2020 IEEE 3rd Student Conference on Electric Machines and Systems (SCEMS 2020)

Jinan, China
4-6 December 2020

Pages 1-517

IEEE Catalog Number: CFP20Q90-POD
ISBN: 978-1-7281-5623-1

Copyright © 2020 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: CFP20Q90-POD
ISBN (Print-On-Demand): 978-1-7281-5623-1
ISBN (Online): 978-1-7281-5622-4

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

2020 IEEE Student Conference on Electric Machines and Systems (SCEMS)

Table of Contents

Message from the Honorable Chair xvii
Organizing Committees xviii

◆ Advanced Electronic Technology and Engineering

Synergistic Risk-Based Robust Scheduling for Hybrid AC-DC Systems via Analytical Target Cascading 1

Zhe Chen, Luyu Wang, Chuangxin Guo, Hangyin Mao

Real-Time Active Power Dispatch for Virtual Power Plant via a Multi-agent Leader-Follower Game Approach 8

Zilong Zhang, Weizhen Yong, Fan Yang, Jingdong Wei, Minghui Zhu

A Modified Interleaved Active-Clamp Flyback Converter for Improving Power Efficiency and Power Density 14

Dazhuang Ma, Jiahui Jiang

Application of Python Parallel Computing in Online Identification of Thevenin Equivalent Parameters 20

Meng Xinyuan, Wen Tao, Ma Kaigang

Multi-area Joint Scheduling Model in Consideration of Flexible Loads 24

Zhi Cai, Fumin Qu, Qiang Ding, Sai Dai, Guofang Zhang, Yongchao Sun

Load Modeling and Harmonic Analysis of Intermediate Frequency Furnace Based on Measured Waveform 29

Shengchuan Zhao, Zhiyong Su, Qiang Wu, Fusheng Guo, Hao Bai, Weihan Zhou, Yongqing Wang, Yadong Liu, Weichao Li

Axially Segmented PMASynRM with Hybrid Rotors 33

Yingqian Lin, Yi Sun, Yunchong Wang, Shun Cai, Jian-Xin Shen

◆ Distribution Network System and Operation

A Data-Driven Slow Dynamic Characteristic Extraction and State Estimation Method for Large Power Grid 39

Cui Xinhui, Ma Kaigang, Meng Xinyuan, Zhang Xiaohua, Duan Fangwei, Li Tie, Cui Dai

Research on High-Speed Self-healing Technology of Active Distribution Network Based on Eddy Current Repulsive Switch 43

Yi Yang, Mingcheng Jiao, Gang Li, Daoshu Yang, Lei Hao, Cong Li

Robust Integrated Optimization of Active Distribution Network Based on System Risk Index 48

Yumin Zhang, Haishu Gao, Xingquan Ji, Qi Liu, Yixiao Yu

Frequency-Domain Reactance Based Protection for Multi-terminal DC Distribution Grid 55

Xiuyan Wei, Guibin Zou, Shuo Zhang

A Modified Newton-Raphson Method for Hybrid AC/DC Microgrids Power Flow Analysis 60

Yitong Liu, Zhengshuo Li

A Novel Current Differential Protection Scheme for Active Distribution Networks 66

Xuelin Guo, Liyan Wang, Liangzhi Sun, Rui Han, Xiangming Sun, Lindong Zang, Chenghan Zhou, Guibin Zou

Two-Stage Distributionally Robust Voltage Regulation of Active Distribution Network with Hybrid Energy Storage.....71

Wantong Zhao, Zhaojing Cao, Can Wan, Yuqi Xu, Changfei Zhao

◆ Electric Machines

Suppression of the Electromagnetic Vibration in Line-Start Permanent Magnet Synchronous Motor 77

Haojie Cheng, Xu Tang, Zhen Yu

Application of High-Voltage and High-Frequency AC Power in the Experimental Research of DBD Device

.....83

Yue Lv, Liang Zou, Ying Sun, Xiaolong Wang, Yuantao Zhang

Design and Optimization of a Novel Dual-Stator Flux-Switching Permanent Magnet Machine 89

Yongji Wang, Wenliang Zhao, Mingjie Yu, Yubo Yang, Byung-il Kwon

Analysis of the Characteristics of Gas-Solid Insulation Surface Discharge under High Frequency Sinusoidal Electrical Stress and Construction of Simulation Model.....94

Yan Qiyue, Zhang Li, Zou Liang, Zhao Tong

Design an Improved Sensorless Sliding Mode Observer for PMSM 100

Yuhang Bu, Aiyuan Wang

Simulation Analysis of Transformer Fractional Fault Model Based on Simulink 105

Xue Li, Hui Zhong, Guangyu Zhang

An Adaptive Short-Term Frequency Stabilization Method for Doubly Fed Induction Generators Considering Power Margins 111

Changwei Li, Peng Zhang, Zhaoyang Jin, Xigui Wang

Improvement of AFO for Sensorless IM at Zero and Very Low-Speed 116

Liu Zhuowei, Yu Peiling

Design and Optimization of Hybrid Excitation Synchronous Machine Based on Multi-objective Genetic Algorithm 124
Zhishuo Yang, Wenliang Zhao, Yan Liu, Xiuhe Wang, Byung-il Kwon

Optimization Design of Electromagnetic Stirrer Based on Finite Element Model and NSGA - Ⅱ Algorithm 130
Zhenyou Liu, Xushuai Zhu, Shumei Shao, Zhizhen Liu, Xiaozhao Wei

Simulation of Field-to-Line Coupling of Lightning Electromagnetic Interference in Wind Turbine 136
Zhu Xiaohui, Zhang Li, Sun Youliang, Bilal Iqbal Ayubi

Multi-physics Analysis of Surface Inset Permanent Magnet Motors with Different Slot-Pole Combinations 141
Xinyu Liang, Wenliang Zhao, Yan Liu, Xiuhe Wang, Byung-il Kwon

Dynamic Hysteresis-Loop Controller for Direct Instantaneous Torque Control of Four Phases Switched Reluctance Motors 147
Yiqian Li, Qishuang Ma, Ping Xu

Effect of Rotor Eccentricity on the Electromagnetic Vibration for Line-Start Permanent Magnet Synchronous Motor 153
Zhen Yu, Xu Tang, Haojie Cheng

Micromagnetic Simulation of Complex Permeability for Nanocrystalline Alloys under kHz Magnetization 159
K. H. Guo, L. Zou, Y. X. Sun, L.J. Dai, Y. P. Zhang, L. Zhang

Effect of Power to Gas on Integrated Electricity-Gas System with Uncertain Wind Generation 164
Han Gao, Zhengshuo Li

Analysis of a Novel Hybrid Excitation Synchronous Motor with Asymmetric Rotor 169
Cong Liu, Wenliang Zhao, Yan Liu, Byung-il Kwon

Coordinated Control Scheme of Thermal Power Unit Considering Wind Power Connection 174
Hongbo Sun, Jian Zhang, Yu Zhang, Chenhui Zhang

Design of a 35kW Permanent Magnet Synchronous Motor for Electric Vehicle Equipped with Nonuniform Airgap Rotor 179
Feng Liu, Xiuhe Wang

Anomaly Detection of Wind Turbine Gearbox Based on Digital Twin Drive 184
Zeng Xiangjun, Yang Ming, Yang Xianglong, Bo Yifan, Feng Chen, Zhou Yu

◆ Electronics and Circuit System

Zero-Crossing Detection Algorithm Based on Narrowband Filtering 189
Zunxian Wang, Shouyuan Wu, Mingxu Wang, Yongxin Yang, Xiaoming Luan, Weichao Li

Research on Compensation Strategies for DFACTS with Insufficient Capacity 194
Xiong Xu, Chongkai Cai, Yongjun Yu, Zhujian Ou, Guangzhu Wang

Complementarity Evaluation Index System and Method of Multiple Power Sources.....200
Yi Zhao, Hao Su, Jiahao Wan, Donghan Feng, Xiaokan Gou, Bing Yu

Research on Modeling and Application of Magneto-Optical Measurement Technology 207
Bo Wang, Shiming Liu, Yongsen Zhao

The Closing Strategy of Vacuum Circuit Breakers to Suppress Inrush Current of Parallel Capacitor...212
Mingxu Wang, Shouyuan Wu, Yongxin Yang, Zunxian Wang, Xiaoming Luan

Analysis and Visualization of Dual Relationship between Electrical LC Oscillation and Ball Mechanical Oscillation.....216
Henghui Xie, Mengwei Li, Qixin Ding, Jiacheng Ruan, Hengxu Zhang

◆ Power Systems

Probabilistic Power Flow Algorithm of Active Distribution Network Based on Semi-invariant and Gram-Charlier Expansion 222
Zhaoqiang Yang

Identification of Weak Nodes in AC/DC Hybrid Power Grid Based on Entropy Theory.....227
Xuetao Yang, Wenshan Wang, Qun Yu

Operation-Characteristic Calculation of MMC Based HVDC Grid 232
Xilin Yan, Chenjing Yue, Jianying Wu, Lei Feng, Nan Zhang, Quanrui Hao

Fault Line Selection Method Based on Variational Mode Decomposition Energy Weight 238
Xingquan Ji, Chengzhi Wang, Yumin Zhang, Jian Yang

A Trainsient Voltage Stability Evaluation Model Based on Morphological Similarity Distance Online Calculation.....243
Song Dunwen, Yang Xuetao, Li Zheng, Dai Hanyang

Soft Open Point–Energy Storage Collaborative Planning Based on Second-Order Cone Programming 248
Shaoqing Si, Yumin Zhang, Xingquan Ji, Bo Xu

The Design and Field Test of a Shunt Unified Power Quality Controller for Mitigating Voltage Sags ...254
Chang Liu, Lin Xu, Wei Wei, Yingdong Wei, Hua Yang, Xueyuan Liu, Yi Zhang, Ying Wang

Economic Losses Aversion Mechanism of Voltage Sag in Pharmaceutical Industry 260
Kede Li, Yinyue Shi, Tianchu Li, Ming Fang

Evaluation of Instigation of Voltage Sags by Distributed Generation with Anti Islanding Protection 265
Khalil Ahmad, Nian Liu, M Rizwan Mushtaq, Ali Waqar, Muhammad Awais, Sunil Pervaiz

Research on Data Segmentation Technology of Gridconnected Test System for New Energy Plants .271
Leshi Zhang, Xiufeng Xing, Xiao Chang, Huipeng Li, Ying Wang

An Overview of Access Standard in Demand Response and Peak Regulation Auxiliary Service Market 277
Xuanyuan Wang, Zhen Liu, Hao Zhang, Yaxuan Han, Dunnan Liu, Heping Jia

Optimal Dispatch of Receiving-Side Power Systems Considering Peak Regulation of External Power 282
Xunhu Yin, Qiulong Ni, Chao Guo, Xiang Li, Yijing Su, Xiang Zheng, Hengyu Hui

Holt-Winters Predicting Model of Energy Meter Based on Optimal Smoothing Coefficient 288
Yunlong Ma, Jie Wang, Jian Song, Zhi Zheng, Lei Huang, Jiahao Zhang

Electro-Thermal-Fluid Coupling Analysis of Ultrahigh Voltage Cable Tunnel 292
He Zhou, Ziqi Lin, Linhua Niu, Xiao Fu, Yaozhong Liu

Architecture and Roadmap of Standard System for Global Energy Interconnection 298
Wang Wei, Zhou Zhou

Analysis of Lightning Strike Failure of Extra High Voltage Overhead Lines in Hubei Power Grid.....306
Tianru Shi, Jianlan Yang, Xiaoqing Lin, Lei Huang, Guan Wang

Distributed Fault Section Location for Active Distribution Network Based on Bayesian Complete Analytic Model 312
Yuyang Li, Zengping Wang

The Unified Energy Flow Algorithm Used Back/Forward Sweep Method for Urban Integrated Energy Systems.....318
Jun Ma, XingJi Hu, WeiDong Li, Xinge Qi, Jiaxin Sui, Yun Zhao

SynchroService: An SaaS Infrastructure to Increase the Availability of Synchrophasor Systems 324
Weikang Wang, Chang Chen, Kaiqi Sun, Wei Qiu, Yilu Liu

Transmission System Load Forecasting Using Neural Network Approach, Case Study: Electricité Du Cambodge (EDC) 329
Phornnara NOP, Zhijun QIN

Research on Control Strategy of MMC-HVDC Transmission for Offshore Wind Power 334
Shuai Wang, Ying Xu, Yajun Lu

Electric Field Simulation of Polluted Insulator on EMU Roof 340
Buchao Jia, Shuang Liang, Qizhe Zhang, Bo Chang, Shenghui Wang

Research on a New Type of “APF+DVR” UPQC 345
Yue Zhao, Xuan Wang, Chongkai Cai, Yongjun Yu, Yongsheng Fu, Guangzhu Wang

Research on Data Acquisition System of Electric Heat Storage Boiler Supporting Big Data.....350
Fangyuan Qiang, Fei Liu, Ke Shi, Lei Wang, Chao Tian, Donggang Hu

Study on the Protective Effect of the Defective Insulating Sheath Used for Transmission Lines.....355
Fangcheng Lü, Wenwen Zhang, Shenghui Wang, Huaqian Wang

A Method of Fault Diagnosis for Secondary Loop in Intelligent Substation Based on Bayesian Algorithm 360
Peng Zong, Zhanjun Gao, Tao Yang, Fengyuan Zhou

Simulation of Propagation Characteristics of PD UHF Signals inside and outside of Switchgear 365
Jinliang Li, Jie Wang, Yingbin Shi, Hongxia Wang, Tao Zhao

A Partitioning Method for Parallel Power System Restoration Based on Virus Propagation Model.....369
Shujian Huang, Yongjian Ye, Wenwen Xu, Long Yang, Wei Luo, Changcheng Li

Data Analysis Systems in European and PJM Electricity Markets and Suggestions for Zhejiang 375
Luosong Jin, Diya Zhou, Jie He, Wen Zhao, Xiangyang Wang, Hengzi Huang

Continuous Commutation Failure Suppression Using Dynamic Reactive Power Control in the Hybrid UHV AC/DC Power System.....380
Bailiang Liu, Zhenquan Wang, Tao Niu, Hongning Zhen, Zhikun Han

A Spatio-Temporal Customer Baseline Load Estimation Approach Based on LAD-LASSO Regression 386
Hongsheng Li, Jia Hu, Bo Chen, Yuxi Wang, Xiaoxing Lu, Kangping Li, Fei Wang

Insulator Intelligent Recognition Based on Machine Vision and Edge Calculation 393
Yuntao Sun, Yong Zhang, Suhong Chen, Yufeng Chen, Chaowei Jin, Shenghui Wang, Fangcheng Lv

Distributed Transaction Optimization for Multiple Microgrids in Grid-Connected and Islanded Modes.398
Zhuo Wang, Xingong Cheng, Luhao Wang, Xiju Zong, Xiuhan Lin, Shiyuan He

Research on Hierarchical Autonomous Operation Monitoring of Energy Stations Based on Cloud Technology 403
Fei Liu, Fangyuan Qiang, Chao Tian, Ke Shi, Lei Wang, Donggang Hu

A Temperature Control Strategy of Fixed-Frequency Air Conditioning Loads for Short-Time Peak Clipping 409
Zhao Yuqiang, Wang Qi, Liu Xiaofeng, Li Xueming, Zhang Weiguo, Ji Cheng

Development of Management System for Insulator UV Imaging Detection.....415
Yufeng Chen, Zhaoli Gao, Mingkai Xv, Xianfei Lu, Leilei Niu, Shenghui Wang, Zihao Wang, Fangcheng Lü

Fault Line Selection Based on the Frequency Characteristics of Feeders 419
Zhuoqun Wang, Jiabi Liang, Jianwei Yao, Ke Zhu

Regenerative Electric Heating Load Modeling Considering Users' Response Behavior Biases.....424
Ruicong Zhang, Haoming Liu, Wei Chen

Power Quality Pricing Method Considering Quality Risk in Deregulated Retail Market.....430
Zihao Li, Haoming Liu

Research on the Characteristic of Waveform Disturbance Caused by the Back-to-Back Capacitor Asynchronous Switching 435
Jianwei Yao, Jiabi Liang, Zhuoqun Wang, Ke Zhu

Method for Calculating the Equivalent Inertia of Power Systems Considering the Frequency Heterogeneity 440
Tiezhu Wang, Mengjun Wang, Shicong Ma, Yiran Jing, Guozheng Wang

Research on DC Microgrid Protection Based on Improved Dual-Slope Current Differential Protection444
Mingyang Wang, Qing Chen, Liuyang Chen

Research on Traveling Wave Fault Location Method of Railway Automatic Blocking/Power Continuous Line Based on Noncontact Measurement 449
Zilong Wang, Jun Liang, Kai Guo, Chuanxi Liu

Identification of the Weak Areas of Simultaneous Commutation Failure for Multi-infeed DC System during Power System Restoration 455
Bianbian Liu, Hongtao Wang, Hongyu Ai

A Model Predictive Control of SMES-Battery Hybrid Energy Storage System for Voltage Regulation in DC Microgrids.....461
Fuyao Ni, Zixuan Zheng, Qi Xie, Chunjun Huang, Yi Zong

Vehicle Intelligent Inspection Technology Based on Automatic Multi-functional Follow-up Probe 467
Wuyang Gai, Bo Peng, Xuan Zhang, Jianxin Bi, Xiaoyue Li, Xiaolong Zhang

Insulator Defect Detection Based on Ultraviolet Imaging and Acoustic Emission Signal.....472
Ming Li, Yugang Jing, Lei Zhang, Xinmei Li, Guilin Huang, Zihao Wang

A Novel Traveling Wave Based Fault Location Algorithm for Teed-Circuits 476
Bin Xu, Sen Yan, Dongfang Hu, Peng Li, Jian Zhang

Economic Power Consumption of Large Industrial Customers under Power Market Environment 481
Wei Hou, Mingqiang Wang, Xin Wang

Overdetermined Equation Based Fault Location Avoiding Influence of Traveling Wave Velocity 486
Hui Wang, Aimin Liu, Jincheng Li, Hongkai Yuan, Kelin Yu

A Novel Identification Method for Low-Frequency Oscillation Modes in Power Systems 491
Qiushi DU, Dachi ZHANG, Siyu HAN, Shengyao SHI, Junhui LI, Wenbo QI

Study and Simulation of Combined Cooling Heating and Power System in an Industrial Park 496
Peng Xu, Qiangsheng Bu, Yuezhu Li, Jian Geng, Junfang Zhang, Qin Ying

Research on Formulation and Decomposition of Medium and Long-Term Electric Power Contracts ... 502
Jiangyang Yun, Ming Yang, Yuechen Shan, Changhang Zhang, Shiying Huang, Yixiao Yu

Reserve Optimization Considering Reserve Deployment Process ... 508
Zhixin Wang, Mingqiang Wang, Zhen Fang, Jianying Li, Jianjie Li

A Novel Control Strategy for Suppression of HVDC Subsequent Commutation Failure ... 513
Wang Jing, Li Jun, Yang Zengli, Zhang Hao, Cong Xinpeng, Hu Yuzhou

An Islanding Integration Strategy During the Reconfiguration of Distribution Systems Based on Multi-sources ... 518
Wei Luo, Yongjian Ye, Shangchun Ju, Shujian Huang, Wenting Yan, Changcheng Li

The Stackelberg Game Park Agent Pricing Strategy Considering the Thermal Inertia of Buildings ... 523
Yuxing Li, Shiwei Qi, Haokuo Xin, Di Yao, Bo Zhao, Wenbo Qi

Study on the Influence of Lightning Current on Space-Time Evolution of Secondary Arc ... 528
Shengyao Wang, Haoxi Cong, Dong Han, Hao Pan, Qingmin Li

CVaR-Constrained Customers' Discomfort-Minimization Scheduling Strategy of a Demand Response Aggregator Considering PV Uncertainties ... 534
Guanghua Wu, Hongyu Li, Jia Hu, Xiaoxing Lu, Fei Wang

Cost-Earning Analysis of Regenerative Electric Heating Customer's Participation in Market Transaction by Load Aggregator Agent ... 543
Wang De, Liu Shaohua, Chen Guiliang, Li Lei

A Graph Label Propagation Semi-Supervised Learning-Based Residential User Profiles Identification Method Using Smart Meter Data ... 550
Hongsheng Li, Fengping Fu, Xinlei Bai, Siqing Yan, Xiaoxing Lu, Kangping Li, Fei Wang

Optimal Scheduling of Microgrids with Multi-Period Islanding Operation Considering Demand-Side Management ... 557
Mostafa Vahedipour-Dahraie, Homa Rashidizadeh-Kermani, Miadreza Shafie-khah, Xiangchu Xu, Fei Wang, Joao P. S. Catalao

Transient Voltage Estimation of Bipolar VSC Station Connected to Islanded Renewable Power Plant 563
Dongdong Bu, Quanrui Hao, Xilin Yan

Standardization of Smart Grid Technology for the Development of Global Energy Interconnection ... 569
Zhou Zhou, Wei Wang

Optimal Allocation of Dynamic Var Sources in Power Systems Using Two-Stage Strategy ... 574
Yan Chen, Meng Ye, Chao Fu, Jing Li, Yuxiang Xie, Hongwei Zhao

Methodology for Determining Limit Scale of Direct Power Purchase Transactions Considering Operating Constraints of Power Systems ... 580
Maosheng Sang, Teng Tu, Minglei Bao, Diya Zhou, Xunhu Yin, Yi Ding

Dynamic Decision-Making of Blackstart Scheme Based on VSC-HVDC ... 586
Yongjian Ye, Wei Luo, Shangchun Ju, Shujian Huang, Long Yang, Changcheng Li

◆ Energy Engineering

The Resilience Assessment Method of Electric-gas System under Earthquake Disaster 591
Yi Zheng, Jing Wu, JiaHong Fu, YiWen Shen, Han Wang, Hang Li, Kai Hou

A Statistical Upscaling Approach of Region Wind Power Forecasting Based on Combination Model 596
Tingting Ding, Peng Li, Guilin Huang, Yixiao Yu, Zhiyuan Si, Fangqing Yan, Xiaoyi Liu, Menglin Li

Dynamic Thermal Line Rating Estimation Using Live Regional Weather Data 602
Xiaowei Fan, Rongfu Sun, Jingran Wang

A Hybrid Photovoltaic Power Prediction Model Based on Multi-source Data Fusion and Deep Learning 608
Zhiyuan Si, Ming Yang, Yixiao Yu, Tingting Ding, Menglin Li

A Short-Term Regional Wind Power Prediction Method Based on XGBoost and Multi-stage Features Selection.....614
Wenze Li, Xiaosheng Peng, Kai Cheng, Hongyu Wang, Qiyou Xu, Bo Wang, Jianfeng Che

Wind Power Probabilistic Forecasting Based on Wind Correction Using Weather Research and Forecasting Model 619
Menglin Li, Ming Yang, Yixiao Yu, Peng Li, Zhiyuan Si, Jiajun Yang

Improvement and Modeling of Dynamic Response Characteristics for Aggregate Thermostatically Controlled Loads 625
Yunfeng Ma, Yang Yu, Yazhou Fan, Zengqiang Mi, Huowen Peng, Jixing Wang, Xiangzhan Meng

◆ High Voltage Power Transmission and Insulation Technology

Hybrid Line Fault Location Method Based on Frequency Characteristics of Wave Speed 631
Tao Yang, Zhanjun Gao, Peng Zong, Jinshuang Mu

Suppression Measures for Overvoltage of Single-Core Cable Sheath Caused by Harmonics and Inrush Current 636
Fusheng Guo, Bin Liu, Xiaoqing Ji, Jing Zhang, Zhihai Tao, Zhiyuan Lv, Weihan Zhou, Yongqing Wang, Xiaoming Luan

Study on Lifting Characteristics of Spherical Metal Particles and Air Gap Discharge Caused by Motion in DC GIL 641
Cheng Han, Zhang Li, Zhao Tong, Zou Liang, Wei Wei

Study on Exploiting Thermostatically Controlled Loads to Reduce Wind Power Curtailment 647
Guangrui Wang, Zhengshuo Li

An Index for the Early Warning of Nodal Outage Risk of Transmission System by Data Driven Method 652

Hui Ren, Haoran Liu, Genwang Wang, Fei Wang

◆ New Battery and Energy Storage Technology

Battery Energy Storage System (BESS) Sizing Analysis of Bess-Assisted Fast-Charge Station Based on Double-Layer Optimization Method 658

Dan Wu, Qiang Gui, Wanru Zhao, Jun Wang, Shanshan Shi, Yun Zhou

Analysis of Profitability Difference of Energy Storage System in Different Links in Whole Life Cycle...663

Haoran Liu, Yantao Wang, Hanmin Liu, Yunfeng Tian

Grid-Side Energy Storage System Day-Ahead Bidding Strategy Based on Two-Level Decision in Spot Market 668

Jin Cheng Shang, Hongkun Bai, Meng Yang, Tianliang Wang, Qian Li, Xin Jiang

Deep Peak Shaving Model of Fire-storage Combination under High Permeability Wind Power Conditions 674

Mengqi Li, Yantao Wang, Yunfeng Tian, Hanmin Liu

An MMC Based Hybrid Energy Storage System: Concept, Topology, and Control.....680

Wanqi Cai, Pengfei Hu, Daozhuo Jiang, Yiqiao Liang

Battery Impedance Measurement Using Pseudo Random Binary Sequences.....686

Li Yan, Chris Bingham, Samuel Cruz-Manzo, Delong Cui, Yunrong Lv

An Optimal Configuration Method for Energy Storage Systems in Distribution Networks Considering Battery Life 692

Yingjie Shao, Ran Ding, Zhaozhao Tian

◆ Power Electronics and Motor Drives

Harmonic Current Suppression of Dual Three-Phase Permanent Magnet Synchronous Machine Based on Hybrid Control Strategy 698

Weiwei Zhang, Bochao Du, Tiannan Li, Shumei Cui

Modeling of the Transformer Coupled Self-Oscillator for Piezo Power Driver 703

Teng Xudong, Qi Mingyan

Fluid-Kinetic Model for Numerical Simulation of Gas-Solid Insulation Surface Discharge.....708

Bilal Iqbal Ayubi, Zhang Li, Sun YouliangYan Qiyue

Study of Double-Sided LCC Compensation Wireless Power Transfer Based on Zero Voltage Switching.. 713

Guowen Feng, Zhizhen Liu, Xiaozhao Wei, Zhenyou Liu, Xushuai Zhu, Shumei Shao

Ambient-based Oscillation Mode Analysis via Dynamic Ensemble ITD and ARMA Model for Converter-based FFR Application 718

Wei Qiu, Yuqing Dong, Lin Zhu, Shutang You, Qiu Tang, Junfeng Duan, Wenxuan Yao, Yilu Liu

Research on CLLLC Bi-directional Resonant Based on Time-domain Analysis 724
QinRui Deng, YingJie He, Chao Lei, JinJun Liu

Multiport Hybrid DC Circuit Breaker with Reduced Fault Isolation Time 730
Shuo Zhang, Guibin Zou, Xiuyan Wei

Research on Active Filter for Supraharmonics Suppression of Power Grid 735
Longyu Xu, Yingjie He, Chao Lei, Jilang Qiu, Qinrui Deng

Research on the Harmonic Transfer Characteristics of Electromagnetic Transformer 741
Yongxin Yang, Shouyuan Wu, Zunxian Wang, Mingxu Wang, Jianwei Yao, Xiaoming Luan

A Practical Method to Improve the Immunity of Adjustable Speed Drive to Transient Low Voltage Disturbance 746
Qi Xie, Zixuan Zheng, Xianyong Xiao, Zhong Xu, Kai Zhou, Qianwen Guo

Research on Active Disturbance Rejection Based on New Single-Stage Buck-Boost Inverter 751
Heng Zhang, Hejin Xiong, Chaozhi He

HVDC Start-up Strategy of AC/DC Hybrid System 756
Yuechen Shan, Jiangyang Yun, Shibo Zhai, Xiang Zhang, Wenning Wang, Jingrui Liu

Current Stress Minimization and Optimal Control Strategy of Dual-Active-Bridge Converter with Bidirectional Inner Dual Phase Shift Control 762
Zifeng Deng, Xinyu Jin, Lingchao Kong, Linxiao Gong, Yong Wong

A Novel Online Parameter Identification Algorithm for Deadbeat Control of PMSM Drive 769
Zitan Wang, Jianyun Chai, Xudong Sun

Three-Phase Split Delta-Source Inverter: Operating Principles and Modulation 775
Xupeng Fang, Weishuo Zhang, Xingchen Kan, Qingqing Wang

Bidirectional Modular Multilevel Converter Based Modelling and Performances Evaluation of Fast Active Power Response for Frequency Regulation 781
Xiaoyuan Wang, Feng Zhang, Anying Yu, Jinbao Ji, Jingxiang Lu, Dianyun Zhao

Response Capability Evaluation of EV Aggregator and Application in Energy and Reserve Markets 787
Xiangchu Xu, Xiaoxing Lu, Fei Wang, Zengqiang Mi, Kangping Li

Research on Temperature Drift Compensation Method to Improve Measurement Accuracy of Outdoor D-PMU 793
Li Xin, Shi Bonian, Wu Renbo

Customization of Electric Vehicle User's Participating in Demand Response Based on Driver's Charging and Driving Habits 797
Hui Ren, Huixin Feng, Ping Chen, Fei Wang

Research on Communication Protocol for Wide Frequency Range Synchronized Measurement 803

Shi Bonian, Guo Fang, Tong Shizhou

◆ Energy Development and Market Demand

Quasi-Monte Carlo Method for Probabilistic Power Flow Considering Uncertainty of Heat Loads 808
Jiting Gu, Lebing Zhao, Chao Zhu

Game Theory Based Optimal Pricing Strategy for V2G Participating in Demand Response.....813
Ping Chen, Lu Han, Hui Ren, Aiwei Zhang

A Control Strategy Based on Deep Reinforcement Learning Under the Combined Wind-Solar Storage System 819
Shiying Huang, Ming Yang, Changhang Zhang, Jiangyang Yun, Yuan Gao, Peng Li

Comparison of Community-Market Designs: Centralized and Peer-to-peer Trading 825
Congcong Liu, Zhengshuo Li

Multi-objective Coordinated Operation for Multi-Energy Hub Considering Heat Network Model 830
Shuai He, Nian Liu, Ruizhi Li

Multi-area Peer-to-Peer Energy Trading.....837
Haotian Yao, Yue Xiang, Junyong Liu, Shuai Hu

◆ Renewable Energy Integration

Development of Distributed Photovoltaic Grid-Connected Simulation System Based on StarSim Platform 843
Chaonan Liu, Zhiyuan Pan, Jinliang Wang, Hongzhen Fan, Weiwei Yang, Hao Zhang

An Energy Management Method of Active Distribution Network with Integrated Electric Vehicles and Distributed Wind Power 847
Yi Zhou, Yunli Yue, Shunxin Li, Cunhao Wei, Zening Li, Su Su

Urban Renewable Energy Consumption Capacity Quantitative and Improving Approach.....853
WenBo Xuan, Hui Li, ZhongYi Liu, YeGuang Sun, Kai Hou

Technical Analysis of Probability Early Warning of User Stealing Electricity Based on Big Data 858
Jinliang Wang, Chaonan Liu, Jin Qin, Weiwei Yang, Wenbo Wang, Wendong Niu, Zishan Liu, Na Song

Dynamic Transient Power Allocation Strategy in On/Off-Grid DC Microgrid 863
Kabindra Pokharel, Sonee Sapkota,Weilin Li, Donghua Wu, Ming Yan, Yi Wang

Optimal Dispatch of Virtual Power Plant with Distributed Renewable Energy Resources and Building Water Supply Systems 869
Yongqing Wang, Weizhen Yong, Minghui Zhu, Jingdong Wei, Zhuang Li, Zilong Zhang

Optimal Operation for Integrated Energy System on User Side Considering Demand Response.....875

Hengyu Hui, Lijun Zhang, Xiao Shi, Kang Xie, Xing Zhou, Xizhu Zhang, Xunhu Yin

A Novel Z-Source Based High Step-Up DC-DC Converter with Switched-Capacitor for Renewable Energy Systems 881
Jiawei Zhao, Daolian Chen

Review and Prospect of Modeling and Optimization of Integrated Energy System 888
Wenxiu Zhang, Jie Lou, Jingshan Wang, Xue Chang, Chaofan Wang, Qiang Yu, Yongliang Liang

Power Coordination Control of Hybrid AC/DC Microgrid Based on Battery's State of Charge 897
Yuqin Xu, Wenwen Fan

An Optimal Function-Provided Scheme for Energy Storage System Configured in Windfarm 903
Kaiqi Sun, Weikang Wang, Wei Qiu, Chang Chen, Chujie Zeng, Yilu Liu

Modeling and Control of Multiple Flexible Loads in Demand Response Considering Renewable Energy Accommodation 908
Jianye Cui, Taoyi Qi, Yingwei Zhu, Kang Xie, Kang Xie

Energy Storage Sharing Mechanism Based on Blockchain 913
Bohang Luo, Xiangyu Shen, Jian Ping

Ultra-Short-Term Wind Power Forecasting Based on Fluctuation Pattern Clustering and Prediction ... 918
Huijing Fan, Zhao Zhen, Jiaming Liu, Fei Wang, Zengqiang Mi

Research on Multi-dimensional New Energy Consumption Evaluation Index System 924
Jianyu Lu, Ke Yang, Haibao Zhai

Modeling of Flexible Resource Willing to Response Based on Utility Theory: A Case Study of Thermal Load 928
Simian Pang, Fan Luo, Lizhong Zhang, Zixuan Zheng, Lanlan Xu

Day-Ahead Scheduling Model Based on Supply-Demand Interaction Mode Considering Production Process of Short-Process Steel Enterprise 934
Haibo Wang, Li Zhang, Yijing Ren, Linghan Meng

Risk-Constrained Combined Bidding Strategy for Arbitrage of a Wind Farm with Power-to-Gas in a Generation Company 942
Peng Liu, Lei Song, Xin She, Shunqiang Feng, Ying Zhang, Di Wang

Coordinated Market Clearing Model of Active Distribution Network with TSO 947
Jingying Yang, Huiping Yu, Zhipeng Zhang, Lin Zhou, Xuefeng Gao, Di Wang

Deep Learning Based Visualized Wind Speed Matrix Forecasting Model for Wind Power Forecasting 952
Jiaming Liu, Fei Wang, Zhao Zhen

Hierarchical Distributed Frequency Regulation Strategy of Electric Vehicle Cluster Considering Demand

Charging Load Optimization 959
Xiaosong Deng, Qian Zhang, Yan Li, Tao Sun, Huanzhan Yue

Ultra-Short-Term Regional PV Power Forecasting Based on Fluctuation Pattern Recognition with Satellite Images 970
Chao Wang, Xiaoxing Lu, Zhao Zhen, Fei Wang, Xiangchu Xu, Hui Ren

Optimal Configuration of Hydrogen Storage System and Hydrogen Supply Chain Equipment for Regional Integrated Energy System 976
Chutong Wang, Xi Ding, Chuangxin Guo, Bo Yang, Jun Pan, Hang Zhang, Xurui Huang

Graph Neural Network-Based Wind Farm Cluster Speed Prediction 982
Ruifeng Chen, Jiaming Liu, Fei Wang, Hui Ren, Zhao Zhen

Calculation Method of the Line Loss Rate in Transformer District Based on Neural Network with Optimized Input Variables 988
Yijing Ren, Li Zhang, Li Zhang, Mengwei Li

An Iterative Dynamic Ensemble Weighting Approach for Ultra-short-term Wind Power Prediction 995
Shuang Tong, Fei Wang, Bo Wang, Hui Ren, Zhao Zhen

Review on Pumped Storage Power Station in High Proportion Renewable Energy Power System ... 1001
Bingxin Sun, Shuping Tian, Jiang He, Liande Liu, Zhiqiang Wang, Jiawei Guo, Fei Xu, Te Cheng, Junhui Li

◆ Smart Grid and Communication Technology

Comparison of Harmonic Models of Nonlinear Home Appliances Based on Measured Data 1007
Xiangmin Xie, Daolian Chen

A Review on Differential Power Processing for PV Submodule DMPPT 1012
Tao Zhang, Jiahui Jiang

Optimal Operation Strategy for Micro-Energy Grid Based on the C&CG Algorithm 1018
Shuai Shi, Jian Chen, Yicheng Zhang, Guilin Huang

Mine Cable Insulation Double-End Synchronous Monitoring with 5G Transmission Technology 1025
Chen Feng, Ming Yang, Xiangjun Zeng, Peng Chen

Optimal Configuration Method of Hybrid Storage System Tracking the Wind Power Plan 1031
Meng Yang, Haoming Liu, Lin Zhao

A Correlation Analysis Method for State Data of Electrical Primary Equipment 1036
Suiyang Li, Lisheng Pang, Weimin Ouyang, Chunlei Li, Zhaohui Li

Author Index