

2023 4th International Conference on Smart Grid and Energy Engineering (SGEE 2023)

**Zhengzhou, China
24-26 November 2023**



**IEEE Catalog Number: CFP23UN6-POD
ISBN: 979-8-3503-5962-6**

**Copyright © 2023 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:	CFP23UN6-POD
ISBN (Print-On-Demand):	979-8-3503-5962-6
ISBN (Online):	979-8-3503-5961-9

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

Capability Modeling and Optimal Decision Making for Primary Frequency Modulation Based on Data-driven	1
Shuai Di	
Construction of a Multi-dimensional Resilience Assessment System for Urban Distribution Network Based on Association Rules	5
Yu Bai, Yunfei Wang, Yanru Liu, Yudi Ding, Ruizhang Wang, Ang Zhao	
Intelligent Operation and Maintenance Direction of the DC System	9
Xiang Ju, Han Chu, Jinlin Wei, Junjie Lan	
Distribution Network Fault Work Order Prediction Based on DSAE-LSTNet	13
Xiaomin Li, Ming Sun, Yu Li, Yuanyuan Wang	
Power quality monitoring and management system based on intelligent fusion terminal	18
Dedao Wang, Xiangfu Guo, Bo Zhang, Shuming Liu, Xiaohang Li, Zihao Jia	
Peak Valley Coupling Coordination Planning of Distributed Load in Medium Voltage Distribution Network under Multi-Demand Response	22
Min Li, Tianlu Luo, Yigang Tao, Xiaohong Tan, Rongyao Li	
Estimation of the Weakening of Power Grid Inertia Caused by Incorporating Wind Farms in Normal Operation	27
Yan Yao, Xuntian Zhou, Zhigang Zhang, Xuanjun Chen, Yanhua He, Shichun Li	
Discussion on the Solution of Power Network Equations	33
Tao Yi	
A Fault Diagnosis Model Based on Attention Convolution Network	37
Wenhui Ding	
Flexible Control Method of an Energy Storage Partition Connected to a New Energy Grid Based on Load Characteristics	41
Xiaowu Peng, Jian Chen	
Multi-group adaptive optimization method for coordinated scheduling of source-network-load-storage considering demand side response	45
Yuanping Guo, Xingyan Liu, Jia Yin, Yan Zhang, Guang Liu	
A Reputation Based Network Security Isolation Method for Power Systems	49
Yingqi Huang, Man Li, Yang Cao, Xiangbei Che, Shiqin Zeng, Siliang Suo	
Optimization Model of Day-ahead-day-in Coordinated Scheduling Considering Two-sided Stochastic Behavior of Source and Load	54
Ning Mi, Ning Qiao, Qiang Li, Chao Zhang, Guolong Yi	
Spatial-temporal correlation analysis of mountain wind speed information in western Sichuan plateau based on improved K-medoids clustering method	58
Zhehui Dang	
Resource Optimization Allocation Method of Power Grid Digital Transformation Based on Cloud Edge Collaboration	62
Longmei Li, Jun Niu, Xiaotong Yang	
Active Power Adaptive Improvement Strategy and Transient Stability Analysis Based on Virtual Synchronous Generator System	66
Yadong Liu, Xinli Song, Hanyang Dai	

Power Distribution Safety Assessment Based on the Digital Twin	71
Lina Sun, Ying Shang, Zhijiang Ma, Haishan Zhou, He Cui	
Model-and-Data-driven Dispatch Considering Expert Knowledge for Active Distribution Grids	75
Jie Ren, Fuping Rao	
Online Optimal Dual Harmonic Injection Strategy for MMC-SESS under Wind Power Fluctuations	80
Lerong Fu, Jin'an Wang, Jianzhong Xu, Yiliang Xu, Yan Xiong, Liu Yang	
Low carbon optimization method of transport network and power grid coupling network for dual carbon target	86
Di Wu, Zhen Liu, Hua Bai, Wangying Kong, Yilin Qiao	
Construction and application of knowledge graph for intelligent decision-making of power grid fault handling	92
Junbo Pi, Shixiong Qi, Qifei He, Pengcheng Song, Xi Shen, Xiang Ma, Jiandong Wo, Yue Zhang, Tao Jiang, Zhengbang Jiang	
Node-Aware Adaptive Data Processing Method Based on Att-BiGRU-RNN	98
Qiao Sun, Fang Xu, Chao Chai, Ke Liu	
A Whole Process Budget Calculation Algorithm for Power Equipment Renovation Projects Considering Importance Deviation	102
Guo Li, Pinlei Li, Jinsheng Chen, Pan Zhang, Xiaowen Zhu, Yongshu Chen, Guokun Xiong	
Multi-Region Game-Optimized Scheduling of Small Modular Reactors Involved in Energy Supply in Multiple Scenarios	107
Sicheng Wu, Yongfei Guo, Tao Li, Tao Zhang	
Identification of weak links in urban distribution networks based on probabilistic currents	118
Lixiao Liu, Yusheng Li, Xiaopeng Lv, Chenjun Zhao, Aidong Bai	
An Aggregation Method for Massive Load Side Resources Participating in the Electricity Spot Market	125
Qiuna Cai, Guobing Wu, En Lu, Kai Dong, Yue Zhao, Qiaoyu Zhang, Xingxing Wanyan, Jun Yang	
Fast Self-Recovering of Complex Distribution Network Fault Based On Real-Time Network Topology Identification	134
Yajun Zhu, Chenghong Tang, Hai Wu, Lulu Chen	
Rotor Unbalance Fault Diagnosis Based on Wavelet Kernel Network	138
Qian Wang, Shuo Hu, Qian Yang, Peng Zhang, Xuanju Ma, Kangshuang Sun	
A T-type VSG Based on Model Predictive Control Without Weighting Coefficient	143
Xiaoliang Yang, Yihao Li, Rui Wang, Nan Jin, Yuyue Cui, Zhiang Fu	
Intelligent Control Method of Grid-Forming Inverter with Impedance Matching	148
Zhuan Zhou, Xingang Wang, Zhiyong Yu, Jiayu Bian, Jin Yu, Kun Wang	
Neural Network PID Control of Water Level in Nuclear Power Plant Regulator	152
Xin Chen, Junjie Peng	
Optimal Clustering Planning Strategy of Active Distribution Network Considering Self Balancing Capacity	158
Liang Ma, Qingxi Li, Shigong Jiang, Yi Song, Yi Sun, Donglei Sun	

An Open-circuit Fault Localization Method of a Cascaded H-Bridge Converter Based on The Capacitor Voltage and The Grid Current	164
Yong Liu, Zhe Guo, Kang Wang, Shisheng Zhao, Yongsheng Zhu, Fuqiang Ren	
Distribution Network Reconstruction Using an Improved Dung Beetle Algorithm	168
Yanmin Wu, Lu Wang, Zhenjie Wan, Xiaofeng Zhang	
A hybrid strategy of network reconstruction and voltage control based on N-1 security verification	172
Peng Lu, Chunxian Feng, Weiming Wu, Xiao Liu, Jiakuan Cui, Yufan Lu	
Multiple load deviation compensation method of distribution network under new power system	179
Zixin Zhang, Jingjiao Yin, Zhentao Han, Xiaoyi Huang, Qixiang Wang	
Research on security control strategy of micro-grid group based on fuzzy control algorithm	183
Xiaochuan Lu, Qiang Li, Dawei Yao	
Comprehensive Evaluation Method for Autonomous Operation Domain of New Distribution System	190
Yabing Wang, Hongmin Wu, Minjian Yang, Jianqiang Ye, Zihao Zhong, Ziling Wang, Wenhao Ma	
Key parameter identification of direct driven wind generation dynamic model considering fault traversal process	194
Wei Fan, Jianming Li, Yu Liu, Deyang Chen, Yingjie Qin, Lu Miao, Xinwei Wang	
Active Secondary Error Correction Algorithm for Power Metering Automation System under Nonuniform Sampling	198
Bo Fan, Xinrui Zhang, Yurong Wen, Ya Xing, Qi Yang	
Fault optimization module design of power exercise decision system based on optimized Bi-LSTM model	203
Kun Wei, Bin Che, Henan Wang, Yunling Sun	
Research on the Design of Power System Business Risk Control System Based on Device Fingerprint under Network Technology	207
Fan Jiang, Yangfeng Rong, Jinhe Yu, Mingyuan Liang, Wei Xing, Bo Zhang	
Study on Intelligent Control Strategy for Distributed Photovoltaic Power Plants Based on Communication Network	211
Yongfeng Miao, Yanqun Huang, Xianglong Meng, Jianan Qu	
Simulation study on guano fault in transmission lines in power systems	215
Xiaopo Mao, Qiuju Cui, Jianfeng Ye, Xin Li, Dehui Deng, Guangyuan Zhou, Chaohui Li, Liang Gao, Haibo Yang, Weiming Yan	
Simulation analysis of MEMS current sensor based on magneto-electric effect	219
Yumin He, Zejie Tan, Xingxing Hu, Yifan Yang, Shengrong Liu	
Simulation analysis of laminated magnetolectric structure magnetic field sensor	223
Junyi Mao, Xuan Zhang, Xingxing Hu, Zejie Tan, Zhenheng Xu	
Research on Power Terminal Identification and Verification Method Based on CIM and Multi-Criteria Fusion	228
Chi Yu, Chaoyang Wu, Shuo Jiang, Xu Liu, Yuan Chi, Xuhui Dai	

Improved SVM Method for Forecasting Recent Charging Load in Small Electric Vehicle Charging Stations	235
Min Yao, Chao Wang, Yanfei Chen, Zhuqing Zhou	
Effects of Inner Loop and PLL on VSC Instability with Variable WTG Output Power	241
Xiangyu Li, Naiyue Zhang, Jiarui Li, Shichen Xie, Shengyu Zhang, Xiaopeng Jin	
A Multi-Task Joint Learning Framework for Transformer Fault Prediction	246
Jinsi Han, Tianqi Liu, Weishang Xia, Xinwei Zhang, Yanzhao Li, Yonglin Pang, Xiaoyu Fan, Zhaogang Han	
A Novel Single-phase Step-up Five-level Inverter Based on Model Predictive Control	250
Lin Jiang, Kun Liu, Feixian Zhao, Chunrong Gan, Liang Li	
A Deviation Compensation Algorithm of Distribution Transformer Digital Twin Based on Data-Driven Model	255
Zheng Li, Zhipeng Wang, Lin Peng, Tianhang Huang, Zhuqian Ou, Xin Zhang	
GIS Partial Discharge Fault Diagnosis Method Based on Synchrosqueezing Wavelet Transform and Vision Transformer	260
Xiangmao Cheng, Gang Yang, Yaozhang Liu, Guiping Chen, Haochun Xu, Yabing Hou	
Study of grounding protector breakdown due to confusing grounding methods considering cable sheaths	266
Penghao Chu, Mingji Shang, Huiguang Zhao, Mingchao Li, Bo Zhang, Chao Gao	
A Three-phase Transformless Photovoltaic Grid-connected Inverter with Reduced Leakage Current	274
Lin Jiang, Fukang Dai, Yuchen Zeng, Hao Wu	
Case study on improving the energy-saving effect of power transformers based on reactive power compensation algorithm	279
Mingxing Wang	
Application of multi-physics co-simulation in model predictive fault-tolerant control strategy of 3-level hybrid grid-tied inverter	283
Zhifeng Dou, Changai Zhang, Hangbing Dou, Zhiying Liu, Haorui Gao, Ye Tian	
Direct Power Control of Brushless Doubly-Fed Reluctance Generator Based on Sliding Mode Control	287
Xiaoliang Yang, Yixuan Qin, Yuyue Cui, Rui Wang, Jihao Zhan, Suyu Hao	
Additional improved adaptive frequency control strategy in VSC-MTDC systems with wind turbines	291
Congshan Li, Kefeng Zhao, Ping He, Pu Zhong	
Research on two-level plant-level load allocation strategy for thermal power units based on virtual power plants	296
Songhan Wang, Jia Li, Xvguang Sui, Ruicai Si, Zhongyan Wang, Zhiwei Li, Ming Che	
Wide range voltage output of three-phase CLLC resonant converter	300
Zhenhai Song, Yuzhuo Pan, Tao Dai, Xiaodong Li, Hao Chen	
Design Procedure of a 10kV/630kW Three-Phase CHB-SRC based Rectifier for High-Power DC Charging Stations	305
Yongxiang Cai, Hongyan He, Wei Li, Song Zhang, Mingjun He, Lu Chen	
DC Component Suppression for Grid-Connected Photovoltaic Inverters Based on Kalman Filter	310
Guofeng He, Youpeng Zhang, Yuren Liu, Xiaopeng Li, Junfang Lin, Liang Zou	

Grounding Characteristics of Natural Grounding System in Underground Tunnel	314
Tianjiao Qiu, Pengyu Ma, Lu Chen, Xueliang Ma, Zhanwei Zhu, Sheng Xing, Zhen Li, Yu Liu	
Research on DC Capacitor Potential Of 5-level ANPC Inverter	319
Shizhou Xu, Chenshuo Lu, Mengjie Zhang, Xiaoxiao Cheng, Yiming Zhong	
Estimation of state of charge for lithium-ion battery based on unscented Kalman filter	323
Yongpeng Shen, Hongyuan Huang, Lei Yao, Zhiwei Chen	
IGBT Open-Circuit Fault Diagnosis of O-Z-Source Inverter Based on Back Propagation Neural Network	327
Deyu Zhuang, Yunlong Liu, Shijun Wu, Guangzhong Huang	
The Detection Method of an Inter-turn Short Circuit Fault in the DFIG Stator Based on the Voltage and Current	332
Yong Liu, Yuye Gong, Zongyuan Xue, Yihao Guo, Yongsheng Zhu, Fuqiang Ren	
Analysis of harmonic transfer characteristics of a three-winding transformer containing Δ winding	336
Yiming Ji, Fangjie Wu, Fei Li, Zhihua Lu	
Optimal Scheduling of Power System with Demand Response: Cloud-Edge Cooperation Approach	340
Peng Lu, Chunxian Feng, Weiming Wu, Tieqiang Wang, Chenjie Tong	
Research on double power frequency ripple suppression method on DC side of single-phase quasi-Z source vehicle charger	346
An Lu, Jing Yuan, Lifang Wang, Qian Cai	
Off-line fault location technology for grounding fault in distribution lines based on signal injection	352
Fuguo Jin, Baoxiang Wang, Weichuan Bao, Yi Wang, Jingming Guo, Haixing Qi	
Adaptive Load Torque Observer for Permanent Magnet Synchronous Motor Based on a Modified Compound Sliding Mode Reaching Law	356
Jingke Pei, Qiding Ran, Xiaojun Zhang, Ling Liu, Dongsong Jin	
Study on the Diagnostic Method of Fault Current and Excitation inrush Current	361
Chaofeng Zhang, Di Xiong, Xiangyang Xia, Jin Pan, Yu Yan, Ao Xu	
Comparison of Neural Network Models in Lithium-Ion Batteries' State of Charge Estimation	366
Zhiwei Dong, Xing Zhou, Yajie Liu	
A Novel Operating Condition Simulation Test Circuit Topology for Saturable Reactors in UHVDC Converter Valves	373
Chong Gao, Tingting Li, Jun Yang, Xiaoguang Wei, Chenghao Wang, Xiaolong Zhang	
Research on a non-impact transient reactive power compensation device based on anti-parallel IGCT valve group and passive device combination	379
Shaojie Liu, Yingying Zhao, Tangyun Xu, Wenhe Li	
Cycle power production prediction based on XGBoost-LME model	384
Xingang Wang, Hengzhi Liu, Gang Xue, Ping Yu, Hanlin Yuan, Yili Yuan, Zhiqiang Yang, Weifeng Qi	
Prediction of transformer top oil temperature based on AC-BiLSTM model	390
Xingang Wang, Chunming Fu, Zheng Zhao, Bin Fu, Tengguang Jiang, Yang Xu, Li Zhang, Yingying Hou	

A three-dimensional reconstruction method of the converter transformer based on point cloud	395
Xiaoyong Fu, Xiangyang Liu, Jianshu Li, Xiaohui Liao	
Carbon emission accounting method of terminal energy based on big data technology	401
Bin Sun, Songling Chen, Xiaoming Fang, Jialei Zhou, Xiaoming Zhang, Tuo Zheng	
Multi-period Dynamic Reconfiguration Method of Urban Integrated Energy System Topology Considering Flexible Supply and Demand Robust Balance	405
Xueheng Yao, Yangjie Peng, Xiaofeng Yu, Yanna An, Qinglong Zhang	
Integrated Energy System Dispatch Strategy Considering Hydrogen Storage and Participation in Frequency Regulation Ancillary Services	409
Lei Chen, Ying Zhang, Yu Ji, Zhongyou Xu, Gui Zhan	
Short-term Load Prediction of Integrated Energy System Based on Random Matrix Coupling Analysis	413
Peng Yu, Yan Cheng, Jiawei Xing, Yong Li, Shibai Wang, Shumin Sun, Yuejiao Wang, Song Yang	
Health state evaluation and adaptive fault diagnosis decision of key equipment in an integrated energy system based on multi-source heterogeneous data	417
Guoliang Li, Yan Lv, Yanlin Li, Zuhui Liang	
Research on Deep Learning Based-carbon Measurement Model in UHVDC System	421
Lan Lou, Jingping Wang, Changjun Xie, Yonghao Bian	
Optimal Allocation of Flexible Resource Capacity in New Energy Towns Considering Uncertainty	426
Baoshi Wang, Dongsheng Lv, Duo Wang	
The method of energy storage location and capacity determination in extreme environments	431
Hongbo Zhou, Qian Wu, Rong Yi, Ying Wang, Xinyue Yu	
A novel SOC equalization control strategy for distributed energy storage system with different capacities in islanded microgrids	435
Maohua Wei, Jingpeng Li, Ling Yang	
Optimal Planning Method of Single-loop Load Storage in Distributed New Energy Multi-scale Source Network	440
Jia Yin, Xingyan Liu, Yuanping Guo, Yan Zhang, Xiaolin An	
Research on Optimal Dispatch of Integrated Energy System Considering Carbon Trading Mechanism and Demand Response	444
Qiang Li, Jian Xu, Yan Jiang, Tongxuan Chen, Hangyu Zhou	
Application of a Battery Module Design for High-Voltage Cascaded Energy Storage System	448
Man Chen, Bin Liu, Minhui Wan, Peng Peng, Qipeng Tan, Wenjie Wang, Hui Huang	
Research on Distributed Photovoltaic Source-load-storage Cooperative Control Strategy	452
Shuping Gao, Yueming Ding, Hao Liu, Rongxi Cui, Zhenghao He	
Lightning protection and optimization of lightning protection for plateau mountain wind turbines	456
Bin Yang	

Research on source-load coordinated optimization of Rural Integrated Energy System considering complementary use of biogas, wind and solar energy	461
Tao Wu, Hong Qi Liu, Xing Long	
Impact of Peer-to-Peer Energy Trading on Peak-to-Valley Difference	468
Peng Li, Yihan Zhang, Meng Yang, Junhui Liu, Xing Chen, Yi Yan, Zheng Yan	
Method and system of power load classification and decomposition based on deep learning	473
Hao Sun, Hongtai Yuan, Yudong Geng, Jing Chen, Chuanfu Zhang, Wen Li	
Intelligent evaluation of carbon emission reduction level in thermal power plants based on hybrid particle swarm optimization algorithm	480
Li Song	
Modeling and dynamic simulation of 300MW variable speed pumped storage unit based on BPA	484
Yingwei Wang, Lei Chen, Mingyi Yue, Shunren Zhang, Guangqing Zhang, Wenjun Gong	
Method of hydro-wind-solar complementary operations considering uncertainty of power prediction in New Energy	488
Binbin Zhou, Congtong Zhang, Tianlong Zhu, Jianjian Shen, Kai Chen, Youxiang Wang	
Control Analysis of Chaos Phenomenon in New Energy System under the Background of "Double Carbon Target"	495
Jikuan Xu	
High proportion renewable energy power system source load storage joint peak shaving and hierarchical optimization operation	499
Ping He, Xin Liu, Lingshuai Kong, Zemeng Liu	
Modeling of electrochemical energy storage system for PSASP transient stability analysis	505
Ping He, Mingyang Wang, Lingshuai Kong, Zemeng Liu	
A Stacking Photovoltaic Power Prediction Model Based on MICE and BiGRU-Attention for Plum Rain Season	512
Yufu Lu, Qiuwen Li, Dong Mo, Yan Sun, Zeyu Wang, Yuxin Ou, Wei Dai	
Optimal scheduling of park-level integrated energy system in the context of carbon trading	519
Chen Zhao, Jinchi Ye, Ping He, Jiale Fan, Yuqi Ji, Xiaopeng Wu	
Performance analysis of 1000 MW ultra-supercritical double reheat unit with back-pressure extraction steam turbine	524
Bin Zhang, Linxuan Li, Fengjun Ji, Guohong Tian, Wenke Zhang, Yan Gao	
Effect of a Protonation Process on the Mechanical Properties of Proton Exchange Membranes	528
Zhenglin Mo, Liang Cai, Wei Li	
Research on operation optimal control of steam electric boiler heat storage system based on park heating	533
Jialin Yang, Pengxiang Zhao, Bing Wang, Na Li, Dongxu Guo	
Optimization Mode and Dynamic Pricing Strategies for New Energy Vehicle Energy Stations	538
Xin Wang, Jun Wang, Jinda Zhu, Gang Ma, Wei Du, Chenghong Tang	
Proximal Policy Optimization Algorithm for Integrated Energy System Operation with Adaptive Learning Rate Decay Strategy	545
Jun Wang, Xin Wang, Wei Du, Yuan Li, Chenghong Tang, Gang Liu	

A New Backup Automatic Switch Scheme Adaptable to Photovoltaic Power Integration	550
Shengkuan Hu, Tao Zheng	
Research on the Low Carbon Transformation Path of City Energy Based on TIMES Model and Case Study	556
Hao Chen, Wenbo Shi, Guang Chen, Fenghua Zou, Zhe Wang, Yahui Ma	
A new energy power system frequency response model modelling approach considering dynamic limiting of wind turbines	562
Shuyu Lai, Cheng Wang, Aojie Ji	
Joint optimized operation of large-scale electric hydrogen production and new energy stations based on proton exchange membrane fuel cells	569
Hongyu Liu, Cheng Wang, Jiawei Zhu	
A Study of Heterogeneous Load Polymerisation Methods	576
Peng Yuan, Qingsong Zhao, Xiaoheng Zhang, Xintong Ma, Jifeng Cheng, Kang Ren, Run Ma	
Design and Performance Analysis of Dish Solar for Low-Carbon Buildings Based on SolTrace Simulation	585
Jikang Su, Yupeng Yue, Zhenjie Wan	
Dynamic model of sintering temperature prediction in rotary kiln based Seq2Seq with dual attention	590
Lei Zhang, Binbin Hong, Yanjie Zou, Yinhua Li, Guofeng Ren, Mingdong Zhao	
Exploration of the migration characteristics of electric vehicles and the impact of distributed energy resources on carbon emissions	596
Caiyang Yu, Xinyu Wang, Huipeng Deng, Lei Zhong, Yinghao Luo, Jinzhou Sun	
Author Index	601