CONFERENCE PROGRAM

ICPE 2020

2020 The International Conference on Power Engineering

With Workshops of

2020 The World Symposiumon Electrical Systems (WSES 2020)
2020 2nd International Conference on Power, Energy and Electrical Engineering (PEEE 2020)

December 19-21, 2020 | Guangzhou, China

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ICPE 2020
POWER ENGINEEGING

CONTENT

Time Zone:
Beijing Time (GMT+8)

Conference Time:
December 19-21

WELCOME ADDRESS

Dear Colleague,

We are pleased to welcome you to ICPE 2020 - The International Conference on Power Engineering with workshops of WESE 2020 - The World Symposium on Electrical Systems and PEEE 2020 - 2nd International Conference on Power, Energy and Electrical Engineering, which will be held online during December 19-21, 2020. It's co-sponsored by Guangzhou University, University of Electronic Science and Technology of China, technically supported by Science and Engineering Institute etc.

After several rounds of review procedures, the program committee accepted those papers to be presented on ICPE 2020 conference. We wish to express our sincere appreciation to all the individuals who have contributed to ICPE 2020 in various ways. Special thanks are extended to our colleagues in the program committee for their thorough review of all the submissions, which is vital to the success of the conference, and also to the members in the organizing committee and the volunteers who had delicate their time and efforts in planning, promoting, organizing and helping the conference.

This conference program is highlighted by four Keynote Speakers: Prof. Adam Waldemar Skorek, University of Quebec at Trois-Rivieres, Canada (IEEE Fellow); Prof. Bikash C. Pal, Imperial College, London, UK (IEEE Fellow); Prof. Udaya Kumara Madawala, The University of Auckland, New Zealand (Fellow IEEE); Prof. Prasad Enjeti, Texas A&M University, USA (Fellow IEEE).

One best presentation will be selected from each session, evaluated from: originality; applicability; technical Merit; qualities of PPT; English. The best one will be announced at the end of each Session, and we will e-mail you after conference.

Yours sincerely,
Conference Organizing Committees

CONFERENCE COMMITTEES

ORGANIZING COMMITTEE

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Siyang Liao, Wuhan University, China
Zhenzhi Lin, Zhejiang University, China

GUIDELINE

Time

The whole program is arranged by **Beijing Time (GMT+8)**, please double-check your Test Time and Presentation Time, and update with your Local Time on your own schedule, to make sure be online on time.

TEST DAY: December 19 - For test of some basic fuctions we would use during conference.

Tool

ZOOM (**zoom.com.cn or zoom.us**) will be used for the whole online event. On the buttom of the web page, you can choose download the app for free and then choose 'JOIN A MEETING ', then input room's ID.

As usual you could not creat an account now, so you can join in our conference as a visitor, ZOOM may ask you to input your phone number and the passwords they sent to your number to verify.

How To Use Zoom

https://support.zoom.us/hc/en-us/articles/206618765-Zoom-Video-Tutorials

Equipment Needs to Be Prepared

Please prepare a digital device with **Microphone** (mandatory) and Webcam(optional), a **computer or laptop** is recommended; Andmake sure you are connected to a stable and **high-quality Wi-Fi network**, or 4G or Internet if available.

Presentation Tips

1, Please prepare a computer or laptop with Microphone and enough battery and connect to a stable and high-quality Wi-Fi network; If not, please pre-record present video as **backup** with **10-12 mins**.

2, Please stay at a quiet place with proper lighting, and without any noise; This is a formal academic event, please wear formal dress and behave properly.

3, Presentation Time: Total 15 Mins for every presenter, 10 Mins for presentation, and 5 Mins for Q&A. At first, please do a self introduction of presenter yourself, then share your screen, and star the presentation.

Presentation Tips

4, One best Presentation will be chosen from each session and announced at the end of the session. The conference secretary will email you the certificates after the conference.

5, An English PPT must be prepared and use English during the presentation

6, Each Presentation will be recorded, if you don't want it, please inform our staff ahead of time.

7, Please enter in your session's room 10 Mins earlier of the start of sessions.

SCHEDULE AT A GLANCE

Beijing Time GMT (+8)

December 19th

Test Day

	ROOM A ID: 992 8976 6343	ROOM B ID: 637 3525 2644
10:00-11:30	Keynote Speakers Test	Session 1-2
11:30-13:30	Lunch Break	
13:30-15:00	Session 3-4	Session 5-6
15:00-15:30	Afternoon Break	
15:30-17:00	Session 7-8	Session 9-10

December 20th

Live Day

	Keynote Speeches ⇔ ROOM A ID: 992 8976 6343
	Chair: Prof. Jinghua Li, Guangxi University, China
9:00-9:05	**Opening Remarks:** Prof. Weihao Hu, University of Electronic Science and Technology of China, China (IET Fellow)
9:05-9:50	**Keynote Speech I:** **'Dynamic Estimation and Control of Power System'** Prof. Bikash C. Pal, Imperial College, London, UK (IEEE Fellow)
9:50-10:35	**Keynote Speech II:** **'Artificial Intelligence in Electro-Thermal Management for Power Devices and Components'** Prof. Adam Waldemar Skorek, University of Quebec at Trois-Rivieres, Canada (IEEE Fellow)
10:35-11:00	Morning Break
11:00-11:45	**Keynote Speech III:** **'Wireless V2G-H2V Technologies'** Prof. Udaya Kumara Madawala, The University of Auckland, New Zealand (Fellow IEEE)
11:45-12:30	**Keynote Speech IV:** **'An Active Detection Scheme for Cyber Attacks on Grid-tied PV Systems'** Prof. Prasad Enjeti, Texas A&M University, USA (Fellow IEEE)
12:30-13:30	Lunch Break

	ROOM A ID: 992 8976 6343	ROOM B ID: 637 3525 2644
13:30-15:30	**Session 1** High Voltage Transmission and Insulation Technology	**Session 2** Power Failure and Maintenance
15:30-16:00	Afternoon Break	

16:00-18:00	**Session 3** Electronics and Electrical Engineering	**Session 4** Power Electronics and Transmission Technology

December 21st

Live Day

	ROOM A ID: 992 8976 6343	ROOM B ID: 637 3525 2644
10:00-12:00	**Session 5** Energy and Electrical Equipment	**Session 6** Electricity Demand and Market Strategy
12:00-13:30	Lunch Break	
13:30-15:30	**Session 7** Smart Grid and Management	**Session 8** New Energy Power Generation and Grid Connection Technology
15:30-16:00	Afternoon Break	
16:00-18:15	**Session 9** New Battery and Energy Storage Technology	**Session 10** Energy and Power System

KEYNOTE SPEAKER I

Prof. Bikash C. Pal, Imperial College, London, UK (IEEE Fellow)

Speech Title: Dynamic Estimation and Control of Power System

ROOM A: ID: 992 8976 6343

Speech Time: 9:05-9:50, December 20, 2020 (GMT+8)

Biography:

Bikash Pal is a Professor of Power Systems at Imperial College London (ICL). He is research active in power system stability, control, and estimation. Currently is leading a six university UK-China research consortium on Resilient Operation of Sustainable Energy Systems (ROSES) as part of EPSRC-NSFC Programme on Sustainable Energy Supply. He led UK-China research consortium project on grid scale storage: Stability and Control of Power Networks with Energy Storage, He also led an UK-India smart grid research consortium project, Reliable and Efficient System for Community Energy Solution – RESCUES. His research is conducted in strategic partnership with ABB, GE Grid Solutions, UK, and National Grid, UK. UK Power Networks. GE commissioned sequel of projects with him to analyse and solve wind farm HVDC grid interaction problems (2013-2019). Prof Pal was the chief technical consultant for a panel of experts appointed by the UNFCCC CDM (United Nations Framework Convention on Climate Change Clean Development Mechanism). He has offered trainings in Chile, Qatar, UAE, Malaysia and India in power system protections, stability and control topics. He has developed and validated a prize winning 68-bus power system model, which now forms a part of IEEE Benchmark Systems as a standard for researchers to validate their innovations in stability analysis and control design. He was the Editor-in-Chief of IEEE Transactions on Sustainable Energy (2012-2017) and Editor-in-Chief of IET Generation, Transmission and Distribution (2005-2012). He is Vice President, PES Publications (2019-). In 2016, his research team won the President's outstanding research team award at Imperial College London (ICL). He is Fellow of IEEE for his contribution to power system stability and control. He is an IEEE Distinguished Lecturer in Power distribution system estimation and control. He was). He has published about 100 papers in IEEE Transactions and IET journals and authored four books in power system modelling, dynamics, estimations and control. Two of his papers in power system stability and

Abstract:

Electrical generation, transmission and distribution systems all over the world have entered a period of significant renewal and technological change and upgrade. There have been phenomenal changes/deployments in technology of generation driven by the worldwide emphasis on energy from wind and solar as a sustainable solution to our energy need. Model based control design strategy is not as effective now in system operation. Faster estimation of system dynamics, phasor estimation, point of wave estimation are now very useful for time critical monitoring and control of a real-world power networks. The interconnected AC system becoming lighter and lighter because of replacement of centralised synchronous plants with non-synchronous ones. Fast frequency response provision is very vital for keeping the lights on. This is the most credible challenge in smart transmission grid operation today. The reports from some of the recent power grid failures have exposed the inadequacy of control and protection of the network. This keynote will highlight the importance of dynamic estimation and control of power networks for their stable operation. It will discuss both centralised and decentralised options. The speaker will share his research experience in this topic. Future research challenges and opportunities will be highlighted.

control topics have received annual best journal paper award. He was Otto Monsted Professor at Denmark Technical University (DTU) (2019) and Mercator Professor sponsored by German Research Foundation (DFG) at University of Duisburg-Essen in 2011. He worked as faculty at IIT Kanpur, India. He holds a Visiting Professorship at Tsinghua University, China.

KEYNOTE SPEAKER II

Prof. Adam Waldemar Skorek, University of Quebec at Trois-Rivieres, Canada (IEEE Fellow)

Speech Title: Artificial Intelligence in Electro-Thermal Management for Power Devices and Components

ROOM A: ID: 992 8976 6343

Speech Time: 9:50-10:35, December 20, 2020 (GMT+8)

Biography:

Prof. Adam Waldemar Skorek, M'87, SM'90, F'09 completed Master of Electrical Engineering Program at Białystok University of Technology (Poland) receiving both Master and Engineer degrees in 1980. He received a Doctor of Technical Sciences Degree in Electrical Engineering at Warsaw University of Technology (Poland) in 1983. On 1987, he joined the University of Quebec at Trois-Rivières (UQTR), where currently, he is a Full Professor and Director of the Research Group on Industrial Electronics. He founded the UQTR's Electro-Thermal Management Laboratory which succeeded both the NanoHeat Laboratory and the UQTR's Industrial ElectroHeat Laboratory founded and directed by himself since 1989. He is conducting the electrical engineering courses for bachelors, masters and Ph.D. students. His research works was granted by NSERC, CFI, FRQNT, MITACS and industry. He published and co-published over 130 papers including works on High Performance Computing applications in electro-thermal analysis. Volunteering more than 33 years in IEEE, he contributed on various positions including the IEEE Industry Application Society Council Member and the IEEE MGA Awards and Recognition Committee Chair.

Abstract:

Electro-Thermal Management (ETM) for power devices and components requires all theoretical, experimental and computing research efforts. Those works are especially important for power systems where various studies of electro-thermal phenomena in power electronics devices, apparatus, enclosures, transformers and electrical machines can be used as examples. Efficient and industrially usable ETM is more as before connected to modeling and simulations, currently related to Artificial Intelligence (AI) studies and applications where computation demand is growing to the point where the High-Performance Computing (HPC) become an essential tool. Hopefully the HPC infrastructures become more easily accessible and offer for researches some new opportunities based on the open and shared resources including not only computing facilities but also knowledge with currently observed openings on the field of intellectual property issues. A presentation from worldwide perspective of some modern research works is completed by lecturer's experiences and guidelines for the future.

KEYNOTE SPEAKER III

Prof. Udaya Kumara Madawala, The University of Auckland, New Zealand (Fellow IEEE)

Speech Title: Wireless V2G-H2V Technologies

ROOM A: ID: 992 8976 6343

Speech Time: 11:00-11:45, December 20, 2020 (GMT+8)

Biography:

Udaya K. Madawala graduated with a B.Sc. (Electrical Engineering) (Hons) degree from The University of Moratuwa, Sri Lanka in 1987, and received his PhD (Power Electronics) from The University of Auckland, New Zealand in 1993 as a Commonwealth Doctoral Scholar. At the completion of his PhD, he was employed by Fisher & Paykel Ltd, New Zealand, as a Research and Development Engineer to develop new technologies for motor drives. In 1997 he joined the Department of Electrical and Computer Engineering at The University of Auckland and, at present as a Full Professor, he focuses on a number of power electronics projects related to bi-directional wireless EV charging systems for V2G-H2V applications.

Udaya is a Fellow of the IEEE and a Distinguished Lecturer of the IEEE Power Electronic Society (PELS), and has over 30 years of both industry and research experience in the fields of power electronics and energy. He has served both the IEEE Power Electronics and Industrial Electronics Societies in numerous roles, relating to editorial, advisory, conference, technical committees and chapter activities. Currently, Udaya is an Associate Editor for IEEE Transactions on Power Electronics, and a member of both the Administrative Committee and Membership Development Committee of the IEEE Power Electronics Society. He was the General Chair of the 2nd IEEE Southern Power Electronics Conference (SPEC)-2016, held in New Zealand, and is also the Chair of SPEC Steering Committee. Udaya, who has over 300 journal and conference publications, holds a number of patents related to wireless power transfer (WPT) and power converters, and is a consultant to industry.

Abstract:

Electric vehicles (EVs) are gaining global acceptance as the means of future transport for sustainable living. EVs can also be used as an energy storage to stabilize the electricity network through the vehicle-to-home (V2H) and vehicle-to-grid (V2G) concepts. For V2G and V2H applications, EVs essentially require a bi-directional power interface either with the electricity network (grid) or home to allow for both storing (charging) and retrieval (discharging) of energy. This can be achieved by both wired and wireless means, but the latter, based primarily on Inductive Power Transfer (IPT) technology, is becoming more popular being convenient, safe, and ideal for both stationary and dynamic charging of EVs. The seminar discusses the challenges and future directions of V2G-H2V technologies, and presents the latest advances in bi-directional wireless power transfer (BD-WPT) technology developed for V2G-H2V applications.

KEYNOTE SPEAKER IV

Prof. Prasad Enjeti, Texas A&M University, USA (Fellow IEEE)

Speech Title: An Active Detection Scheme for Cyber Attacks on Grid-tied PV Systems

ROOM A: ID: 992 8976 6343

Speech Time: 11:45-12:30, December 20, 2020 (GMT+8)

Biography:

Prof. Prasad Enjeti is an American educator and engineer. He is a TI Professor and Associate Dean for Academic Affairs in the Department of Electrical & Computer Engineering at Texas A&M University. Enjeti was born on November 25, 1957 in Chintamani, Karnataka, India; the son of Murthy and Padmavathi (Gummaraju) Enjeti. He received a Bachelor of Science in Electrical Engineering from Osmania University in 1980. Two years later he earned his Master of Science degree in Electrical Engineering from the Indian Institute of Technology Kanpur. Also in 1988, Prasad was given a Doctor of Philosophy degree in Electrical Engineering from Concordia University.

Dr. Prasad Enjeti is a recognized authority in the power electronics industry. As a technical power electronics expert, he can quickly assess case details and prioritize the key points. As an experienced executive, he can provide industry overview and recognize the business implications at hand. Enjeti is the lead developer of the Power Electronics / Power Quality & Fuel Cell Power Conditioning Laboratories at Texas A&M University and is actively involved in many projects with industries while engaged in teaching, research and consulting in the area of power electronics. His research emphasis on industry-based issues has attracted significant funding. So far, 26 PhD and 41 MS students have graduated under his supervision and have spring-boarded into key leadership positions. Dr. Prasad Enjeti is a Fellow of IEEE (year 2000) for "Contributions to solutions of utility interface problems in power electronic systems and harmonic mitigation". He is the inaugural recipient of the R. David Middlebrook Technical Achievement Award from the IEEE Power Electronics Society, 2012.

Session 1: High Voltage Transmission and Insulation Technology

Session Chair: Assoc. Prof. Hui Hou, Wuhan University of Technology, China

ROOM A ID: 992 8976 6343

13:30-13:45	P1023	Research on Induced Current and Induced Voltage of 500kV Double Circuit Transmission Line **Prof. Ren Hongtao**, Zheng Shanshan Hua Dong Engineering Corporation Limited, China
13:45-14:00	P1070	A Stacked Cockcroft-Walton High Voltage Multiplier for 220 V at 50 Hz inputs **Prof. Kei Eguchi** , Daigo Nakashima, Wanglok Do, Farzin Asadi Fukuoka Institute of Technology, Japan
14:00-14:15	P1032	Reliability Evaluation of HVDC Protection System Based on Interval Analytic Hierarchy Process and Interval Entropy Method Mixed Weighting **Ms. Ting Wang**, Zheng'an Du, Kanjun Zhang, Kun Chen, Fan Xiao State Grid Hubei Electric Power Research Institute, China
14:15-14:30	P1029	An LED Driver Connecting a Nested-type SC Converter and an SI Buck-Boost Converter in Parallel **Prof. Kei Eguchi**, Akira Shibata, Wanglok Do, Farzin Asadi Fukuoka Institute of Technology, Japan
14:30-14:45	P1068	A Practical Under-Voltage Load Shedding Strategy for Regional Power Grid Considering Multiple Operating Modes **Ms. Ye Lin**, Sun Jingliao, Zhou Taibin, Zhang Jing, Sun Weizhen, Xi Honglei State Grid Zhejiang Electric Power Co., Ltd., China
14:45-15:00	P1071	Research on Modularizing Design of 10kV Line Outlet Switchgear for Live Maintenance Yuan Yao, Xudong Ouyang, Guowei Zeng, Qi Tang, **Mr. Wenyu Ma** Wuhan University of Technology, China
15:00-15:15	P1080	Operation Health Status Monitoring Algorithm of Special Transformers Based on BIRCH Clustering and Gaussian Cloud Methods **Mr. Zhenyue Chu**, Weifeng Wang, Bangzhun Li, Weichao Jin, Shengyuan Liu, Bo Zhang, Zhenzhi Lin Zhejiang University, China
15:15-15:30	P2006	Simulation and Optimization of a Kind of Ultra-Wideband Bandpass Filter with Notch-Band **Dr. Xingbing Ma** School of Electronic Engineering, Tianjin University of Technology and Education, China

Session 2: Power Failure and Maintenance

Session Chair: Assoc.Prof. Zhaoyang Fu, Northwestern Polytechnical University, China

ROOM B ID: 637 3525 2644

13:30-13:45	P1050	Research on the Fault Diagnosis Of Dual-Redundancy BLDC Motor **Assoc.Prof. Zhaoyang Fu**, Xingbang Liu, Jinglin Liu Northwestern Polytechnical University, China
13:45-14:00	P1074	Reliability Evaluation of Power Distribution Grids Considering the Dynamic Charging Mode of Electric Buses Kaiqing Qiu, **Mr. Wadih Naim**, Ebrahim Shayesteh, Patrik Hilber KTH Royal Institute of Technology, Sweden
14:00-14:15	P1089	A Strategy for Judging Real-time and Active Reporting Outage Based on the Power Consumption Information Acquisition System Tao Xu, Jian Yuan, Sijie Yang, Chaoliang Wang, Lijun Ma, **Ms. Di Wu**, Shengyuan Liu, Zhenzhi Lin, Li Yang Zhejiang University, China
14:15-14:30	P302	Non-Contact Fault Location and Identification Method for Same-Tower Multi-Circuit Transmission Lines **Mr. Tao Yin**, Jian Li, Dongsheng Cai, Qi Huang, Weihao Hu University of Electronic Science and Technology of China, China
14:30-14:45	P1045	An Optimization Model of Power Emergency Repair Path Under Typhoon Disaster **Mr. Shaohua Zhu**, Hui Hou, Ling Zhu, Yongchao Liang, Ruizeng Wei, Yong Huang, Yubao Zhang Wuhan University of Technology, China
14:45-15:00	P1006	Defect detection of Aluminum Conductor Composite Core (ACCC) wires based on semi-supervised anomaly detection Dabing Chen, **Mr. Yanqing Zhu**, Liheng Yang, Guanyu Yuan, Rui Wei, Yining Hu Southeast University, China
15:00-15:15	P1065	Research on Correlation Factor Analysis And Prediction Method of Overhead Transmission Line Defect State Based on Association Rule Mining and RBF-SVM Xinghua Wang, **Mr. Zuming Yan**, Yongbin Zeng, Xiaoye Liu, Xiangang Peng, Haoliang Yuan Guangdong University of Technology, China
15:15-15:30	P1002	Low-latency Integrated Energy Conversion Equipment Design **Mr. Di Wu**, Fei Xiao, Meiping Fu, Jianrong Mao Xuji Group Corporation, China

Session 3: Electronics and Electrical Engineering

Session Chair: Dr. Wanglok Do, Fukuoka Institute of Technology, Japan

ROOM A ID: 992 8976 6343

16:00-16:15	P1007	Three-Phase Unbalanced Load Control Based on Load-Electricity Transfer Index Jinyuan Pan, Jian Liu, Xiaoqian Chen, **Mr. Kanghua Zhong** Guangzhou Power Electrical Technology Co., Ltd, China
16:15-16:30	P1062	SiC-MOSFET Shunt Active Power Filter Based On Half-Cycle SDFT and Repetitive Control **Mr. Xiao Guo**, Hongyi Lin, Guozhu Chen Zhejiang University, China
16:30-16:45	P1035	The application of Distributed Power Flow Controller in Gan Quan-Xiang Fu 220kV AC lines in Hu Zhou **Dr. Qian Chen**, Peng Qiu, Xiaoming Huang, Yi Lu, Jing Zhou Electric Power Research Institute of State Grid Zhejiang Electric Power Corporation, China
16:45-17:00	P1086	Multi-objective Optimization Strategy of Multi-Sources Power System Operation Based on Fuzzy Chance Constraint Programming and Improved Analytic Hierarchy Process **Ms. Yuge Chen**, Changming Chen, Jien Ma, Weiqiang Qiu, Shengyuan Liu, Zhenzhi Lin, Minhui Qian, Lingzhi Zhu, Dawei Zhao Zhejiang University, China
17:00-17:15	P2005-A	Influence of PLL's Parameters and Receiving Power Grid Strength on Commutation Failure of Inverter Station **Mr. Peiyuan Tang**, Xiaoming Yuan, Jun Lu Huazhong University of Science and Technology, China
17:15-17:30	P1115	Design of Market Liberalizing Degree Based on the Evolutionary Game Bidding of Generators **Mr. Jiajun Tang**, Xinyi Liu, Chuan He, Yating Li, Zhi Zhang, Jing Li, Zhemin Lin, Yongbo Li, Hanhan Qian, Zhenzhi Lin, Li Yang Zhejiang University, China
17:30-17:45	PEEE20-207	Research on the Control Technology of Self-Synchronous Voltage Source Inverter for Distributed Parallel System **Zhong Xu**, Zhu Runqiu, Hou Kai, Yuan Weifeng NARI Technology Co., Ltd., China
17:45-18:00	P2004	Key Indicators Analysis Approach for Green Power Considering Contributed Characteristics Xiangcheng Zhang, Laijun Chen, Hongxia Li, Yang Si, Fan Yang, **Mr. Libo Jiang**, Yongqing Guo Sichuan Energy Internet Research Institute, Tsinghua University, China

Session 4: Power Electronics and Transmission Technology

Session Chair: Assoc. Prof. Zhongxian Wang, Heilongjiang University, China

ROOM B ID: 637 3525 2644

16:00-16:15	P1022	Research on Fast Real-Time Calculation Model for Transient Temperature Rise of Power Cables in Duct Chenzhao Fu, **Prof. Yongchun Liang**, Ying Sun, Qingquan Li Hebei Univerisity of Science and Technology, China
16:15-16:30	P1027	Anti-Disturbance TUBE MPC Method of Wireless Power Transmission System Based on State Feedback **Dr. Jiawen Peng**, Liyan Zhang, Qihong Chen, Keliang Zhou, Zhitao Liu, Hongye Su Wuhan University of Technology, China
16:30-16:45	P1098	Research on AC/DC Power System Simulator Wei Deng, Wei Pei, Xue Zhang, **Mr. Qi Wu**, Li Kong Institute of Electrical Engineering of the Chinese Academy of Sciences, China
16:45-17:00	P1048	Dynamic Equivalent Modeling for Power Converter Based on LSTM Neural Network in Wide Operating Range Yunlu Li, **Mr. Guiqing Ma**, Junyou Yang, Haixin Wang, Jiawei Feng, Yihua Ma Shenyang University of Technology, China
17:00-17:15	P1051	DC Offset Elimination Method of Phase-Locked Loop Based on Novel Generalized Integrator **Assoc. Prof. Nanmu Hui**, Yingying Feng, Xiaowei Han Shenyang University, China
17:15-17:30	P1104	A Novel Compensation Pixel Circuit for High Bits of AM mini/micro-LED Based on PWM Method **Dr. Bin Zhao**, Juncheng Xiao, Quansheng Liu, Bin Liu, Liang Hu, Junbiao Peng, Shenzhen China Star Optoelectronics Semiconductor Display Technology Co., Ltd., China
17:30-17:45	PEEE20-210	Enhancing Power Loss by Optimal Coordinated Extensive CS Operation during Off-Peak Load at the Distribution System **SN Syed Nasir**, JJ Jamian, R Ayop, MW Mustafa Universiti Teknologi Malaysia (UTM), Malaysia
17:45-18:00	PEEE20-426	Solar PV System Performance Ratio Evaluation for Electric Vehicles Charging Stations in Transit Oriented Development (TOD) Areas **Kianda Dhipatya Syahindra**, Samsul Ma'arif, Aditya Anindito Widayat, Ahmad Fakhrul Fauzi, Eko Adhi Setiawan Universitas Indonesia, Indonesia

Session 5: Energy and Electrical Equipment

Session Chair: Prof. Zhong Cao, Guangzhou University, China

ROOM A ID: 992 8976 6343

10:00-10:15	P1016	Planning of Distributed Integrated Cooling System In Reducing the Peak Power Consumption **Dr. Dongwen Chen**, Xiao Hu, Yong Li, Yuquan Liu Shanghai Jiao Tong University, China
10:15-10:30	P1082	Energy-Saving Rating of Green Bed and Breakfast Based on The Fuzzy Comprehensive Evaluation **Mr. Zhian Lin**, Yimin Liu, Jun Xu, Jien Ma, Shengyuan Liu, Liang Zhang, Min Yu, Weichao Jin, Li Yang, Zhenzhi Lin Zhejiang University, China
10:30-10:45	P1053	The effect of Porous Media on a Solar Thermoelectric Energy Harvesting System **Dr. Yuttana Mona**, Sukanya Pothaya, Sitthichai Wongnor, Tuan Anh Do Chiang Mai University, Thailand
10:45-11:00	P1040	Effect of Flue Gas Purification Facilities of Coal-Fired Power Plant on Mercury Emission **Dr. Li Bing**, Hongliang Wang Huadian Electric Power Research Institute Co.,LTD., China
11:00-11:15	P1061	Comprehensive Thermal Resistance Model of Forced Air Cooling System for Multiple Power Chi **Mr. Hongyi Lin**, Xiao Guo, Guozhu Chen Zhejiang University, China
11:15-11:30	P1111	A Fault Tolerance Method Based on Switch Redundancy for Shunt Active Power Filter **Assoc.Prof. Dongdong Chen**, Yanqiang Lin, Long Xiao Minnan University of Science and Technology, China
11:30-11:45	P306	Small-Signal Modeling of Wind Farm With Direct-Drive PMSG using The Component Connection Method **Mr. Jie Yu**, Jian Li, Weihao Hu, Guozhou Zhang, Hao Wang, Qi Huang, Zhen Chen University of Electronic Science and Technology of China, China
11:45-12:00	P1084	Two-Dimensional Evaluation Model of Electrical Equipment Based on Combined Weighting and Rating Algorithm **Mr. Xueyuan Cui**, Feng Lu, Yifan He, Jien Ma, Shengyuan Liu, Qin Xue, An Wen, Di Wu, Zhenzhi Lin, Li Yang Zhejiang University, China

Session 6: Electricity Demand and Market Strategy

Session Chair: Assoc. Prof. Qingguang Yu, Tsinghua University, China

ROOM B ID: 637 3525 2644

10:00-10:15	P1069	Residential High-Resolution Electricity Demand Optimization with a Cooperative PSO Algorithm **Asst. Prof. Jiawei Zhu**, Qiang Liao, Yishuai Lin, Weidong Lei, Ruoyao Cui Chang'an University, China
10:15-10:30	P1102	Multi-Area Joint Scheduling Model Considering Peak Load Regulating of Nuclear Power **Assoc. Prof. Zhi Cai**, Guofang Zhang, Dan Xu, Qiang Ding, Xiaming Guo, Yi Sun China Electric Power Research Institute, China
10:30-10:45	P1076	Study of Offshore Wind Power Penetration Rate in Gas Turbine Generator Platform Power Grid **Assoc. Prof. Qingguang Yu**, Yuming Liu, Zhicheng Jiang, Le Li, Yinke Zhang, Min Guo Tsinghua University, China
10:45-11:00	P1103	Short-term Household Load Forecasting Based on Long- and Short-term Time-series Network Xifeng Guo, **Mr. Ye Gao**, Yupeng Li, Di Zheng, Dan Shan Shenyang Jianzhu University, China
11:00-11:15	P305	Analysis of Power Grid Transient Stability Characteristics Based on Massive Transient Stability Simulation Data **Mr. Haocheng Yang**, Jian Li, Dechao Xu, Shuwen Xu University of Electronic Science and Technology of China, China
11:15-11:30	P1105	Coordinated P2P Electricity Trading Model With Aggregated Alliance and Reserve Purchasing for Hedging the Risk of Deviation Penalty **Mr. Zelong Lu**, Jianxue Wang, Weizhen Yong, Zhiwei Tang, Meng Yang, Bin Zhang Xi'an Jiaotong University, China
11:30-11:45	P301	Dynamic State Estimation of Power System with Stochastic Delay Based on Neural Network **Mr. Guangdou Zhang**, Jian Li, Dongsheng Cai, Qi Huang, Weihao Hu University of Electronic Science and Technology of China, China
11:45-12:00	P1107	The GRA-two Algorithm for Massive-Scale Feature Selection Problem in Power System Scenario Classification and Prediction Yang Wang, **Dr. Xinxiong Jiang**, Faqi Yan, Yu Cai, Siyang Liao School of Electrical Engineering and Automation, Japan

Session 7: Smart Grid and Management

Session Chair: Assoc. Prof. Zhi Cai, China Electric Power Research Institute, China

ROOM A ID: 992 8976 6343

13:30-13:45	P1056	A Model-based Attack Detection Scheme for Distributed DC Microgrid System **Dr. Sen Tan**, Peilin Xie, Josep Guerrero, Juan Vasquez Aalborg University, Denmark
13:45-14:00	P1001	Research on Sensorless Control System of Low Speed and High Power PMSM Based on Improved HIGH Frequency Signal Injection **Mr. Zhao Xiang**, Wang Chengsheng, Duan Wei, Jiang Jun Automation Research Design Institute of Metallugical Industry, China
14:00-14:15	P1064	A Distribution Network Reconfiguration Method based on Comprehensive Analysis of Operation Scenarios in the Long-Term Time Period Xinghua Wang, **Mr. Xiaoye Liu**, Shengchao Jian, Xiangang Peng, Haoliang Yuan Guangdong University of Technology, China
14:15-14:30	P1077	An Improved Quasi-Type-1 PLL based on Paralleled Filtering Stage **Mr. Xian Wang**, Dazhi Wang, Linxin Yu, Ye Li, Shuai Zhou Northeastern University, China
14:30-14:45	P1079	The Optimal Emergency Demand Response (EDR) Mechanism for Rural Power Grid Considering Consumers' Satisfaction **Ms. Yunchu Wang**, Jianfeng Jin, Haifeng Liu, Zhi Zhang, Shengyuan Liu, Jien Ma, Chao Gong, Yufeng Zheng, Zhenzhi Lin, Li Yang Zhejiang University, China
14:45-15:00	P1008	On-Line Data Splicing Power Flow Analysis Method Based on Sensitivity **Mr. Lu Jun**, Zhang Lu Lu, Shi Dong Yu Power system research institute China Electric Power Research Institute, China
15:00-15:15	P1109	Day-Ahead Dispatch of Multi-Energy System Considering Operating Conditions of Multi-Energy Coupling Equipment **Mr. Weizhen Yong**, Jianxue Wang, Zelong Lu, Fan Yang, Zilong Zhang, Jingdong Wei, Junfeng Wang Xi'an Jiaotong University, China
15:15-15:30	P1081	Identification of Distribution Network Topology Parameters Based on Multidimensional Operation Data **Mr. Jiaqiao Li**, Di Wu, Weichao Jin, Zhenyue Chu, Shengyuan Liu, Jien Ma, Zhenzhi Lin, Li Yang Zhejiang University, China

Session 8: New Energy Power Generation and Grid Connection Technology

Session Chair: Assoc. Prof. Qingguang Yu, Tsinghua University, China

ROOM B ID: 637 3525 2644

13:30-13:45	P1047	An Optimal Subsidy Scheduling Strategy for Electric Vehicles **Mr. Yubao Zhang**, Hui Hou, Junli huang, Qingyong Zhang, Aihong Tang, Shaohua Zhu Wuhan University of Technology, China
13:45-14:00	P1055	Research on Performance Matching of Intake and Exhaust Ports of Marine Medium Speed Dual Fuel Engine **Mr. Binqi Li**, Jien Ma, Zhengyan Qian, Jiaxi Hu, Hui ZHENG, Ya-ping He, Youtong Fang, Qiu Lin Zhejiang University, China
14:00-14:15	P1090	Thermal-Electromagnetic Coupling Simulation Study of High Efficiency And Energy Saving Application of Induction Motor for Offshore Oil Platform Le Li, **Assoc. Prof. Qingguang Yu**, Zhicheng Jiang, Yuming Liu, Min Guo Tsinghua University, China
14:15-14:30	P1100	A Coreless Hybrid Coil Design For The Wireless Power Charging System Assoc. **Prof. Zhongxian Wang**, Xiaoqiang Chen, Tengfei Ye, Kang Chen Heilongjiang University, China
14:30-14:45	P1078	Strategy Analysis about the Active Curtailed Wind Accommodation of Heat Storage Electric Boiler Heating Zhenjiang Lei, Gang Wang, Tong Li, **Ms. Shanshan Cheng**, Junyou Yang, Jia Cui Shenyang University of Technology, China
14:45-15:00	P1093	Optimal Operation of Integrated Energy System Considering Virtual Heating Energy Storage Yingfei Gong, Xuan Yang, Jingkun Xu, **Mr. Changming Chen**, Tianyu Zhao, Shengyuan Liu, Zhenzhi Lin, Li Yang, Haitao Qian, Cao Ke Zhejiang University, China
15:00-15:15	P1097	Research on Power Increase Adaptive Control Strategy Based on 5 MW Wind Turbine Deng Ying, **Mr. Asif Rashid**, Liu He Shang, Tian De, Tang Shize, Atif Iqbal North China Electric Power University, China
15:15-15:30	P304	The Nonlinearity Property Accommodation in the Monte Carlo Method of Generation System Reliability Prediction by the Neural Network Model **Mr. Martin Onyeka Okoye**, Junyou Yang, Yunlu Li Shenyang University of Technology, China

Session 9: New Battery and Energy Storage Technology

Session Chair: Assoc. Prof. Dmitriy N Karamov, Irkutsk National Research Technical University, Russia

Session CO-chair: Prof. Konstatntin V. Suslov, Irkutsk National Research Technical University, Russia

ROOM A ID: 992 8976 6343

16:00-16:15	P1094	Research on Energy Management and Control Method of Microgrid Considering Health Status of Batteries in Echelon Utilization **Dr. Ning Yan**, Haichuan Zhao, Shaohua Ma, Tao Yan Shenyang University of Technology, China
16:15-16:30	P1026	Parameter Identification of PV Cell via Adaptive Compass Search Algorithm **Ms. Fang Zeng**, Hongchun Shu, Jingbo Wang, Yijun Chen, Bo Yang Kunming University of Science and Technology, China
16:30-16:45	P1044	Structural Optimization of Autonomous Photovoltaic Systems with Storage Battery Replacements **Assoc. Prof. Dmitriy N Karamov**, Konstantin Suslov Irkutsk National Research Technical University, Russia
16:45-17:00	P1085	Research on Energy Management Strategy of Fuel Cell Power Generation System based on Grey-Markov Chain Power Prediction **Mr. Zhichao Fu**, Chen Qihong, Zhang Liyan, Zhang Haoran, Deng Zhihua Wuhan University of Technology, China
17:00-17:15	P1101	Research on MPPT Control Strategy of Photovoltaic Cells under Multi-peak **Mr. Chunguang Zhou**, Huang Liang Wuhan University of Technology, China
17:15-17:30	P1092	A MPC-Informed ECMS Based Real-Time Power Management Strategy for Hybrid Electric Ship **Dr. Peilin Xie**, Sen Tan, Josep Guerrero, Juan Vasquez Aalborg University, Denmark
17:30-17:45	P1017	Demand Prediction and Utilization of Airport Charging Infrastructure Construction from the Perspective of New Infrastructure **Prof. Jinglei Yu**, Qin Jia, Huaqing Hu China Academy of Civil Aviation Science and Technology, China
17:45-18:00	P1046	Non-Invasive Load Identification based on LSTM-BP Neural Network **Mr. Chen Shijie**, Huang Liang, Ling Zaixun, Cui Yibo, Wang Qiong Wuhan University of Technology , China
18:00-18:15	P1034	Analysis of ECT Effect on Accuracy of Measurement and Protection **Mr. Mengmeng Zhu**, Hongchun Shu, Fang Zeng, Yingquan Shen, Biao Tang, Xin Zhang, Quancong Zhu, Yutang Ma Kunming University of Science and Technology, China Power Science Research Institute of Yunnan Power Grid Co., Ltd., China

Session 10: Energy and Power System

Session Chair: Assoc.Prof.Giedrė Streckienė, Vilnius Gediminas Technical University, Lithuania

ROOM B ID: 637 3525 2644

16:00-16:15	PEEE20-103	Experimental Analysis of an Air Storage Tank in Wind Driven Ventilation System **Giedrė Streckienė**, Juozas Bielskus, Dovydas Rimdžius, Vytautas Martinaitis, Violeta Motuzienė Vilnius Gediminas Technical University, Lithuania
16:15-16:30	PEEE20-104	Why Should the Automated Guided Vehicles' Batteries be used in the Manufacturing Plants as an Energy Storage? **Ozan Yesilyurt**, Dennis Bauer, Alexander Emde and Alexander Sauer Fraunhofer Institute for Manufacturing Engineering and Automation IPA, Germany
16:30-16:45	PEEE20-206	Research and Mathematic Simulation of the Pollution Particle Motion Process in the Fluid Stream under Effluents Treatment **Jamil Safarov** Azerbaijan State Agricultural University, Azerbaijan
16:45-17:00	PEEE20-105	Techno-economic Assessment of Hydrogen Usage in a Smart Grid, Employing a Staggered Optimization Algorithm **Friedrich-Wilhelm Speckmann**, Max Weeber, Kai Peter Birke Fraunhofer Institute for Manufacturing Engineering and Automation IPA, Germany
17:00-17:15	PEEE20-211	Optimal Energy Allocation Algorithm of Li-Battery/Super capacitor Hybrid Energy Storage System Based on Dynamic Programming Algorithm Xiaokun Zheng, Wei Jiang, Lu Yin, **Yanan Fu** Energy Connect (Beijing) Co., Ltd., China
17:15-17:30	PEEE20-416	Brutalism: as a Preferred Style for Institutional Buildings in Modern Architecture Period **Elena Imani**, Samira Imani TOBB University, Turkey
17:30-17:45	PEEE20-425	Hybrid Solar Forecasting Method Based on Empirical Mode Decomposition and Back Propagation Neural Network **Ahmed Aghmadi**, Soumia El hani, Hamza Mediouni, Nisrine Naseri, Fatima El issaoui Mohamed V University, Morocco
17:45-18:00	PEEE20-315	Virtual Power Plant: State of the Art Providing Energy Flexibility to Local Distribution Grids **Zahid Ullah**, Nayyar Hussain Mirjat Institute for Globally Distributed Open Research and Education, UK

PRESENTATION ABSTRACT

Session 1: High Voltage Transmission and Insulation Technology

P1023	Due to the loop distance of double circuit transmission line on the same tower is small, the electromagnetic coupling and electrostatic coupling between the power failure line and the running line are greatly enhanced, and higher induced current and induced voltage are generated on the power failure line. At the same time, the line is erected without transposition, the line's three-phase parameter is asymmetrical, and the induced current and induced voltage show obviously phase separation characteristics. The paper apply transient simulation software EMTP to simulate the induced current and induced voltage under different line lengths, transmission power flow and phase sequence arrangement, which provides a reference for the design, planning and operation of 500kV double lines on the same tower in the regional power grid.
P1070	For non-thermal food processing utilizing underwater shockwaves, this paper presents a stacked Cockcroft-Walton voltage multiplier (CWVM). By converting 220 V ac and 50 Hz inputs, the proposed multiplier generates more than 3.5 kV dc output. To generate 3.5 kV at high speed, conventional multipliers connect some voltage multipliers in series. Hence, the conventional multipliers suffer from high voltage stress on circuit components. To solve this problem, we design a novel high voltage multiplier by employing stack topology. By stacking CWVMs, the proposed multiplier can achieve high voltage gains with low voltage stress. The characteristics of the proposed multiplier are demonstrated by theoretical analysis and simulation program with integrated circuit emphasis (SPICE) simulations. The SPICE simulations demonstrated that the proposed multiplier can achieve high voltage gains as well as high speed operation and low voltage stress.
P1032	As the core of the secondary part of the HVDC transmission system, HVDC protection is the first line of defense for the safe and reliable operation of the HVDC transmission system. Its reliability directly determines the safety of the HVDC transmission equipment and the stable operation of the power grid. Therefore, it is necessary to evaluate the reliability of the HVDC protection system. Based on the operating data of the converter station, this paper puts forward relevant evaluation indicators, and uses the mixed weighting method of interval analytic hierarchy process and interval entropy weight method to evaluate the converter station's HVDC protection system and protection equipment. The evaluation results qualitatively and quantitatively judge the operating status of the equipment and verify the effectiveness and feasibility of the method. Using this method can scientifically and reasonably evaluate and analyze the operation of the HVDC protection system and various equipment, and judge the operation status of various equipment. This method can provide important guidance for the selection of new station equipment, the operation, maintenance, and overhaul of the HVDC transmission protection system of the converter station.
P1029	For light emitting diode (LED) lighting applications, a novel hybrid LED driver with high voltage gains is proposed in this paper. Unlike existing LED sink drivers with series-connected structure, the proposed driver has the switched-inductor and switched capacitor (SISC) topology combining with an SI buck-boost converter and a nested-type SC converter in parallel. In the proposed topology, the LED cathode and anode are connected to the SI buck-boost converter and the nested-type SC converter, respectively. The characteristics of the proposed topology are analyzed theoretically. Furthermore, the validity of the proposed topology is confirmed by simulation program with integrated circuit emphasis (SPICE) simulations and breadboard experiments. The SPICE simulations and experiments reveal that the proposed driver can achieve high voltage gains and flexible controllability of outputs.

P1068	Nowadays, under-voltage load shedding (UVLS) schemes in China's regional power grids are often drafted according to one certain operating mode, and then been chosen by experienced technicians based on comparison between simulation results on various operating modes. This process seriously depends on the skill and experience of the technician, and cannot guarantee the safety under some circumstances. Considering the above issues, this paper proposes a configuration method of UVLS applying to distributed control systems, and an automatic scheme formulating process. Specifically, aiming at developing a strategy suitable for multiple operating modes, Analytic Hierarchy Process (AHP) is introduced to obtain the fuzzy comprehensive sensitivities of the buses. The transient voltage stability of a regional power grid is investigated and the UVLS strategy is studied, which indicates the validity and practicality of the proposed configuration method.
P1071	In order to improve the reliability of power supply and reduce the failure rate of switchgear, this paper designs a new reliable and safe modular high voltage switchgear. An electric field and temperature field simulation model is established to check the insulation and temperature rise performance of the new designing switchgear. The electric field simulation results show that the place where there has connection or corner has strong chance to occur partial discharge. The heat field results reveal that even in the condition of passing through current with long time, the maximum temperature rise of the switchgear is 55.9K and 48.7K respectively, which is lower than the standard design requirement 70K. Some measures can be taken to improve the insulation and temperature rise performance of the new switchgear, such as polishing the connection or using stainless steel at the top of the switchgear.
P1080	The health status monitoring of special transformers is of great significance to ensure the secure operation of the distribution network and the power quality of special transformer users. Given this background, an operation health status monitoring algorithm of special transformers is proposed in this paper based on balanced iterative reducing and clustering using hierarchies (BIRCH) and Gaussian Cloud methods (GCM). The algorithm is composed of two parts, i.e., the offline and online parts. For the offline part, the operating indexes of special transformers are extracted based on historical operating data, and Gaussian clouds of normal operating conditions of the special transformers are determined by BIRCH clustering and Gaussian cloud methods. For the online part, Gaussian clouds of real-time operating conditions of special transformers are determined by BIRCH clustering and Gaussian cloud methods based on real-time operation data. Then, the monitoring results of operating health status are determined by the distance between the standard Gaussian clouds and the real-time Gaussian clouds of special transformers. Finally, case studies for actual special transformers are performed to verify the proposed method, and the results show that the proposed model can effectively identify the abnormal operation of the special transformer.
P2006	This paper presents a ultra-wideband (UWB) bandpass filter (BPF) with a controllable notch band. The proposed BPF covers a bandpass frequency area from 3.1 to 10.6 GHz. Which is consists of a main transmission line with characteristic impedance 50 Ohms, and five loaded short-/open-circuit lines. Hereinto, one shorted-circuit stub is used to achieve low frequency stopband and cut-off frequency stopband, and other four open-circuit stubs are utilized to realize the target notch band and to optimize high frequency stopband performance. To obtain a certain notch-band bandwidth, two stubs working for notch band are designed with adjusted gap distance to couple with each other. Based on theoretical analysis, simulation by HFSS tool and optimization, an UWB BPF with one notch band bandwidth from about 4.94 to 6.38 GHz with -10 dB is established to cover bandpass domain from 3.1 to 10.6 GHz. Analysis and simulation data are in good agreement, the design method is verified well.

PRESENTATION ABSTRACT

Session 2: Power Failure and Maintenance

P1050	In order to improve the reliability of the system, a dual-redundancy brushless DC motor is designed. According to the structural features of dual-redundancy brushless DC motor, the mathematical model is built up. Methods of motor fault detection are studied. The fault signal is analyzed by Fourier transform. For the deficiency of Fourier transform, a fault detection using wavelet transform method is proposed. The current is determined to the fault detection signal based on the motor fault tree. The coif5 is selected as the wavelet basis function. Through the analysis of motor failures, the characteristics of the winding open circuit, a phase with Hall for high and low are obtained by the coif5 wavelet function. The fault feature vectors are obtained by the layer 2 decomposition coefficients. The experimental results verify the effectiveness of the method.
P1074	Advances in wireless power transfer technology provide the possibility to construct electrified roads and charge electric vehicles driving on the road. Dynamic charging mode enables the contactless interaction of electric vehicles with the power grid and has a promising prospect, but it may also bring about potential challenges to the power grid such as reliability deterioration. Electric buses serve as the forerunner to use this new charging mode due to their fixed driving patterns. Thus, it is needed to investigate its potential impact on power distribution system reliability. In this paper, first, the electric bus dynamic charging model is constructed, and then the impacts of this model on power distribution system reliability are studied. Simulation results indicate that compared with the non-dynamic charging mode, the electric bus dynamic charging mode does not cause additional deterioration to the reliability performance and has a slightly better effect.
P1089	To optimize the energy structure, smart grids are constructed rapidly. The optimization of the power consumption information acquisition system helps to eliminate outages caused by device quality failures, and makes the processing of outages more efficient. A reasonable outage reporting strategy can detect and handle outage faults on the low-voltage side in time, reducing the safety threats to people and devices caused by continuous faults. Therefore, given all the technical means mastered and the shortcomings of the original outage analysis strategy, an outage judgment strategy is established in this paper to make outage judgments for each level. First, the outage judgment strategy of the collection devices is used to analyze the information about outages reported by the collection devices (i.e., special transformer terminals, public transformer terminals, type I concentrators, type II concentrators, and smart meters), and create corresponding outage analysis units; Second, the outage judgment strategy of the outage analysis unit is used to determine the area where outages occurred. A display interface of the master station is designed in this paper based on the function of the strategy. Combined with the results of the actual application, the outage judgment strategy analyzes and judges each outage faults. The outage area in transformer terminals, station areas, and low-voltage branch lines are determined and the corresponding alarms are sent to the emergency maintenance platform to realize power recovery.
P302	Fault identification and location of the multi-circuit transmission line can ensure the safe and stable operation of the power system. The existing contact method is difficult to install and maintain, and the cost is high. This paper proposes a novel non-contact fault identification and location method, which addressed the aforementioned limitations by using fewer magnetic sensors and making the method suitable for multi-circuit transmission lines. First, a magnetic array with fewer magnetic sensors is constructed based on electromagnetic effects, and a current reconstruction method is determined. Second, failure current characteristics have been

	determined. Then use the reconstructed current and magnetic field combined with the fault current characteristics to identify and locate the fault. Finally, the double-circuit transmission line was simulated on Ansys Maxwell and Matlab, and an experimental platform was established to verify the effectiveness of the method.
P1045	For power system disaster prevention and mitigation, preparing for the deployment of disaster response crew in advance have important scientific significance and engineering value. This paper proposes an optimization model of power emergency repair path under typhoon disaster. It aims to deploy the repair team in advance based on the advance prediction of the power outage. First, the random forest algorithm is used to predict the number of outage users. Then, the genetic algorithm is used to optimize the repair route according to the damage degree. Finally, taking Xuwen County, Guangdong Province, China as an example. And the results show that the optimization of the repair path can help to choose the appropriate compromise solution. The results show that the strategy can improve the user-side objective by 4.12% and the grid-side objective by 23.84%.
P1006	X-ray imaging is proven effective in the visualization of defects inside the Aluminum Conductor Composite Core (ACCC) wires. Although object detection pipelines have been extensively considered in the nondestructive testing tasks, the difficulty in obtaining defect samples has become the main obstacle to the application of such methods in the task of automatic defect detection for ACCC wire X-ray images. In this paper, we conducted a new semi-supervised approach based on anomaly detection. Different from the commonly used supervised methods, the proposed method requires only samples without defects for the learning process, therefore we are no longer limited by the insufficient and unbalanced defect samples. Experimental results show that the accuracy of the proposed method is up to 0.761, which proves the effectiveness of the method in the automatic defect detection of ACCC X-ray image.
P1065	The effective assessment and prediction of the defect state of transmission lines can provide important technical support for the maintenance management of transmission lines. This paper proposes a method of correlation factors analysis and prediction for transmission line defect state based on association rule mining and RBF-SVM since the single operation parameter is often used in the analysis and prediction of transmission line defect state, and ignoring the influence of internal and external factors such as the meteorological conditions, operating conditions, etc. Firstly, according to the defect state assessment of transmission lines, based on the existing data, a characteristic library of the defect state and correlation factors is constructed by considering various relevant influencing factors. Then FP-Growth algorithm is introduced into the association rules mining, which can find the internal and external factors that have a strong association with defect, and the association rules can be used as the input feature of the prediction model, so as to avoid the influence of low association factors on the accuracy of defect state prediction. Finally, RBF-SVM was used to predict the defect state, and have a better prediction accuracy compared with three commonly used methods of the linear SVM, ANN and the decision tree. The proposed approach is illustrated by predicting the defect state of an overhead transmission line in a certain area. The results verify the effectiveness of the method and provide a certain reference for the maintenance of the transmission line.
P1002	Integrated energy service is the main form of future energy supply. Integrated energy optimization and integration can make full use of distributed energy and renewable energy. In this paper, a set of low-latency integrated energy conversion equipment with electricity as the core have been designed to meet the comprehensive energy requirements of electricity, cooling, heating, hot water, etc. The distributed photovoltaic power generation, micro-turbine combined heat and power, electrochemical energy storage, hot water storage tanks, electric auxiliary heat, ground source heat pumps and multi-port power converter were integrated with low-latency fast local communication to achieve the coordinated control between energy

	portfolios. And with the lowest operating cost, maximum renewable energy utilization, and highest energy utilization efficiency as the control objects, uses power electronics converter millisecond-level high-speed response performance and inertia controllability, to support the conversion of single energy flow to multi-energy flow, ensure the reliable, economical, efficient and green operation of the user's integrated energy system, realize multi-energy complementation, and energy cascade utilization.

PRESENTATION ABSTRACT

Session 3: Electronics and Electrical Engineering

P1007	The three-phase unbalanced load has great influence on the safety and economy of distribution network. Aiming at the status quo, a new control method considering load-electricity transfer index proposed in this paper, based on the analysis of three-phase unbalanced control measures. The reference phase sequence is defined, and the load transfer index are proposed. On the basis of load transfer index, considering the conversion relationship between load and electric quantity, the electric quantity transfer index is put forward. Taking electric quantity transfer index to select balanced load and phase sequence, in order to realize the treatment of three-phase imbalance. Taking a real distribution network as an example, the method presented in this paper are simulated. The results show that it performs effective in improving power quality of distribution network.
P1062	The switching frequency of traditional active power filter (APF) is usually between 10 kHz and 20 kHz. To better suppress switching subharmonics, the output filters of APFs usually use LCL-filters. However, LCL-filters not only have complex parameter design but also introduce resonance points, which complicate the design of the circuit and control algorithm of APFs. In this paper, SiC-MOSFET is used as the power device of APF, the switching frequency of APF is increased to 50 kHz. In this case, using L-filter instead of LCL-filter can also suppress the switch subharmonics to a smaller level, which simplifies the circuit design and control algorithm design at the same time. In addition, when the sampling frequency and switching frequency are higher, the sampling points and switching times in a power frequency cycle increase exponentially, so the accuracy of harmonic extraction and output current control will be higher. Then, the common harmonic extraction algorithms of APFs, sliding window discrete Fourier transform (SDFT) and current control algorithm, repetitive control (RC), are analyzed in the frequency domain. A modified half-cycle SDFT and half-cycle RC are proposed, which reduces the inherent delay of the algorithms by half, and reduces the dynamic response time of APFs from two to one power frequency cycle, thus improving the dynamic response performance of APFs.
P1035	With the increase of the load, the proportion of receiving power and the proportion of new energy generation, the imbalance of power flow which is the mismatch between the line power flow and the current-carrying capacity becomes more and more serious in the process of power grid operation, resulting in the low operating efficiency of power grid assets. The Distributed Power Flow Controller (DPFC) is adopted to control the power flow, which has advantages of small size, light weight and low cost, etc. This paper introduces the working principle and development trend of DPFC and the configuration of DPFC in Gan Quan – Xiang Fu 220kV line in Huzhou. Finally the simulation results is given to prove that DPFC can cooperate with AC line to operate stably.
P1086	Nowadays, the valid development and full utilization of renewable energy sources such as wind power and solar energy are considered to be one of the most significant approaches to get rid of the energy dilemma and realize environmental governance. However, although there are more and more renewable power sources connected to power systems, the renewable energy has not been fully used yet. In this context, an optimization model for the regional power system with the pump storage power, wind, hydro, and thermal power is proposed to enhance the economy, environmental protection, energy-saving and stability of the power system. Besides, the fuzzy chance constraint programming and the improved analytic hierarchy process are used to deal with the uncertainty of the wind power and the load demand and the multi-objectives function, respectively. The case study not only verify

	the effectiveness of the proposed model but also shows that better comprehensive performance of the power system can be achieved through the proposed model when considering the effect of the pump storage power.
P2005-A	Commutation failure is one of the most common faults in line commutated converter based high voltage direct current (LCC-HVDC). In recent years, with the rapid development of new HVDC transmission projects and renewable energy power generation in China, strong DC and weak AC has been a typical feature in power system. For inverter station, the weak receiving grid cannot provide the same level in commutation voltage support compared with the strong receiving grid under the AC fault. And the influence of dynamic process in control system on commutation process may be more obvious when LCC-HVDC is connected with weak receiving grid. According to current situation and future development trend of Chinese power system, there is realistic value to study the influence of the receiving grid strength and the dynamic process of control system under the weak receiving grid on the commutation failure. As an important part of inverter control system, phase locked loop (PLL) measures the reference information of the ac grid voltage phase at the receiving end for the valve control system to generate pulse signal for thyristor. Although the PLL is located in the last stage of the control system, its dynamic process will directly affect the commutation process of the thyristor in converter. This is one of factors in control system may cause commutation failure in inverter station. Consider the mechanism of PLL, it will go through a tracking process if the phase of receiving grid changes. In this process, valve control system cannot get real phase of receiving grid from PLL in real time. More importantly, PLL is a nonlinear system when analyzing commutation failure, so it's hard to calculate a mathematical formula for its tracking process. After introducing the role and characteristics of the PLL, the effect of phase error from PLL on the extinction angle is analyzed. The LCC-HVDC detailed model established in PSCAD/EMTDC is used to test the impact of the tracking process of PLL on the commutation failure under different PLL parameters and the influence of different end-grid strengths on the commutation failure.
P1115	The orderly release of electricity plan is an important measure for China's electricity market reform which also lead to excessive pressure for coal power units caused by the low planned electricity quantity. Allowing high-priced units to participate in the market can effectively alleviate the market pressure. However, the participation of high-priced units in electricity market will have an impact on the declaration behavior of other generators. In this context, an evolutionary game model of bidding for two groups of generators considering the market liberalizing degree (MLD) is proposed. Above all, the profit model of two kinds of generators is proposed under two bidding strategies considering the MLD. On this basis, an evolutionary game model of generators' bidding is built to qualitatively analyze the market equilibrium solution which is affected by the MLD coefficient. Thus, the expected evolutionary stable equilibrium of bidding can be formed spontaneously in electricity market by adjusting the MLD coefficient. The case studies are performed for demonstrating the proposed evolutionary game model of generators' bidding, and simulation results show that different MLD and the initial state of bidding behavior of generators will influence the final evolutionary stable equilibrium of bidding market, and it also shown that the government can make the electricity market develop toward the expected state by adjusting MLD and supervising the bidding behavior of generators.
PEEE20-207	In this paper, a small signal model based on droop controller is established for the self-synchronous voltage source parallel system. The influence of droop coefficient on system stability is analysed, and the constraint conditions of droop coefficient are given. Based on the analysis of the parallel system of self-synchronous voltage source inverter, a multi-machines parallel control scheme of self-synchronous voltage source inverter is

	formulated. The model and test platform are built to carry out the parallel simulation and experimental verification of distributed line impedance parameters. Simulation and experimental results show that the proposed control strategy can achieve good dynamic and steady-state power sharing.
P2004	Key green power indicators are information which can intuitively reflect the status of green power construction in a region. Selecting reasonable key indicators will help to identify week link the development of green power, and promote the development of clean energy and power systems. A multi-dimensional quantitative analysis method for key green power indicators is proposed in this paper. First of all, this paper designed a set of indicators starting from the different links of power supply, grid and load. The indicator set includes three dimensions: green power development, green energy sharing and green power living, and the selecting method key green power indicators is established. Then, from the aspects of indicator score and indicator weight, a model for quantitatively evaluating the development level of green power was constructed to analyze the development week link of green power. Finally, the effectiveness and feasibility of the proposed method are verified by using the indicator data of Qinghai Province. Qinghai's green power development level and development trend are quantified. The development balance of different links of green power was analyzed, and the constructed indicators are used to obtain the weak links of Qinghai's green power development. The calculation examples show that the evaluation and analysis method proposed in this paper can help to quantify the level of green power development and guide the coordinated development of various construction parts.

PRESENTATION ABSTRACT

Session 4: Power Electronics and Transmission Technology

P1022	A straightforward and fast transient temperature rise calculation model is necessary for electrical engineers to manage power cable load. A self-heating lumped parameter model (LPM) without the requirement of monitoring cable surface temperature is developed to evaluate the real-time transient temperature rise of the power cable in ducts. A mutual-heating lumped parameter model to describe the mutual heat interaction between any two cables is proposed in this paper as well. The transient temperature rise of any power cable in duct is the sum of the self-heating temperature rise and the mutual-heating temperature rise from all the other power cables in ducts. All parameters of these two models are obtained by transient thermal circuit analysis, CYMCAP calculation results and generic algorithm. A case study has been conducted to verify the feasibility of the proposed LPMs and the self and mutual temperature rise for each cable in ducts have been obtained. These results agree with the accurate data obtained from CYMCAP well, indicating that LPM can be used as a fast and straightforward tool to calculate the transient temperature rise of power cables in duct.
P1027	The wireless power transmission (WPT) system for electric vehicle charging has the advantages of being safe and reliable, without plugging and unplugging, but the random misalignment between the energy transmitting coil and the energy receiving coil will cause uncertain disturbance to the transmission power and system performance. Therefore, it is necessary to improve the robustness of the wireless power transmission system. This paper designs a TUBE model predictive control (TMPC) to make the system converge to the desired value along the reference trajectory. To reduce the difficulty of solving the reference trajectory, the idea of segmented optimization is adopted. State feedback is presented to further enhance the system's anti-disturbance ability to increase the system transmission power. Moreover, the compensation for the sampling delay of the controller is proposed to ensure the stability of the control system. Experimental results demonstrate that, compared with traditional predictive control, the proposed TUBE MPC based on state feedback control strategy can increase the transmission power of the system by about 10% under uncertain misalignment.
P1098	AC/DC hybrid power supply will become an important form of power distribution in the future. Its simulation are the indispensable means for AC/DC power system research and related equipment/system development. This paper proposes a concept of AC/DC power system simulator, expounds the digital simulation platform and physical testing platform. Based on this, the paper focuses on the physical testing platform, and proposes corresponding simulation schemes including AC/DC flexible interconnection simulation, DC/DC flexible access simulation, and coordinated operation strategy. The corresponding tests reveal the effectiveness and feasibility of AC/DC power system simulator.
P1048	The internal parameters and topology of the power converter are unknown in some practical cases. Existing modeling methods based on impedance frequency scanning method can only guarantee that the dynamic modeling is effective at a single working point. To make the established dynamic model effective in a wide range, an equivalent modeling method for power converter based LSTM Neural Network is presented. At first, the equivalence of black-box modeling problem and deep loop neural network is studied. Then, dynamic modeling method black-box power converter on wide operating range by using LSTM neural network is proposed. Finally, the simulation results under large disturbance and multi-operating points show that the proposed method is effective under wide operation range.

P1051	As a important technology in the grid-connected devices application field, grid synchronization technique is widely used in distributed generation and power quality control. The synchronous reference frame phase-locked loop (SRF-PLL) has become a widely used method in grid synchronization technique for its simple structure and strong stability. However, the conventional SRF-PLL has insufficient capability to suppress DC offset, which easily causes fundamental frequency and phase oscillations. In order to solve this problem, this paper proposes a novel generalized integrator(NGI), and based on the NGI, a modified novel generalized integrator (MNGI) that can eliminate DC offset voltage is proposed. Then a novel PLL based on dual MNGI(DMNGI) is proposed. This method improves the capability of the phase-locked loop to suppress DC offset. At the same time, this paper designs the parameters of the PLL, and the rationality of the proposed PLL is verified through the experimental comparison with the other two methods.
P1104	The work presents a novel pixel circuit which breaks the constraint that the PWM driving method combined with internal compensating is unable to achieve the high-bit display. By adding another TFT to transform the equal division of PWM into unequal division subfield, the bit of a 10 row panel based on 240 Hz is greatly improved from 3 bits to 8 bits, which is a great breakthrough for bits improving in the driving field of PWM and internal compensating. Furthermore, simulation results of the original 6T1C circuit and revised 7T1C circuit demonstrate that the current error ratio is almost the same, indicating that this revising 7T1C circuit is suitable for bits improving without sacrificing the circuit margin.
PEEE20-210	Minimise dependency of energy from depleted non-renewable had pushed the usage of electric vehicle (EV). However, the presence of charging station (CS) may cause another impact such as higher power loss, especially involving uncoordinated CS. The impact becomes vital when the numbers of CS to charge the EV increased dramatically. From research, CS at residential usually operated during off-peak load. Furthermore, the variation of the charging pattern that difficult to perceive had added severe condition. Thus, the exploration of the mitigation method is necessary to avoid the stress at the existing distribution network. This paper suggests a coordinated method based on the power loss forecast throughout the charging time. The method will prioritise the buses based on power loss impact on the network, which later to determine the suitable numbers of CS operation. The approach considers customer satisfaction to charge the EV at a specific duration fully. Thus, to present the effectiveness of the approach, the analysis conducted using a suitable distribution system with residential block. The results show a positive outcome in enhancing distribution power loss without interrupt customer satisfaction. The method is suitable to deal with many CS that operates simultaneously during off-peak load.
PEEE20-426	Transit Oriented Development (TOD) areas are locations that have limited land area. Solar PV systems are planned to be installed in these areas to support electric vehicles such as e-scooters, electric cars, motorcycles, and buses. However, solar PV systems in general require a large land area. The purpose of this paper is to find out and compare the Performance Ratios (PR) of a solar PV system installed on the rooftop with a floating solar PV system installed on the lake to determine which solar PV system fits better for TOD areas. PR analysis uses two methods, PVSyst software simulation and is validated using mathematical calculations. The result of the PR of floating solar PV is 76.39% using PVSyst simulation and 80.24% using mathematical calculation. Meanwhile, the PR of rooftop solar PV is 82.69% using PVSyst simulation and 73.41% using mathematical calculation. The significant factors that influence PR value are the energy produced by the solar PV system, its losses, and albedo value of the reflector surface for bifacial solar PV. Albedo value has to be maximized in order to obtain a higher performance ratio value. Based on this study, both rooftop and floating PV systems are equally suitable for TOD areas.

PRESENTATION ABSTRACT

Session 5: Energy and Electrical Equipment

P1016	A distributed integrated cooling system, including cold supply and cold storage, can store cold energy during the valley electricity period and release cold energy during peak electricity period, thus effectively realizing cutting peak electricity loads can achieve higher economic performance and capacity factors. However, a distributed integrated cooling system's planning suffers from lacking systematic guidance in planning and optimal operation. This paper presented an efficient analytical planning method considering cutting peak electricity power and the corresponding compensating cost and inducted the condition of applying an integrated cooling system. The critical operating electricity price and economic equilibrium electricity price are presented as two indexes to evaluate the economic condition of operating and constructing an integrated cooling system. The analytical planning model is validated to be exact and efficient by the numerical simulation due to less iteration. The planning results show that a distributed integrated cooling system is fully utilized during a year, but the relative ability to cut peak electricity load decreases with electrical loads. Because the compensating cost is lower than the price differences between peak and flat-peak electricity prices, which is cheaper than a battery, a distributed integrated cooling system is a cost-effective technology for cutting peak electricity loads.
P1082	Formulating a reasonable energy-saving strategy for Bed and Breakfast (B&B) can effectively reduce the operating costs, increase the revenue and achieve sustainable development. Given this background, a fuzzy evaluation-based energy-saving rating method for B&B is proposed in this paper. Four energy-saving indexes are determined for different loads of B&B. Then the weighting method of the indexes based on deviation degree is presented. Finally, the energy-saving rating method of B&B based on the principle of maximum membership is proposed. A case study of B&B in Anji, China is employed to demonstrate the proposed rating method. This case analyzes and determines the overall energy-saving grade and weakness of the B&B. The result shows that the rating method proposed is more theoretical and the rating result is more reasonable and comprehensive.
P1053	This present study investigates the effect of adding a porous medium to the hot surface of a system for thermoelectric power generation (TEG). The thermal efficiency, electromotive force (e.m.f) and output power for TEGs with and without porous media are compared. Four TEG modules were connected in series and connected to an electrical data logger. The hot side of the TEG was covered by a parabolic dome and along the hot surface of the TEG there were placed various porous media: fine sand, coarse sand, and crush stone. The cooling side of the TEG modules was set on a heatsink and floating in water. The results of the maximum temperature difference between the two sides of the TEGs increased by 30.23% for fine sand, and 34.88% for crush stone compared to the temperature difference without porous media. The porous medium of crush stone shows the maximum temperature difference of 5.8 oC and the e.m.f of the system is increased to a maximum of 209 mV or increases about 16.11% over that without porous media.
P1040	Ontario Hydro method had been applied in site test of flue gas mercury form and concentration in front of and behind denitration facility, dust removal facility, wet flue gas desulfurization facilities in nine typical coal-fired units. Meanwhile, mercury content in coal, fly ash, slag, desulfurization gypsum and wastewater was tested. Influence of coal-fired power plant regular flue gas pollutant purification facilities on mercury transfer and emission characteristics was observed. The results show that clean flue gas of coal-fired power plant is mainly composed of gaseous mercury, and mercury emission concentration in different units

	has very large difference. In addition, Hg0 and Hg2+ account for different proportions. SCR denitration facilities have insignificant removal effect on mercury, whereas promoting oxidation of mercury in element form, thereby producing huge influence on mercury emission characteristics. Emission characteristics of dust removal facilities on mercury are embodied on synergistic removal on mercury in particle form with average mercury removal efficiency of 41.6%. Emission influence of wet flue gas desulfurization facilities on mercury is embodied on synergistic removal on gaseous mercury with average mercury removal efficiency of 36.8%. Mercury is transferred from flue gas to fly ash, desulfurization gypsum and other solid products through control by regular flue gas purification facilities. Influence of mercury on solid products, mercury stability on the solids and the second mercury pollution are worthy of attention.
P1061	It is necessary to design a heat sink according to the losses of chips in the application of power chips to maintain the temperature of the chip junction at a low level. Since multiple power chips are distributed on the same heat sink, the surface temperature of the heat sink is unevenly distributed, the chips located at the air outlet need to withstand higher temperatures. In order to describe the surface temperature of the heat sink accurately, a novel comprehensive thermal resistance of the forced air cooling system for multi-power chips was proposed. A temperature rise test by a static var generator (SVG) prototype was designed to prove the accuracy of the model proposed. The thermal resistance error of the model proposed in this paper is only 2%. Comparing with two traditional thermal models, the accuracy of the novel thermal resistance model is improved by more than 20%.
P1111	In order to improve the reliability of the shunt active power filter(SAPF) system, the fault-tolerant control strategy of the system is studied in this paper. A fault-tolerant control strategy based on improved switch redundancy is designed inside SAPF system, and fault-tolerant is achieved through circuit reconstruction. Then the operating mode and voltage vector characteristics of the fault-tolerant topology are analyzed, and the corresponding SVPWM control algorithm is derived. Finally, experiments verify the practicability and effectiveness of the SAPF fault-tolerant control method proposed in this paper.
P306	In order to analysis the small signal stability of the direct-drive permanent magnetic synchronous generator (PMSG) based wind farm, this paper makes a small signal model of the windfarm including a detailed model of PMSG adopting a component connection method (CCM). In the process, the system, consist of wind turbine units with PMSG, collection cable, feeder, transmission cable and gird side, is divided into several subsystems. The interconnection between different subsystems is represented by a linear algebra matrix. Then, through integrating the model of each block and the interconnection matrix, the state space matrix of wind farm can be easier to be built. Based on this model, eigenvalue trajectory is applied to analysis control parameters of the wind turbines to achieve better dynamic performance of the system. A simulation model based on MATLAB/SIMULINK of a two by two wind turbines (WT) wind farm is presented as a test system to validate the effectiveness of CCM.
P1084	In the process of electric energy substitution, many industries have gradually replaced the traditional energy consumption equipment with new electrical ones. To avoid the disadvantage of one-sidedness in equipment evaluation and provide a more comprehensive reference for enterprises to replace equipment, a two-dimensional evaluation model composed of static and dynamic rating model is proposed in this paper based on combined weighting and rating algorithm, considering the comprehensive performance in both the inherent properties and the actual power consumption features of electrical equipment. The static and dynamic parameters related are firstly extracted, and then the weights of

parameters are determined by the analytic hierarchy process (AHP) subjective weighting algorithm and principal component analysis (PCA) objective weighting algorithm. To compare the performance of different equipment more intuitively, the rank sum ratio (RSR) and technology for order preference by similarity to an ideal solution (TOPSIS) are used to rate the static and dynamic scores, respectively. Case studies for different types of electrical tea dryers in Anji, Zhejiang Province, China, show that the proposed evaluation model is more comprehensive and the rating result is more reasonable, which helps the enterprises have a more comprehensive understanding of the electrical equipment performance.

PRESENTATION ABSTRACT

Session 6: Electricity Demand and Market Strategy

P1069	Residential electricity consumption accounts for almost one third of the total. Occupant's indoor activities will highly affect the electricity use pattern. This paper presents a cooperative particle swarm optimization algorithm to optimize residential schedules of controllable devices considering user's indoor activities. First of all, Markov Chains are employed to model occupant's behaviors, in which the American Time Use Survey data are used to generate transition matrices. Then, engineering models of electric appliances are established and electricity consumption is able to be simulated by corresponding people's activities to common electricity usage. Finally, a cooperative particle swarm optimization algorithm is employed to optimize appliance's schedules. Experiments are conducted. The results indicate that peak loads can be shaved, electricity bills can be decreased by 3.1%, and a reduction of 5.9% of total power can be reached by optimizing high-resolution residential demand.
P1102	With the rapid development of clean energy such as wind power and nuclear power, the operation of nuclear power units with base load will bring huge peak load regulating pressure to the local power system. In order to use more regulation resources, a multi-area joint optimization model considering peak load regulating of nuclear power is proposed. Based on the output characteristics of wind power and nuclear power, the matching of peak load regulating of wind power and nuclear power is analyzed, and the method of subdividing the peak load regulating depth of nuclear power is proposed to linearize the constraint of nuclear power. Considering the power constraints of AC/DC transmission channel, wind curtailment cost and peak load regulating cost of nuclear power, a joint scheduling model with complementary energy sources in multi-area is established, which can effectively reduce the impact of reverse peak load regulating of wind power and improve the clean energy consumption. The effectiveness of the proposed model is verified by a practical example of an inter-regional interconnected power grid system in China.
P1076	Because of the energy supply of the offshore oil platforms mainly relies on the supply of gas turbine, the development of renewable energy will become a rich energy supply for offshore oil platforms and a reliable way to improve the stability of the grid of the platforms. This paper developed the simulation model of offshore oil gas turbine platform power grid, simulated the hybrid power grid structure, the energy storage of frequency regulation, high wind power penetration rate, wind power and gas turbine power frequency stability and fault treatment. The method of increasing renewable energy penetration rate was proposed, and the hybrid energy coordinated control strategy of offshore oil platform was also carried out. Based on the weakly connected distributed offshore oil platform power grid project, this paper studied the influence of wind power and turbine power penetration rate on the power grid, in order to explore, determine and verify the limit of high wind power penetration rate under the condition of "large generation machine and small grid". The simulation experiment of high wind power penetration rate under the condition of different load conditions and different wind speed limits were discussed, on the basis of research the influence degree of the stability of power grid frequency of low wind power swings, as well as to the wind power is given priority to with gas turbine mainly in both cases the advantages and disadvantages of the grid system, and attempt to put forward the corresponding switch control strategy.
P1103	Focusing on the issue of significant randomness and low latitude of short-term household electrical load data, this paper proposes a novel short-term load multi-step forecasting method based on long-and short-term time series network (LSTNet). First of all, massive

	historical load data as input by constructing a continuous feature map of time sliding window. Secondly, convolutional neural network (CNN) and long short-term memory (LSTM) are used to capture temporal short-term local information and long-term related information respectively, and autoregressive (AR) models are used as linear components. Then, the models will be evaluated using a scheme called walk-forward validation, and the average absolute percentage error (MAPE) and root mean square error (RMSE) are used as accuracy evaluation indicators. Finally, the four-year electric load data of a family in Paris, France is used to verify the proposed method and comprehensively compare the proposed method with the three most popular load forecasting algorithms. The experimental results show that in the prediction results for the next week, the MAPE and RMSE of the prediction method proposed in the paper are smaller than those of other algorithms, which can more effectively express the time series relationship of household short-term load and have higher prediction accuracy.
P305	A large number of simulation results will be generated during the calculation of the power system digital simulation. Manual analysis of massive numerical results is inefficient and error-prone. Besides, some imperceptible operating rules of power system operating mode may be ignored. In order to solve these problems, a transient stability assessment method based on deep learning is proposed in this paper. By analyzing simulation data, the relationship between power grid stability characteristics and the set operation mode is constructed. According to these research results, the calculation and analysis of power system transient stability will be effectively supported.
P1105	The increasing of distributed energy and flexible load incentivize market participants to participate in a more active market. A coordinated peer to peer (P2P) trading model with an aggregated alliance and reserve purchasing is proposed in this paper. Under such a coordinated trading model, the market participants form an alliance, where the agents perform aggregated alliance and purchase reserve from a mobile energy storage supplier. To reduce the risk of deviation penalty in P2P trading, the agents seek to maximize the welfare of the entire alliance in the P2P process, while considering product differentiation and deviation risks. The proposed trading model design comprises: i) a coordinated P2P market design with the aggregated alliance and reserve purchasing, ii) a two-stage P2P market-clearing model to maximize trading utility while reducing the risk of deviation. To solve this two-stage multivariable coupling problem in a distributed way, we propose a primal-dual based ADMM method. Through the case study, compared with the traditional P2P trading model, the proposed market model can reduce the deviation penalty and improve the comprehensive welfare, while the convergence can be effectively guaranteed.
P301	With the development of the wide-area power systems, time delays, including inherent and malicious network attacks time delays, are introduced into control signal communication channel, which jeopardize power system operation, control and protection. To eliminate the threats, state estimation was used to monitor the power system operating state. However, traditional state estimation methods are difficult to carry out due to the time delays have randomness. Therefore, a dynamic state estimation (DSE) method for power system based on delay and its stochastic characteristics was proposed in this paper. First, dynamic equations of important components, such as generators, exciters and power system stabilizers (PSSs), are introduced to describe complex power systems. In order to facilitate the use of Kalman filter (KF) methods, the power system state equations are discretized. Then, the correlation between stochastic delays and power system operating state indicated by neural network (NN). On the basis of the correlation, a KF method combined with NN has been proposed to adapt to the power system with stochastic delays. Finally, to verify the effectiveness of the proposed method, simulation experiments has been carried out on an actual power system.

	The simulation results show that the proposed method performs well in monitoring generators' dynamic performance when the power system was disturbed by stochastic delays.
P1107	Feature selection is a powerful tool for choosing a feature subset of relevant attributes and has been widely used in many research fields, including power system. In this paper, we have introduced a two-step feature selection algorithm that combines the advantages of Grey Relation Analysis (GRA) and Binary Particle Swarm Optimization (BPSO) search method. The proposed method aims to solve the problem of massive-scale feature selection in power system and find these attributes which are highly related to the target power system scenario. This algorithm would eliminate some features based on GRA correlation coefficient in step 1, and the remaining features would accept further selection in step 2, in the meanwhile, the modified initialization rule based on GRA coefficient would be used to enhance the optimization speed and improve the performance of the final feature subset. The effectiveness of the selected feature subset is evaluated using the classification and prediction accuracy. After some experiments based on actual power system scenario data, our method has shown strong ability to find a subset with high classification accuracy and low dimension, while the predictor also has better forecasting performance when using the selected feature subset, which would help operators to judge the state of the power system, so that they could make some more accurate decisions to improve the safety and stability of the grid.

PRESENTATION ABSTRACT

Session 7: Smart Grid and Management

P1056	DC microgrids (MGs) are complex systems connecting a number of renewable energy sources to different types of loads based on distributed networks. However, the strong reliance on communication networks makes DC MGs vulnerable to intentional cyber-attacks. In this paper, a distributed attack detection scheme is presented for the DC MG system by proposing an observer. The proposed detector is able to detect attacks with only local knowledge of the overall DC microgrid system. By eigenvalue assignment method, the designed residual is decoupled from both load and neighbor voltage changes. Furthermore, an optimization problem is provided to increase the attack detectability of the proposed observer. The presented method is easy to design with less computation complexity. The performances of the proposed scheme are validated by numerical simulations and experiments.
P1001	With more and more applications of high-power PMSM in low-speed applications, the accuracy of the control system has also become more demanding.It is difficult to detect the position and control the speed of the motor according to the counter EMF because its amplitude is small.This paper adopts an improved high-frequency signal injection method and the filtering method of single synchronous shafting filter and PLL, a set of high-power sensorless AC speed regulating system is designed based on the NPC three-level back-to-back converter with IGBTs which improves the robustness and control accuracy of low-speed high-power PMSM.The experimental and simulation results show that the control system meets the design requirements of engineering application.
P1064	Reconfiguration is an important means to achieve optimal operation of the distribution network, but in actual distribution network operation, sectionalizing and tie switches are usually not switched frequently to adjust distribution network structure. In order to meet the practical application, this paper proposes a distribution network reconfiguration method based on comprehensive analysis of operation scenarios in order to find a reconfiguration solution with the best overall performance over a long term operating period. In this paper, different load combinations at each node of different time cross-sections in distribution network are regarded as distribution network operation scenarios. Firstly, the improved K-Means algorithm is used to cluster the operation scenarios of distribution network during the period to form typical operation scenarios, and the time share of each typical scenario in the entire time period is obtained. Then, the Time Interval Loss Index (TILI) is proposed to evaluate the total distribution network loss performance of reconfiguration solution in the entire time period, and then establish reconfiguration optimization model with this as optimization target, using genetic algorithm to optimize. Case study shows that the proposed method can adequately consider distribution network operation scenarios, and the overall network loss during time period is lower than the traditional reconfiguration method based on single operation scenario.
P1077	For three-phase grid synchronization applications, the performance of conventional phase-locked loop (PLL) is declined under unbalanced and distorted grid condition. To solve this problem, moving average filters (MAF) has been widely studied and utilized in PLLs in recent published literatures at the cost of slowing down the dynamic response. This paper proposes a paralleled filtering stage to improve the dynamic performance of PLL. The proposed filtering stage with smaller time delay is based on MAF and delay signal cancellation (DSC) operator and incorporated into quasi-type 1-PLL (QT1-PLL) structure. Compared with differential MAF-PLL (DMAF-PLL) and QT1-PLL, the proposed filtering stage based PLL can obtain a faster transient response without degrading phase estimation

	accuracy. The effectiveness of the proposed method is confirmed through experimental results.
P1079	More and more requirements for the operation of the rural power systems arised with the increase of type and capacity of the rural load in China. In fact, the economy, flexibility and stability of the rural power grid can be improved by an emergency demand response (EDR) mechanism, which can fast reduce distributed load considering consumers' satisfaction. An EDR mechanism for the rural power grid is proposed considering the characteristics of small distributed load capacity in rural areas. The optimal demand response model of diversified loads is built to maximize the utility of rural private industry. A bi-level optimization model is presented to minimize the deviation between the power shortage and reduced demand, considering the active demand response of rural consumers. Case studies are finally employed to demonstrate the effectiveness of the EDR mechanism for enhancing the security of the rural power system.
P1008	This paper proposes an online data splicing power flow analysis method based on sensitivity analysis. Since the step-down transformer in the whole network data is usually equivalent to the 220kV side, the equipment below 220kV is not modeled in detail, and the provincial network data is modeled to 110kV and 35kV voltage level equipment in detail. Different levels of modeling have a greater impact on the accuracy of stability analysis and calculation. Therefore, the purpose of improving data accuracy is achieved by splicing the entire network data (external network) and provincial network data (internal network). This paper is based on the sensitivity analysis method to stabilize the tie-line power by adjusting the output of the external network units, and form the whole network data that can accurately analyze the stability characteristics of the provincial network. The problem of power flow deviation caused by the voltage and angle deviation of the nodes at both ends of the regional tie line during the data splicing process is solved. Through the actual application of splicing the entire network and Hunan Provincial Network data, the effectiveness and necessity of the proposed method have been verified.
P1109	Multi-energy microgrid (MEMG) is a typical realization of multi-energy system. Its day-ahead dispatch is crucial for the economic operation of MEMG. However, previous research usually considered the efficiency of multi-energy coupling equipment in MEMG as a constant value neglecting the non-linear relationship of heterogeneous energy conversion. With this, day-ahead dispatch would result in inappropriate plans and further impair safe operation of MEMG. To deal with this challenge, this paper studies a novel day-ahead dispatch model for MEMG by considering variable operating conditions of multi-energy coupling equipment. Specifically, first, a novel day-ahead dispatch model of MEMG is proposed. The day-ahead dispatch model incorporates refined energy conversion constraints, and these constraints can capture variable operating conditions of multi-energy coupling equipment. Then, due to the non-linear terms with respect to variable operating conditions, a piecewise linearization method is utilized to transform the proposed model into a mixed-integer linear programming formulation. Finally, simulation results show that our approach can obtain a more reasonable day-ahead dispatch scheme with multiple advantages, such as improving the overall operating economy, avoiding multi-energy power curtailment, and enhancing the potential of demand response.
P1081	The connection relationship of distribution network topology is of great significance for the maintenance and fault diagnosis of distribution network, and scheduled power outage optimization. At present, the verification of topological documents mainly relies on on-site inspection, which consumes a lot of manpower and material resources and is inefficient. Therefore, an efficient method for topology verification of low-voltage substation areas is required. Given this background, a model for error correction and user access phase

identification of low-voltage stations based on multi-dimensional voltage data collected by smart meters is presented in this paper, which can provide a certain reference for topology identification and line troubleshooting of low-voltage substations. First, the t-Distributed Stochastic Neighbor Embedding (t-SNE) algorithm and the Principal Component Analysis (PCA) performs dimensionality reduction on the original load data to solve the problem of redundancy caused by the high dimension of the original voltage data set. Second, the Local Outlier Factor (LOF) algorithm is used to identify abnormal samples in the voltage data set. Then, the spectral clustering method is used to cluster the dimensionality-reduced load data to realize the phase identification of single-phase users in the low-voltage station area. Finally, the real data of a certain area in Haining, Zhejiang Province of China are used as simulation cases for demonstrating. The results of the case studies show that the model proposed in this paper is feasible and effective.

Session 8: New Energy Power Generation and Grid Connection Technology

P1047	To address the problem of disorder charging among electric vehicles(EVs), this paper proposes an optimal subsidy scheduling strategy for EVs. The strategy can decrease the fluctuation of the load of grids. Firstly, we use Monte Carlo approach based on historical data to simulate the charging behaviors of users. The simulation results are used to establish orderly charging model. Then, multi-beneficial model is established based on time of use (TOU) tariff. The multi-beneficial model can be optimized by using Particle Swarm Optimization (PSO). Next, a stimulus subsidy strategy based on Weber-Fechner Law could further improve users' satisfaction. Moreover, dynamic non-cooperative game simulation is used to adjust both the users and the girds' behaviors. By using the method of traverse, data including the optimal subsidy time and quantity can be obtained. In the end, the results of case study show that multi-beneficial benefit increases by 23.19% and the users benefit and the grid benefit increase by 1.33% and 21.86% respectively. This can prove that the strategy is beneficial both to the users and the grid.
P1055	The performance influence on the dual fuel engine by the intake/exhaust port flow coefficient and swirl are major factors to the dual fuel engine. Therefor the optimization of the intake and the exhaust ports was carried out to ensure the adaptability of the airway structure to the ACD320 dual fuel engine in this paper. According to the limitation conditions of the structural parameters, the multiple airways crossing the diameter of the intake/exhaust port were designed. The research on variation rules of flow and swirl characteristics in different intake/exhaust port circulation cross-sectional area by aerodynamics modeling and simulating approach to optimizing the matching degree between the cylinder and the intake/exhaust port of a marine dual fuel engine was presented. And the optimizing match results were verified and analyzed by the experimental results of the practical intake and exhaust port models. The influence on the performance by the intake/exhaust air flow area and the valve lift is analysed comprehensively by the AVL test results of the intake and the exhaust ports. The suction and combustion processes at different size of intake and exhaust port are simulated by AVL Fire to validate the optimum matching. Results show that the intake flow coefficient tends to be stable when the diameter of the intake port greater than 83 mm, the swirl number tends to be stable when the diameter of the intake port greater than 88 mm and the exhaust flow coefficient tends to be stable when the diameter of the exhaust port greater than 80 mm. Analysis show that the mean flow coefficient present optimum consequence when the diameter of the intake port is 88.6 mm. By analyzing and comparing intake airflow, efficiency, emissions and indicate power, the fifth group (intake port 88.60mm, exhaust port 80.00mm) matching is the optimum matching for ACD320 type marine dual fuel engine. The results provide reference for the design and optimization of dual fuel engine.
P1090	The load of the offshore oil platform is mostly pump unit, Asynchronous motor with cage rotor has simple structure , reliable operation, and inexpensive. But it has a huge shortcoming of its low effiency. When the output power is constant, improving effiency is to decrease loss of the motor. This paper discusses some methods of energy saving and low consumption of the pump unit to improve the efficiency. Direct drive pump can completely eliminate transmission loss, eliminate bearing of centrifugal pump impeller pump, reduce friction, and thus reduce mechanical loss. The rotor copper loss and stator copper loss will be reduced by using copper squirrel cage and multi-wound motor, so the efficiency of the motor will be improved. If all the pump unit of the offshore oil platform is turned into this low consumption

	motor, it will save a lot of energy and greatly improve the efficiency of the load. Today, motors are widely found in various devices and their analysis involves the coupling of multiple physical fields. One of the most serious problems for some large motors is the heating problem, which generates various losses during motor operation, and these losses are eventually converted into thermal energy and emitted in the form of heat. The operating temperature of the motor has a great influence on the insulating material of the motor.Afterwards, a method of thermal-electromagnetic coupling simulation of the motor is carried out with a pump unit in the the offshore oil platform as an example, and the magnetic line distribution, magnetic field density distribution cloud diagram and water pump temperature distribution of the motor are obtained, which are the basis of the electromagnetic design of the water pump and the design of the heat dissipation system.
P1100	In the dynamic magnetic coupling wireless charging system, the optimal design of the resonant coil structure is one of the key technologies to ensure the power transmission with the high efficiency. In this paper, based on the good static characteristics of system, a hybrid structure coil is proposed to improve the efficiency and the dynamic anti-offset ability of system. Based on the simplified circuit model of the PP compensation network, the efficiency and the output power of system under the optimal load impedance are derived based on Kirchhoff voltage law. According to the efficiency expression, the number of the turns of the hybrid coil and the radius of the coil are optimized, and the parameter design method of the hybrid coil under the specific environment is given. In order to evaluate the dynamic performance of the system, a quantitative evaluation index is given, which synthesizes three kinds of the dynamic characteristics of the axial, the radial and the angular. Finally, the feasibility of the designed coil is verified by the finite element simulation.
P1078	In this paper, the model of active curtailed wind accommodation based on heat storage electric boiler heating was studied and the curtailed wind accommodation strategy of combined heat storage electric boilers and coal-fired boilers heating was proposed. This is to maximize the curtailed wind accommodation for the ever-increasing curtailed wind problem and environmental problem caused by traditional energy heating in northwest China, northcentral China, and northeast China. Different from the heat storage electric boilers with constant power operation in the past, the multi-level input/exit operation mode of the heat storage electric boilers proposed could accommodate more wind power. The simulation analysis result of a wind power heating project in northeastern China shows that the strategy proposed for active curtailed wind accommodation of heat storage electric boiler heating can effectively improve the wind power accommodation capacity.
P1093	The integrated energy system (IES) is the physical carrier of the Energy Internet, whose optimal operation has become a hot topic because of its effectiveness in improving energy utilization efficiency. This paper proposes an optimal operation model of integrated energy system, where the internal energy flow transmission characteristic of the heating network is modeled as virtual heating energy storage by the node method to enhance the operating flexibility of IES. The second-order cone relaxation method and the incremental formulation for the piecewise linearization method are utilized to transform the proposed nonlinear model into mixed integer quadratic constraint programming model, which can be effectively solved by the commercial solver. Case studies show that the proposed model effectively reduces the operating costs and improves the renewable energy penetration level of IES.
P1097	Wind power is one of the cheapest and direct methods to alleviate negative impacts on environment therefore the demand of efficient wind energy conversion system is increasing. Uneven distribution of wind impacts the performance of wind turbine system so constant and noise free power at output is required. The pitch angle varies according to the wind speed and the output power equation of the entire wind turbine system depends on the pitch angle

	of a wind turbine. Pitch angle control is widely used to optimize power above the rated wind speeds. In this paper, an efficacious adaptive controller is proposed for pitch angle control to preserve the output power of a 5 MW wind turbine under dynamic wind conditions. The efficiency of the proposed controller is illustrated in comparison with the low level control loops such as PI. The proposed model is tested in GH Bladed 5MW wind turbine system.
P304	One of the major concerns of the utility companies is to ensure that the generation capacity (GC) is maintained above the load growth. The demand for assessment of the GC at non-distant time intervals is thus crucial. In general, the rising load is linearly proportional to the generation deficiency. A linear regression approach had been successfully developed to predictively accommodate this demand to avert the issue of deficit supply arising from an unforeseen delay. The Monte Carlo (MC) technique was used in the generation system (GS) modeling. However, due to the inherent stochasticity associated with the MC algorithm, the emerging graphical relationship between the load and the generation deficiency is generally linear but always maintains nonlinearity at various intervals along the gradient curve. This paper integrates the artificial neural network (ANN) nonlinear feature using the Levenberg-Marquardt training algorithm with the MC simulation to accommodate the MC-associated nonlinearities to improve the generation system reliability (GSR) prediction. The generalization performance of the prediction obtained on the test data was found to have been greatly improved.

PRESENTATION ABSTRACT

Session 9: New Battery and Energy Storage Technology

P1094	With the large-scale application of electric vehicles, the use of retired power batteries in power system and other fields has become a trend in the future. How to quickly and accurately estimate the health status of power batteries and reasonably carry out energy management has become one of the main problems to be solved. This paper takes the application of retired power batteries in microgrid (MG) as an example. Firstly, considering the influence of the depth and times of batteries charge and discharge on the operation life, the life loss model of retired power batteries is established, and the coupling relationship between the power batteries life decay model and SOC, SOH is established. Secondly, according to the characteristics of SOC and SOH, K-means clustering method is used to cluster the batteries to construct the energy storage system (ESS). Finally, considering the characteristics of supply and demand balance, operation reliability and economy, the energy management and control of ESS in MG is carried out. Simulation results show that the proposed energy management and control method can effectively improve the economy, reliability and security of the ESS in the process of echelon utilization.
P1026	Photovoltaic (PV) cell parameter identification is of great significance to accurate PV cell modelling, which can further critically influence overall optimal control and output characteristics simulation design of PV systems. Nevertheless, this high non-linearity obstacle often simultaneously exists multiple local optimums, thus conventional optimization approaches can hardly maintain a consistently satisfactory performance to obtain global optimum. Hence, an adaptive compass search (ACS) algorithm is employed in this paper to identify several critical unknown parameters of the most common utilized PV cell model, i.e., double diode model (DDM). Compared with fixed sequence based original compass search (CS) algorithm, ACS algorithm can dramatically improve global exploration ability via adaptive sequence of exploration directions via historical searching results. Particularly, case studies verify the feasibility and merits of ACS algorithm, which validates that it can achieve more desirable performance compared against whale optimization algorithm (WOA) in terms of optimization precision and convergence rate.
P1044	This paper presents a methodology for structural optimization of the power equipment composition of autonomous photovoltaic systems with storage battery replacements. Based on the fundamental principles of systemic energy research, systems theory and the theoretical framework of electrical engineering, among others, this methodology adopts a universal approach to describing climatic indicators by processing FM 12 Synop and METAR multi-year meteorological data sets. The paper gives a detailed description of the autonomous photovoltaic system, its basic elements and control algorithms. The universal storage battery model is treated separately. A comprehensive description is provided of an algorithm for calculating storage battery lifetime. The notions of partial cycle and local minimum state of battery charge are introduced. These indicators are necessary for the correct estimate of the number of battery cycles to failure. After identifying the number of cycles to failure and the average annual number of cycles, it is possible to calculate storage battery lifetime. Next, it becomes possible to consider storage battery lifetime when dealing with the structural optimization of photovoltaic power systems. Importantly, the results reveal a more than 10% increase in the LCOE indicator. Kurbulik, an autonomous energy system located in a protected area of Lake Baikal, is given as an example. The optimization results show that the combined use of renewable energy

	sources reduces diesel fuel consumption by 51%. Storage batteries are replaced three times every six years. The levelized cost of energy is 16.80 rubles/kW•h (as compared to 34.82 rubles/kW•h for diesel generation alone). The presented methodology is universal and can be applied to different locations.
P1085	Fuel cell power generation system is a potential renewable power source. To reduce hydrogen consumption and enhance the dynamic performance of the system, Grey-Markov chain power prediction energy management strategy for fuel cell power generation systems was proposed. Firstly, topology of the system is proposed, and mathematical model was established through mechanism analysis. Secondly, framework of power prediction of the system was presented, and Grey-Markov chain model was proposed to predict load power of the fuel cell power system, based on which energy management of the system was implemented. Finally, the proposed energy management strategy was compared with rule-based strategy by experiment. The results show that the proposed power prediction energy management strategy can accurately predict the load power in advance and reduce hydrogen consumption in the fuel cell power generation system.
P1101	Under the condition of partial shadow occlusion, the P-U curve of the photovoltaic array exhibits the characteristics of multi-peak output. The traditional maximum power point tracking (MPPT) algorithm is easy to fail, and the particle swarm algorithm, as multi-objective optimization algorithm, is characterized by its low volatility and fast convergence speed. It is applied to the optimization process of multi-peak photovoltaic cells. Aiming at the multi-peak output of the photovoltaic array, this paper builds a simulation model based on the standard particle swarm algorithm and the perturbation and observation method through MATLAB/Simulink. The simulation results show that compared with the traditional perturbation and observation method, the standard particle swarm algorithm can reduce fluctuations when the power is stable and can quickly track the output multi-peak maximum power point when the light intensity changes suddenly.
P1092	Shipboard power systems (SPS) are complex systems connecting multiple power sources, energy storage systems (ESSs) and various types of loads. However, the fluctuated propulsion loads may lead to a low power quality of the system. In this paper, a power management system (PMS) is designed for SPS in the framework of an optimization-based method. With equivalent consumption minimization strategy (ECMS), the proposed method is able to provide an optimal power-split between hybrid energy sources in real time, while minimizing the fuel consumption of the system. Furthermore, the equivalence factor is adjusted by model predictive control (MPC) of PMS. The performances of the proposed approach are evaluated by simulations.
P1017	In order to predict the demand for airport charging facilities/piles, a demand prediction model was proposed for airports, which includes airside and landside of airports. The airside prediction model was calculated according to air traffic volume and vehicle pile ratio. The landside prediction model was calculated according to the electric vehicle flow and charging probability. Results showed that the number of charging piles in China mainland airports would reach 536000, including 26000 charging piles on the airside and 510000 on the landside in 2035. The relevant policy suggestions from the aspects of investment, operation management, and technical standards were put forward and the "new infrastructure" technology was suggested to be applied in airport’s intelligent charging facility network building.
P1046	Smart power consumption is an important part of ubiquitous power Internet of things. Load identification, as an important part of smart power consumption, is of great significance to users and power grid. Aiming at the problems of long training time and low recognition accuracy in existing algorithms, this paper proposes a non-invasive load identification

	algorithm based on LSTM-BP. Firstly, the data is normalized, and then the dimension of high-dimensional data is reduced by PCA. Then, LSTM-BP neural network is built for load identification. Finally, Redd data set is used to test and analyze the algorithm. Compared with the existing load identification algorithm based on event detection, this method has higher stability and accuracy.
P1034	Electronic current transformer (ECT) is responsible for collecting and transmitting measurement, protection, and control signals of substations, which is regarded as a critical device for the connection of primary and secondary equipment in an intelligent substation. Naturally, a well-designed ECT is essential to ensure a safe and stable operation of power systems. This paper attempts to provide a detailed discussion and analysis of the principle, structure and characteristic of ECT, which mainly focuses on the following three aspects, i.e., steady-state accuracy, frequency response test and transient spread characteristics test. For a comprehensive performance test, a laboratory test platform is established in intelligent substations to simulate actual operation condition of ECT and further implement error accuracy analysis, frequency response test, transient response test and long-term test. Simulation results show the influence of ECT on measurement and protection accuracy, which can provide theoretical basis and evaluation criteria for further improvement of digital measurement performance and large-scale application in intelligent substations.

PRESENTATION ABSTRACT

Session 10: Energy and Power System

PEEE20-103	With the growing demand for energy efficient HVAC systems and integration of renewable energy sources, existing energy transformers are being improved and new solutions are being sought. Various energy storage technologies are applied to solve unpredictable renewable energy flows. This paper investigates an innovative ventilation system with roof turbine ventilator and variable volume isobaric air tank, which is used to store an excessive wind energy. The study focuses mainly on isobaric air storage tank operation. The experimental results of the tank charging and discharging processes under different operation conditions are presented. These conditions include different weights placed on the top of the storage and air flow rates in the wind tunnel. The operation of the tank during one windy day in chosen location is studied. The obtained data showed the initial results of the operation of the developed ventilation system and possible modifications in order to improve its functionality.
PEEE20-104	This paper examines to what extent automated guided vehicles' (AGV) batteries can be used as a mobile electrical energy storage to increase energy flexibility and reduce peak loads in manufacturing plants. First, it is indicated, what demand response and peak shaving in manufacturing mean. Then, existing battery applications for peak shaving are presented. Finally, the benefits and potential of using AGVs as energy storage to reduce peak loads in the company are illustrated, after an approximate cost calculation for peak shaving of a company with AGV batteries are performed in a use case scenario considering AGV availability during manufacturing. The results of the approximate cost calculation show that it can be beneficial for companies to use AGV batteries as an energy storage in manufacturing plants to reduce their peak loads.
PEEE20-105	A sustainable energy economy implies high shares of volatile renewable energy sources and requires the use of energy storage technologies. Hydrogen is a very flexible energy carrier and can be employed as a large-scale energy storage in electric grids. This paper focuses on the integration of hydrogen production, conversion and storage options in a smart grid environment. A process current source (PCS) that functions as a rectifier for an alkaline electrolysis system and is compared to a conventional rectifier structure that is not specifically designed for dynamic operation. All components of the smart grid are scaled using a staggered algorithm that combines a pattern search algorithm and a genetic algorithm. This smart optimization tool shows high flexibility, accuracy and low computing times. The required computing time has been reduced by 56% in contrast to genetic algorithms without the pattern search method. Furthermore, the energy system optimization reduced the alkaline electrolysis below 30% of the initial scale in order to yield lower costs. Therefore, the difference in rectifier performance was reduced to a minor contribution.
PEEE20-206	The article covers the issues of the mathematic simulation of the pollution particle motion process in the fluid stream, and there are defined the options influencing the process of the sweat. There are also analysed the challenging problems of the effluent water dispose. There is also devoted attention to the updating of the sedimentation process by the use of constrained features which exclude sediments in the objectionable points of the cleansing system and etc.
PEEE20-211	The establishment of an integrated fast charging station for photovoltaic storage and charging is an effective solution to fast charging of electric vehicles. For the li-battery/Super capacitor hybrid energy storage system, it is an effective method to reduce the cost of the

	system by extending the life of the li-batteries. This paper establishes the li-battery cycle life estimation model with irregular discharge and proposes an optimal energy allocation algorithm of li-battery/super capacitor hybrid energy storage system is proposed based on dynamic programming algorithm. Simulation results are presented to validate the theoretical analysis.
PEEE20-416	From the 1950s onward, Brutalist style spread all over the world and dedicate many breath-taking architectural movements to buildings. Architect's opinion about this prominent approach to building design varies greatly. Brutalist style has known primarily for its aesthetics and property for institutional buildings with the use of functional reinforced concrete, steel, modular, and repetitive elements. Besides all advantages of brutalism, this style is sharply criticized for being cold, crude, cruel, and not appropriate for many climates. Brutalism also became popular with governmental and institutional buildings in modern architecture period and most of the well-known university campuses were built in this style. The purpose of this paper is to study the adaptability of brutalist style with institutional buildings and evaluate it from this point of view. Three institutional buildings have been selected as case studies for evaluating in this research such as The Royal College of Physicians, Brunel University Lecture Theatre, and Metu faculty of architecture. Due to this study, Brutalist style through their fire-resistant and durable materials which don't need to be renovated constantly is suitable for institutional buildings.
PEEE20-425	In order to improve the accuracy of solar radiation prediction and optimize the energy management system. This study proposes a forecasting model based on empirical mode decomposition (EMD) and Back Propagation Neural Network (BPNN). Empirical mode of decomposition (EMD)-based ensemble methods with powerful predictive abilities have become relatively common in forecasting study. First, the existing solar radiation datasets are decomposed into an intrinsic mode function (IMF) and one residue produces fairly stationary sub-series that can easily be modeled on BPNN. Next, both components of the IMF and residue are applied to create the respective BPNN models. Then, the corresponding BPNN is used to predict some sub-series. Finally, the predictive values of the original solar radiation datasets are determined by the sum of each predicted sub-series. Compared with traditional models such as conventional neural network or ARIMA time series, the hybrid EMD-BPNN model shows great results in term of RMSE with 28.13 (W/m2). On the other hand, the result of BPNN and ARIMA was 83.28 (W/m2) and 108.88 (W/m2), respectively. that the non-stationary and non-linear of solar radiation signal has less effect on the accuracy of the prediction.
PEEE20-315	Integrating decentralised energy sources into the traditional distribution networks can result in technical issues impacting the power quality. Innovative ideas are, therefore, needed to promote the transformation of systems to a smart grid. Distribution System operator (DSO) could make use of the flexibility of emerging technologies as a method to address these power quality issues. This study aims to present an overview of a local flexibility market (LFM) which will allow DSO requirements to be fulfilled through the (VPP) as an energy flexibility provider. The required optimization loads, generators and as well as storage units, are undertaken in the general algebraic modeling simulation (GAMS) environment. The aim of the optimization problem is to provide DSOs the opportunity to increase or curtail the local generations and loads in order to satisfy their requirement. The VPP will then be responsible for handling the relevant requests in real time to ensure the correct operating schedule of a resource is applied. The preliminary results of simulation studies presented in this paper have shown that the local market framework for flexibility could have potential for deferring investments in distribution network capacity, minimizing energy costs and improving the hosting capacity of distribution networks.