
Active Distribution Network Energy Storage Planning Model for Reliability Requirements.....	526
<i>Yaqi Sun, Wenchuan Wu, Haotian Zhao, Yujie Sheng</i>	
Operation Strategy for Active Distribution Network with Energy Storage considering Internet Data Center	531
<i>Chunpu Cao, Yalu Sun, Kun Ding, Minghua Jiang</i>	
Hierarchical Coordinated Energy Management Considering Price-based Demand Response for Coupled Transmission and Distribution Systems.....	537
<i>Huiting Yang, Hongtao Wang</i>	
Research on True Type Test Technology for Singlephase Grounding Fault Detection in Distribution Power Networks	543
<i>Zhenyu Zhang, Zhiping Cai, Xiang Luo, Dong Lin, Jueying Wang, Ziyi Guo</i>	
Research on Optimal Power Flow Algorithm of Reactive Voltage in Distribution Network Based on Improved PSO	550
<i>Kuanhong Li, Siyang Cao, Zhongbo Xiao, Dehuai Li, Yicen Wang</i>	
Safety-Centric Analysis of Grounding Systems for Substations in Distribution Grids	555
<i>Fazel Mohammadi, Mahmood Mirhashemi</i>	
Differential Protection Strategy for Active Distribution Network Based on improved Dynamic Time Warping Algorithm	560
<i>Hao Zhou, Ming Bu, Jianfeng Zhang</i>	
Diagnosis Method for Causes of Low Voltage in Distribution Network Considering Meteorological Factors.....	566
<i>Yun Xie, Jian Wang, Yanhui Zhang, Haoxiang Lv, Zhenjia Li, Shengwen Shu</i>	
Day-ahead to Intraday Low Carbon Economy Dispatch of Distribution Grids Accounting for Stepped Carbon Trading	572
<i>Zhensong Zeng, Yu Shen, Dingfei Que</i>	

➤ Smart Grid Operation and Optimization Management

Frequency Constrained Power Dispatch and Its Application in Yunnan Grid	578
<i>Yukang Shen, Zhaoxin Wen, Shitao Dong, Chenhui Lin, Wenchuan Wu, Bin Wang</i>	
Bi-Level Stackelberg Game Trading Strategy for Supply and Demand in Multi-energy Markets	583
<i>Juan Zuo, Xinhong Wu, Tao Chen, Wenbo Wang, Chongxin Xu, Shengkui Ma</i>	
Electricity Price Prediction in Electricity Markets Using an ATT-CNN-LSTM Model Based on the Sparrow Search Algorithm	589
<i>Hongcheng Zhao, Jiapeng Liu, Yang Lu, Jin Tao, Yixiang Li, Wanxi Chen, Yingjie Yan, Yuzhen Wang</i>	
Low-Carbon Evolution and Development Path of New Power System	595
<i>Dongliang Zhang, Peng Wang, Xiang Wang, Ying Mu, Yuqi Jia, Wanlei Xue, Chenhui Li, Dashun Guan</i>	
The Development of Electrochemical Energy Storage and Its Application to Local Industries.....	600
<i>Yuze Li, Shuhuan Mao, Peng Tao, Dongru Li, Shize Dai</i>	
Distributed Power Market Clearing Model based on ADMM for Virtual Power Plant composed of Energy Storage	608
<i>Zihao Zhao, Zhongkai Yi, Ying Xu, Wenmeng Zhao, Tian Mao, Tao Wang</i>	

Low Carbon Economic Dispatch of Cogeneration Considering Carbon Capture	614
<i>Yajie Xu, Xiaozhu Liu, Han Wang, Changjun Xie, Banghua Du, Zhewei Wang</i>	
Auxiliary Calculation Model and Software Development for Power Production Project Cost.....	620
<i>Liping Zhang, Li Li, Xin He, Qingdan Huang, Minzhou Li, Xiaoyang Liu, Zhaolong Jing, Zhixiang Li</i>	

➤ New Motor Design and Intelligent Control

An Evaluation System for Improving the Stability of the Receiving End System by Adding Condenser Function to Thermal Power Units.....	626
<i>Mingyang Liu, Ze Gao, Chongchong Li, Xueqing Pan, Hua Wang, Guanyu Zhang, Yuanyang Ma</i>	
Multi-Port Converter Design Solution for LNG Cold Power Generation	632
<i>Yu Qi, Pengliang Zuo, Dongxu Wang, Zheng Cai, Yingjun Guo</i>	
Inertia Estimation and Frequency Response for Power Systems Integrated with VSG-based Wind Turbines.....	636
<i>Dangsheng Zhou, Siying Xu, Yu Zhang, Seiki Igarashi, Jun Li, Xu Cai</i>	
Deadbeat Predictive Current Control of PMSM Based on High-Order ESO	641
<i>Zheng Yidong, Deng Zhiqian</i>	
Research on the Control Strategy of Virtual Synchronous Generator with Improved Damping	646
<i>Chen Li, Huaiyuan Wang</i>	
PMSM Current Decoupling Control Based on Modified ADRC	650
<i>Meng Wanyu, Liu Weifeng, Wang Huizhen</i>	
Analytical Magnetic Field Calculation of Outer Rotor Flux-concentrating PMVM Based on Equivalent Magnetic Circuit Model.....	656
<i>Bo Wu, Mingzhong Qiao, Yihui Xia, Kangning Wang</i>	
Optimal Dispatch of Multi-energy Power System Based on Uncertainty of Thermal Power Unit	662
<i>Wei Hu, Ning Mi, Hailiang Zhong, Dan Li, Kun Ma, Tianxiang Geng, Yun Wang, Bo Su</i>	
Influence of PM Flux-focusing on Torque Density in Dual-Armature Doubly Salient PM Machines.....	670
<i>Guangqiang Ming, Shihao Ma, Xiaochen Xu, Yicheng Wang</i>	

Virtual Three-level Model Predictive Flux Control with Low Computational Burden for Induction Motors.....	676
---	-----

Huahan Wu, Yuzhen Xu, Lang Ling, Tiejun Ma, Chengxin Li, Tao Jin

➤ Digital Power System and Energy Management

Optimal Configuration and Capacity Price Formulation of Energy Storage Considering Conditional Value-at-Risk	682
--	-----

Minda Liu, Jiajun Wei, Yuan Qin

A Novel Method for Complex Power Quality Disturbance Classification Based on Singular Value Decomposition and One-Dimensional Residual Network.....	688
---	-----

Huangbin Chen, Qinyu Huang, Tao Jin

Distributed Power Source Planning Based on Improved Particle Swarm Optimization	694
---	-----

Jiahui Wang, Zhili Tan

Analysis and Improvement Method of over Current Direction Element in Doubly-Fed Wind Farm.....	701
--	-----

Xueyan Guo, Ye Liu, Weiguo Yu, Zhihui Xing, Haoye Zheng, Yuwen Liang, Yuguang Yuan, Qingyuan Xu

Power System Restoration Strategy Considering the Wind Farm with Hydrogen Storage	708
---	-----

Youwang Wei, Weikang Fang, Lei Sun

Two-Stage Active Power Control of Wind Power under the Background of the Energy Internet.....	714
---	-----

Mengyao Zhang, Ling Xu, Jianhui Ni, Jiaming Cai, Bo Liu

Design of a New Power System Configuration Management Center Based on Dynamic Publishing and Global Collaboration	720
---	-----

Yuheng Ding, Yuan Gao, Xingliang Chen, Yuhao Tang, Jin Wu

➤ Artificial Intelligence Technology for Power Control Systems

An Overview of Ancillary Services Provided by Vehicle-to-Grid Systems	726
---	-----

Fazel Mohammadi, Mahmood Mirhashemi

Defect Detection and Localization Method for Porcelain Insulators Based on Ultrasonic Guided Waves	730
--	-----

Bingyan Jin, Shengwen Shu, Weiming Chen, Lingfei Li

Classification Method of Cable Defect Types Based on Broadband Impedance Spectrum and Bi-LSTM	736
---	-----

Fanyi Cai, Baijie Zhou, Zhien Zhu, Jian Xue, Longxiao Chen, Chuanbo Wang, Haining Tang

Research on Substation Alarm Intelligent Handling Strategy Based on Image Recognition and NLP	741
---	-----

Xiaomeng Li, Hualiang Zhou, Zhantao Su, Yifeng Wang, Jing Wang, Han Sun, Yuxin Chen, Lu Lu

Construction of Knowledge Graph of Substation Main Equipment Based on LLM	746
---	-----

Xiaomeng Li, Jingrong Zheng, Zhantao Su, Yuxin Chen, Yifeng Wang, Chen Chen, Yueling Zhao, Kun Wang

➤ Power Grid Operation and Electricity Market

Low-carbon Economic Dispatch of Virtual Power Plant with Diversified Utilization of Hydrogen Energy under Green Certificate and Carbon Trading	751
--	-----

Yinggao Chen, Mingfa Yang, Lang Ling, Zheng Wang, Chengxin Li, Tao Jin

Low Carbon Economic Dispatch for Integrated Energy Systems with CCUS Power Plant.....	757
---	-----

Yongkang Wang, Jun Yi, Weifang Lin, Xiaoyu Ren

Optimal Operation of Virtual Power Plant with RSOC under Low Carbon Target	763
--	-----

Qiujie Wang, Zihao Leng, Ziran Xu, Guoan Liu, Jiaxun Chen, Guanhui Liu

An Innovative Electricity Price Forecasting Approach Using LightGBM Optimized by Tree-structured Parzen Estimator.....	768
<i>Xin Huang, Yuzhen Xu, Lang Ling, Tiejun Ma, Zheng Wang, Tao Jin</i>	
Generalized Reclosing Time Sequence Optimization Scheme Based on Deep Q-Network in N-x Scenarios	774
<i>Yi Zhu, Zhenxing Li, Qiujie Wang, Yangze Wang, Cong Hu, Hong Tan, Hanli Weng</i>	
➤ Advanced Battery Design and Capacity Optimization	
Capacity Optimization of Grid-Connected PV_Fuel Cell Based Energy Systems with Different Optimization Algorithms	780
<i>Wen-Chang Tsai</i>	
Optimization of an Integrated Energy System with Reversible Solid Oxide Cell Based on Shapley's Value Method	786
<i>Ruhuan Li, Jun Zhou, Zitong Qiu, Chengze Ji</i>	
Coordination Control Architectures for Solar-Wind-Battery-Hydrogen System.....	792
<i>Zhuoqun Wu</i>	
Improvement of Online Electrochemical Impedance Spectroscopy for PEM Fuel Cells based on DC/DC Converters	797
<i>Yaxu Sun, Hanqing Wang, Ruihua Li, Bo Hu, Jian Fang, Yawen Lei</i>	
Hierarchical Efficiency Optimization Strategy based on Wavelet and Fuzzy Control for Aircraft Hydrogen Fuel Cell Hybrid APU	803
<i>Xiaoyin Lu, Shiwei Ma, Jianghua Xie</i>	
➤ Author Index	