International Conference on Sustainable Power Generation and Supply

(SUPERGEN 2012)

IET Conference Publications 611

Hangzhou, China
8-9 September 2012

ISBN: 978-1-62748-125-0
# TABLE OF CONTENTS

Mitigation of Subsynchronous Oscillation in Hulun Buir Power Plant with SVC ................................................................. 1  
Gongwei Xi; Chunlin Guo; Jian Zhang; Lin Yang; Xiangning Xiao  

The Effect of SVC on the Transient Stability Simulation and Analysis of Henan Power Grid ........................................ 6  
Zhongchang He; Wei Zong; Tiogxia Fan  

Applications of Strong Tracking Filter in Power System Dynamic State Estimation ......................................................... 11  
Hong Li  

Operational Reliability Analysis Considering Multi-factors in Large-scale Freezing Weather ...................................... 16  
Jingying Wu; Xiaoze Song; Senjun Hu; Zhen Wang; Ke Wang  

A Survey of Methods for Improving the UHV Power System Transfer Capacity .................................................. 22  
Dong Chen; Zhou Xia; Li Wei; Xue Feng; Li Hui; Wang Zhi-dong  

FACTS Parameters Optimization Based on Prony Analysis .................................................................................. 26  
Ke Wang; Senjun Hu; Zhen Wang; Jingying Wu; Xiaoze Song  

Research on Application of TCR+FC Typed SVC in Power Quality Integrated Management for Power Traction System ............................................................... 32  
Dan Wang; Chayong Yang; Xin Zhang; Jinhao Wang; Gengyin Li  

Design of TCSC Damping Controller for SSO Suppression based on TLS-ESPRIT .................................................. 37  
Xi Wu; Ping Jiang; Jing Lu; Xin Zhao  

A Model Predictive Control Based SIPS to Prevent Transient Instability ...................................................................... 42  
Xiaochen Du; P. Crossley  

Fault Section Estimation in Bulk Power Grid Based on Discrete Event System ........................................................... 48  
Yu Jiang; Huxian Hu; Ye Zhang; Dayan Sun; Hafeng Li  

Damping Subsynchronous Resonance with SVC based on DTA .................................................................................. 54  
Zhao Xin; Guo Shan; Yu Ruoying  

Study on Transient Characteristics of CCC-HVDC Transmission Systems ............................................................... 59  
Siyu Zhou; Jun Wen; Wenjia Cao; Sizhuo Lv; Wei-yang Yin  

Observability Analysis of Power System Including VSC-HVDC .................................................................................. 64  
Zuowei Chen; Chongrui Liu; Pengfei Tian; Hafeng Li; Wei Wang  

The Influence of Induction Motor on Voltage Stability of Power System Based on Bifurcation Theory ...................... 69  
Jiang Lingyun; Guo Chunlin; Zhang Fei  

Performance Analysis of MNMR State Estimator Considering PMU Data ................................................................. 75  
Jianmin Zhang; Ancheng Xue; Tianshu Bi  

Performance Analysis for the Robustness of MNMR State Estimation in Power System ............................................. 80  
Jianmin Zhang; Ancheng Xue; Tianshu Bi  

Simulation of SSR Evoked by TCSC for UHVAC Transmission System from Yimin to Fengtun on RTDS .................................................................................. 86  
Xin Zhang; Yundong Song; Dan Wang; Zhiqin Zheng; Gengyin Li  

Electric Load Dynamic Frequency Modelling and Its Application for Islanding Operation Control .............................. 93  
Zhou Bo; Han Minxiao; Tang Xiaojun; Wu Yong  

AGC and Artificial Dispatching Based Real-time Control Framework of Power System Thermal Stability .................................................................................. 99  
Xiaodan Cui; Wei Li; Xiancheng Ren; Bijun Li; Feng Xue; Yongjie Fang  

Low Frequency Oscillation Damping Estimation Using Subspace Identification ......................................................... 104  
Hongliang Huang; Sheng Dong  

Application and Prospect of Direct Current in Modern Society .................................................................................. 108  
Wen-jia Cao; Jun Wen; Si-ya Zhou; Si-zhuo Lv  

Phase-plane Analyses of a Microgrid under PQ Control Mode ................................................................................ 113  
LeiQi Zhang; Yun Liu; Huanhai Xin  

Simulation of a Dynamic Voltage Restorer in Distribution Systems with Microgrids ............................................... 118  
Qiongni Li; Chang Liu; Lin Shen; Gengyin Li  

Validating Wind Field Models for Power System Impact Studies ........................................................................... 123  
C. Plumley; D. Hill; D. McMillan; K. Bell; D. Infield  

A Combined Controller Design of Power System Stabilizer and Wind Turbine Drive-train Damping Filter .......... 129  
F. Zhang; W.E. Leithead; O. Anya-Lara  

Modelling the Effects of the Environment on Wind Turbine Failure Modes Using Neural Networks .......................... 135  
G. Wilson; D. McMillan; G. Ault
Comparison of a 2nd Generation Lidar Wind Measurement Technique with CFD Numerical Modelling in Complex Terrain .......................................................... 141

J. Butler; F. Quail

Frequency Support from Wind Plant to Power Systems .......................................................... 147

L. Wu; D.G. Infield; J. Feuchtwang

Research on Asymmetry Fault Characteristics of Doubly Fed Induction Generator Wind Turbine Xiang Li; Keyao Sun; Bin Wang; Gengyin Li .......................................................... 153

A Chance-constrained Programming Based Energy Storage System Sizing Model Considering Uncertainty of Wind Power .......................................................... 159

Lina Li; Li Yang

The Influence of Chimney Structural Parameters on the Solar Chimneys Integrated with Seawater Desalination .......................................................... 165

Lu Zhao; Yuan Zheng; Zhenjie Li; Yujun Sha

Experimental Investigation on the Effect of Cover Material on the Performance of Solar Still .......................................................... 170

Lu Zhao; Yuan Zheng; Zhenjie Li; Yujun Sha

Numerical Analysis of Flow Heat Transfer Characteristics in Solar Chimneys Integrated with Seawater Desalination .......................................................... 174

Lu Zhao; Yue Yuan; Zhenjie Li; Wenming Liu

The Influence of Heat Collector Structural Parameters on the Solar Chimneys Integrated with Seawater Desalination .......................................................... 181

Lu Zhao; Yue Yuan; Zhenjie Li; Wenming Liu

A Method of Electric Vehicle Charging Load Forecasting Based on the Number of Vehicles Chuanlin Guo, Wenbo Qi, Li Wu, Hang Du, Pengxin Hou, Xiangning Xiao .......................................................... 188

Shengli Xing

Microgrid Emergency Control Based on the Stratified Controllable Load Shedding Optimization .......................................................... 193

Collective Control of a Cluster of Stall Regulated Wind Turbines .......................................................... 198

S. Har; W.E. Leithead

Neural Network Modelling with Autoregressive Inputs for Wind Turbine Condition Monitoring .......................................................... 206

Y. Wang; D.G. Infield

A Newton Quadratic Interpolation Based Control Strategy for Photovoltaic System .......................................................... 212

Yun Liu; Liyuan Chen; Lin Chen; Huaizhi Xin; Deqiang Gan

Modelling and Simulation of Doubly-fed Induction Wind Power System Based on Matlab/Simulink .......................................................... 218

Zhen Sun; Hongya Wang; Ying Li

Scheduling Strategy of Hybrid Wind-Photovoltaic-Hydro Power Generation System .......................................................... 223

Liyuan Chen; Yun Liu

Low Voltage Ride Through Capability Enhancement of PMSG-based Wind Turbine .......................................................... 229

Optimization of Large-scale Offshore Wind Farm Electrical Collection Systems Based on Improved FCM .......................................................... 234

Shuhong Wei, Yang Fu, Lingling Huang

Research on Optimization of Electrical Connecting Network for a Solar Photovoltaic Power Plant .......................................................... 240

Research Based on LabView on Wind Turbine Monitoring System .......................................................... 244

Ma Chenyan; Zhao Daoli; Wan Tianhui; Wu Luochang; Li Yanfeng

Aspects of Power System Restoration Considering Wind Farms .......................................................... 248

Haiyan Zha; Yutian Liu

Overview of Development of Electric Vehicle Standards at Home and Abroad .......................................................... 253

Wang Dan; Guo Chunlin; Xiao Xiangning

Operational Characteristics of SMES and its Effects on Microgrids .......................................................... 258

Lin Shen; Chang Liu; Qionglin Li; Gengxin Li

Optimal ESS Operation Strategy in Distribution System with Wind Power .......................................................... 264

M.D. Zhang; J. Xie; D.Q. Gan

The Valuation of Optional Financial Contract in Electricity Market .......................................................... 270

Qiaoyan Bian; Zehan Lu

Optimized Controller Design of a FESS for Power Fluctuation Smoothing of a Wind Farm .......................................................... 276

S.L. Liu; Y. Liu; J.Y. Wen

On Embedded Energy Storage for High Penetration of Wind Power .......................................................... 281

T.C. Yang; D. Yue; H.H. Xin

Excitation System for Xiangshuijian Pumped Storage Unit .......................................................... 286

Guanghui Hua, Weiguo He, Xiaolu Li

Study on Energy Storage System Investment Decision Based on Real Option Theory .......................................................... 291

Xiaqing Xin; Bei Li
Demand Side Management Practice of Cool Storage Projects in Hebei Province ................................................................. 295
Haisheng Yang; Shuping Chang; Ruitao Wu

The Effects of the Proportion Factor of TCSC on SSR and SSO ..................................................................................... 299
Haifeng Li; Chongru Liu; Pengfei Tian; Zuowei Chen; Yingsong Deng

Modelling Simulation of a Comprehensive Compensation Device in Electric Traction Systems ........................................... 303
Jing Liu; Kangning Wang; Ziyu Wang; Jinhao Wang; Gengyin Li

Harmonic Suppression in Electric Traction System Based on a Single-phase Hybrid Active Filter ........................................... 308
Ziyu Wang; Jinhao Wang; Jing Liu; Jian Wang; Gengyin Li

Design of a Three-Phase Cascaded Power Electronic Transformer Based on Energy Internet .................................................... 313
Zhendong JI, Yichao Sun, Shuzheng Wang, Jianfeng Zhao

Study of the Effect of AC System Strength on the HVDC Startup Characteristics ................................................................. 319
Jia Chen-chen; Wen Jun; Bie Xiao-yu

PSCAD/EMTDC based SVPWM Inverter Simulation ........................................................................................................... 324
Zifan Zhang; Ming Zhou; Meng Xiang; Yang Liu

Research on the Reasonable Selection Range of Each PID Parameter of HVDC Systems ......................................................... 329
Bie Xiaoyu; Wen Jun; Jia Chenchen

Microbial Fuel Cell Electric Behaviour .................................................................................................................................. 332
D.G. Finarelli; A. Callegari; E. Dallago; A. Liberale; S. Dan

Lifetime Prediction for Gas Turbine Materials in Power Generation .................................................................................. 335
J. Sumner; A. Encinas-Oropesa; M. Seraffon; N.J. Simms; J.R. Nicholls

Thermal-mechanical Fatigue Behaviour of 9-12% Cr Power Plant Steels and Pipes ............................................................... 341
W. Sun; D.W.J. Tanner; T.H. Hyde; A.A. Saad

Wind Power Multi-scenario State Transition Based Unit Commitment and Reserve Optimization ...................................... 349
Meng Xiang; Ming Zhou; Zifan Zhang; Yang Liu

Economic Analysis and Calculation of the Cogeneration Upgrade for Large Fossil Fired Generation Unit ........................................ 356
Haisheng Yang; Shuping Chang; Ruitao Wu

Simulation Research for LVRT of DFIG based on Rotor Active Crowbar Protection .............................................................. 361
Li-ling Sun, Pu Yang, Yi Wang

Simulation Analysis of Influence of MW-level Grid-connected Photovoltaic Power Station on Distribution Networks .............. 368
Wang Shuo; Liu Di; Xu Yonghai; Tao Shun; Xiao Xiangning; Zheng Jianhai; Lin Yan

Study on Energy Saving Generation Dispatch Based on Improved PSO Algorithm .............................................................. 374
Xian Guo; Haozhong Cheng; Liangzhong Yao; M. Bazargan, Zeliang Ma

Reliability Assessment of SIPS Based on a Safety Integrity Level and Spurious Trip Level ....................................................... 380
M. Panteli; P.A. Crossley

Application of PMUs to Coordinate Hydroelectric and Wind Power Plant operation ................................................................. 387
Qiyu Chen; T. Little; Haifeng Wang

Impact of Various Load Compositions on the Input Signal Selection for Wide-area Damping Controllers .................................... 393
Sheng Ding; Huiqi Jiang Huang

Impact of Electric Vehicles As Interruptible Load on Economic Dispatch Incorporating Wind Power ....................................... 397
Sufen Tong, Youbing Zhang, Jun Qi

Impacts of Electric Vehicles on Power Grid ......................................................................................................................... 402
Yiyun Tu, Can Li, Lin Cheng, Lin Le

Calibration Method of Capacitive Electronic Voltage Transformer in Smart Substation ......................................................... 407
Xiaoyong Xu; Chaolong Ou; Lu Fang

Dynamic Reactive Power Compensation During Fault Conditions for Wind Farms with the Consideration of Wind Turbine Protection Effects .................................................................................................. 412
Zhou Ling; Song Xiaofang; Chang Kang; Xue Feng; Meng Zhaojun

The Research on Coordinated Operation and Cluster Management for Multi-microgrids ......................................................... 417
Xing He, Qian Ai, Peng Yuan, Xiaohong Wang

The Collaboration Between Demand Response and Smart Grid ................................................................................................. 420
Huaiqi Shen; Yongqiang Zhu

Extension of Power System Early-warning Defense Schemes by Integrating Typhoon Information ............................................... 424
Y.J. Wu; Y.S. Xue; H.H. Wang; Y.Y. Xie; F. Xue; F.S. Wen; Z.Y. Dong

Wind Power Fitness Function Calculation Based on Niche Genetic Algorithm ........................................................................ 431
Pan Yanhong

Comparative Study on System Transient Stability Using Cascade STATCOM and SVC ........................................................................ 436
Boqiang Xu; Xia Chen; Lijun Chi; Liling Sun

Evaluation of Finite Horizon Active Network Management ...................................................................................................... 443
J.G. Robertson; A.R. Wallace
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load Modeling with Considering Frequency Characteristic</td>
<td>451</td>
</tr>
<tr>
<td>Changshun Cai, Yuqing Jin, Yiping Jin, Ping Ju</td>
<td></td>
</tr>
<tr>
<td>An Analysis of Capacity Requirements of Battery Energy Storage Based on Forecasted Wind Power Correction</td>
<td>457</td>
</tr>
<tr>
<td>Pan Wenzhong, Feng Bo, Zhu Jianhong</td>
<td></td>
</tr>
<tr>
<td>One Power Control Strategy of Wind Farm Based on the Battery Energy Storage</td>
<td>462</td>
</tr>
<tr>
<td>He HaiPeng, Pan Wenzhong, Li Bei, Ma HuiMeng</td>
<td></td>
</tr>
<tr>
<td>Hypothesis Testing of the Stochastic Model of Demand and Supply Power of Plug-in Electric Vehicles</td>
<td>466</td>
</tr>
<tr>
<td>S. Q. Bu, W. Du, H. F. Wang</td>
<td></td>
</tr>
<tr>
<td>S. Q. Bu, W. Du, H. F. Wang</td>
<td></td>
</tr>
<tr>
<td>Man-in-the-middle Attack Test-bed Investigating Cyber-security Vulnerabilities in Smart Grid</td>
<td>479</td>
</tr>
<tr>
<td>Y. Yang; K. McLaughlin, T. Littler, S. Sezer, Eul Gyu Im, Z. Q. Yao, B. Pranggono, H. F. Wang</td>
<td></td>
</tr>
<tr>
<td>Optimal Time of Applying Corrective Damping Control to Damp Power System Oscillations</td>
<td>487</td>
</tr>
<tr>
<td>Jun Cao, W. Du, H. F. Wang</td>
<td></td>
</tr>
<tr>
<td>The Incorporation of Generalized VSC MTDC Model in AC/DC Power System State Estimation</td>
<td>493</td>
</tr>
<tr>
<td>Jun Cao, W. Du, H. F. Wang</td>
<td></td>
</tr>
<tr>
<td>The Research of Fault Diagnosis in Grounding Grids</td>
<td>499</td>
</tr>
<tr>
<td>Huihong Xu, Jun Cao</td>
<td></td>
</tr>
<tr>
<td>Towards More Reliable Wind Turbines: Models for Gear Condition Monitoring</td>
<td>502</td>
</tr>
<tr>
<td>Qiang Xu, Yongqian Liu, De Tian, D. G. Infield</td>
<td></td>
</tr>
<tr>
<td>A Scenario-based Network Reconfiguration Framework Under Uncertainties</td>
<td>506</td>
</tr>
<tr>
<td>C. Zhang, Z. Z. Lin, F. S. Wen, J. S. Huang</td>
<td></td>
</tr>
<tr>
<td>Load Characteristics of Electric Vehicles in Charging and Discharging States and Impacts on Distribution Systems</td>
<td>513</td>
</tr>
<tr>
<td>Hui Wang, Qi Song, Liyan Zhang, Fushuan Wen, Jiansheng Huang</td>
<td></td>
</tr>
<tr>
<td>Power Quality Comprehensive Evaluation Based on Combination Weighting Method</td>
<td>520</td>
</tr>
<tr>
<td>X. L. Zhai, Z. Z. Lin, F. S. Wen, J. S. Huang</td>
<td></td>
</tr>
<tr>
<td>Online Self-design and Adjustment of Power System Stabilizers</td>
<td>525</td>
</tr>
<tr>
<td>Online Self-design and Adjustment of a DC/AC Converter Based Stabilizer</td>
<td></td>
</tr>
<tr>
<td>Potential of Plug-in Electric Vehicles for Supporting Regional Power Distribution System Operation with High Penetration of Wind Generation</td>
<td>539</td>
</tr>
<tr>
<td>Sikai Huang, D. Infield, A. Zaher</td>
<td></td>
</tr>
<tr>
<td>A Comprehensive Evaluation Index System for Power System Operation</td>
<td>545</td>
</tr>
<tr>
<td>Hong Wang, Zhenzhi Lin, Fushuan Wen, Jiansheng Huang</td>
<td></td>
</tr>
<tr>
<td>Assessment of Load Supply Capability with Power Supply Bottleneck Discovery</td>
<td>551</td>
</tr>
<tr>
<td>Jin Wang, Fushuan Wen, Yan Yang, Xia Yin</td>
<td></td>
</tr>
<tr>
<td>Power System Fault Diagnosis with a Weighted Fuzzy Time Petri Net</td>
<td>558</td>
</tr>
<tr>
<td>Wenke Wu, Fushuan Wen, Yusheng Xue, Xia Yin</td>
<td></td>
</tr>
<tr>
<td>Multiple-criteria Decision-making of Distribution System Planning Considering Distributed Generation</td>
<td>565</td>
</tr>
<tr>
<td>Xue Xiao, Zhenzhi Lin, Fushuan Wen, Jiansheng Huang</td>
<td></td>
</tr>
<tr>
<td>Optimal Planning of Battery Swap Stations</td>
<td>571</td>
</tr>
<tr>
<td>Dan Zheng, Fushuan Wen, Jiansheng Huang</td>
<td></td>
</tr>
<tr>
<td>Impact of Large Scale Wind Power Penetration on Power System Oscillations Based on Electric Torque Analysis</td>
<td>578</td>
</tr>
<tr>
<td>Yi Ge; Hai Cai; Jun Cao; H. F. Wang</td>
<td></td>
</tr>
<tr>
<td>The Influence of the Spatiotemporal Complementarities of Countrywide Dispersed Wind Power on the China Electricity System</td>
<td>585</td>
</tr>
<tr>
<td>Economic Analysis of Long-distance Ultra HVDC Transmission for Remote Renewable Energy Resources in China As Affected by Their Spatiotemporal Complementarities</td>
<td>593</td>
</tr>
<tr>
<td>Power Cable Fault Location Based on Mathematical Morphology and Wavelet Theory</td>
<td>599</td>
</tr>
<tr>
<td>Mingcai Kang, Yang Wei, Junfang Zhang, Guang Hu, Qiu Yingming</td>
<td></td>
</tr>
<tr>
<td>Impact of Distributed Generation on Voltage Stability</td>
<td>605</td>
</tr>
<tr>
<td>Jun-Jiang Zhang, Peng Wei, Yingning Qiu, Si-min Ding</td>
<td></td>
</tr>
</tbody>
</table>
Faulted-phase Selection Scheme for China 500kV Transmission Line Based on Wavelet Transforms and Artificial Intelligence

Jianyi Chen; R.K. Aggarwal; Yuping Lu

Author Index