

# The 12<sup>th</sup> IET International Conference on **AC and DC Power Transmission**



**Day 1 Morning, Saturday, 28 May 2016**

## Plenary Session (ALL DELEGATES) Zhonghua Hall 2

- 08:30 --- 09:30 **Registration**
- 09:30 --- 09:50 **Chair's welcome and introduction**  
Professor Rong ZENG, Tsinghua University, China
- 09:50 --- 10:10 **IET representative welcome speech**  
Mr. Ian MERCER, IET head of international operations & China country manager
- 10:10 --- 10:35 **Keynote Speech**  
*Dr. Jinliang HE, Tsinghua University, China. Technical Committee chair of ACDC 2016*  
Deeply Controlling Overvoltage of UHV AC System by Advanced Surge Arresters of Low-Residual-Voltage
- 10:35 --- 11:00 **Keynote Speech**  
*Dr. Ziming SONG, Chief specialist for HVDC at Toshiba international (Europe) Ltd*  
The Power of VSC Technology for a Future Low Carbon Grid
- 11:00 --- 11:20 **Poster Session and Refreshments**  
*Photo shooting for all speakers, chairs, VIP guests (In front of backdrop)*
- 11:20 --- 11:45 **Keynote Speech**  
*Dr. Ahmed ZOBAA, Senior lecturer and MSc course director at Brunel University, UK*  
Current and Future World Energy Outlook and the Impact of Power Electronics
- 11:45 --- 12:10 **Keynote Speech**  
*Hong RAO, Director of State Key Laboratory of HVDC, President of the Electric Power Research Institute of China Southern Power Grid Co., Ltd. China*  
VSC-HVDC application in CSG
- 12:10 --- 12:35 **Keynote Speech**  
*Dr. Junzheng CAO, Technical Director, C-EPRI, NARI, China*  
Chinese HVDC Technology and Application
- 12:35 --- 13:00 **Keynote Speech**  
*Dr. Andrew KUSIAK, Professor and chair of the department of mechanical and industrial engineering at the University of Iowa, USA*  
Big Data in Wind Energy Generation and Control
- 13:00 --- 14:30 **Poster Session and Lunch**

## Day 1 Afternoon, Saturday, 28 May 2016

### Session A1: Recent important projects

Zhonghua Hall 2

**Session Chair:** Andrew Kusiak, Professor and chair of the department of mechanical and industrial engineering at the University of Iowa, USA

- 14:30 --- 14:45 **A1.1 (0007)**  
**Influence of Aging Characteristics of Conductor Surface on Resultant Electric Field of  $\pm 800\text{kV}$  UHVDC Transmission Lines**  
Y Yi, C Y Zhang, Z Y Chen, L M Wang
- 14:45 --- 15:00 **A1.2 (0017)**  
**Feasibility Research of Lightning Rods Installed on the Frames of Main Transformers in 1000kV UHV Substation**  
Liuchun Zhang, Yu Yin, Dong Ge, Shuchun Du
- 15:00 --- 15:15 **A1.3 (0018)**  
**Harmonics Analysis and Simulation of NLM in MMC**  
Ye Wang, Zhechen Huang, Yubo Yuan, Lei Gao, Peng Li
- 15:15 --- 15:30 **A1.4 (0042)**  
**Cost Analysis and Comparison of HVAC, LFAC and HVDC for Offshore Wind Power Connection**  
X Xiang, M M C Merlin, T C Green
- 15:30 --- 15:45 **A1.5 (0064)**  
**Coordinated Power Control Strategy for the Multi-Terminal VSC-HVDC System**  
WEI YUE, XIAOYONG LIU, SHICHAO ZHANG, TAO CHEN, SONGGUANG ZHANG
- 15:45 --- 16:15 **Poster Session and Refreshments**
- 16:15 --- 16:30 **A1.6 (0066)**  
**DC Resonance Suppression Method of Hybrid HVDC Transmission System**  
GUOQIANG WANG, HAIQING WENG, RONG YI, LEI JIN, YU LUO, TING HOU
- 16:30 --- 16:45 **A1.7 (0073)**  
**Secondary Arc Characteristics and Single-phase Autoreclosure Scheme of UHV Transmission Line with Hybrid Reactive Compensation**  
Bin Li, Qingquan Li, Hongshun Liu, Tingting Lv, Runchang Li, Songyan Li
- 16:45 --- 17:00 **A1.8 (0093)**  
**A Real-time Simulator capable of studying dynamic insulation coordinate in a MMC-HVDC system**  
W Wang, W Li, C Dufour, J Bélanger

**17:30 --- 19:00 Evening Drink Reception**

**Session B1: Future innovation and international projects**  
Zhejiang Hall

**Session Chair:** Dr. Ahmed Zobaa, Senior lecturer and MSc course director at Brunel University, UK

- 14:30 --- 14:45 **B1.1 (0006)**  
**An Optimal Reactive Power Control for Isolated Modular DC/DC Converter System**  
Yi Zhang, Binbin Li, Shaolei Shi, Dianguo Xu
- 14:45 --- 15:00 **B1.2 (0023)**  
**A New Pilot Distance Protection Scheme for Teed Lines**  
T Zheng, Y T Zhao, J Li, X H Wei, Y P Wang, C Chen, Z P Wang
- 15:00 --- 15:15 **B1.3 (0041)**  
**Optimization of Reactive Power and Voltage for Hybrid AC / VSC-HVDC System**  
Chenzhi Wei, Min Mou, An Wen, Weifang Huang, Xin Jin, Huan Ye, K. Liu, Y. F. Zhang
- 15:15 --- 15:30 **B1.4 (0056)**  
**Mitigation on requirement of DCCB by DC reactor for multi-terminal HVDC operation**  
K Tahata, R Uda, K Kuroda, K Kikuchi, R Yamamoto, H Ito, F Page, G P Adam, L Xu, S J Finney, B W Williams, D Holliday
- 15:30 --- 15:45 **B1.6 (0117)**  
**The effect of different filters connected to DC-DC converters in Multi-Terminal HVDC system for offshore wind farms**  
XIAOYUN RONG, Ewen Macpherson
- 15:45 --- 16:15 **Poster Session and Refreshments**
- 16:15 --- 16:30 **B1.7 (0137)**  
**Reactive Power Control in MMC HVDC System during ac Fault**  
Xiuyu Chen, Garth Irwin, Dennis Woodford, Aniruddha Gole
- 16:30 --- 16:45 **B1.8 (0141)**  
**Supplementary damping control of VSC-HVDC for interarea oscillation using goal representation heuristic dynamic programming**  
Y Shen, W B Chen, W Yao, S W Liao, J Y Wen
- 16:45 --- 17:00 **B1.9 (0131)**  
**Ultra-fast Electromagnetic Transient Model of the Modular Multilevel Converter for HVDC Studies**  
Xu Jianzhong, Ding Hui, Fan Shengtao, Aniruddha M. Gole, Zhao Chengyong, Xiong Yan
- 17:00 --- 17:15 **B1.10 (0004)**  
**Insulation coordination optimization study for  $\pm 660$ kV EHVDC project with increased transmission capacity**  
L C Zhang, C X Zhang, Y Y

**17:30 --- 19:00 Evening Drink Reception**

**Session C1: Real implications and applications**  
Jiangsu Hall

**Session Chair:** Prof. Chijie Zhuang, Tsinghua University, China

- 14:30 --- 14:45 **C1.1 (0012)**  
**The AC Side Fault Characteristics and Protection Scheme of the Unified Power Flow Controller Based on MMC**  
T Zheng, D Wu, K T Wang, H T Zeng, H H Qi
- 14:45 --- 15:00 **C1.2 (0014)**  
**The Effects of the Current Transformer Saturation on Mal-operation Under the DC Magnetic Bias Caused by HVDC**  
G Y Lu, T Huang, F F Zhang, T Zheng, L G Liu
- 15:00 --- 15:15 **C1.3 (0020)**  
**Interlayer Affect on Re-coating of External Insulation Anti-pollution Paints in HVAC/HVDC**  
Longji Li, Qinghua Tang, Minglei Wu, Xilin Wang, Zhidong Jia
- 15:15 --- 15:30 **C1.4 (0025)**  
**Analysis of an DC Trip Accident Based on a deductive and inductive method in Nan'ao VSC-MTDC Project**  
Daoqing Fan, Songguang Zhang, Shuguang Guo, Xiaoyi Su
- 15:30 --- 15:45 **C1.5 (0039)**  
**Economic Viability of Price Arbitrage Operation of Vanadium Redox Battery in Alberta's Energy market**  
Abiola Adebayo, Payam Zamani-Dehkordi, Hamidreza Zareipour, Andy Knight
- 15:45 --- 16:15 **Poster Session and Refreshments**
- 16:15 --- 16:30 **C1.6 (0052)**  
**Impact of Surface Conditions on Corona-generated Audible Noise for Long-term Operating Conductors in UHVDC Transmission Lines**  
Y Yi, C Y Zhang, Z Y Chen, L M Wang
- 16:30 --- 16:45 **C1.7 (0069)**  
**Active Power and Ac Voltage Slope Control for VSC Connected to Ac System with Low SCR**  
Chengyong Zhao, Bin Yuan, Jianzhong Xu
- 16:45 --- 17:00 **C1.8 (0075)**  
**The Research of Difference Frequency Disturbance in Parallel Switching Power Supply System**  
N Yin, L M Li, Y Q Pei, D W Hu
- 17:00 --- 17:15 **C1.9 (0081)**  
**IGBT technology for future high-power VSC-HVDC applications**  
Heng Wang, Kwok-Wai Ma

**17:30 --- 19:00 Evening Drink Reception**

## Day 2 Morning, Sunday, 29 May 2016

08:30 --- 09:30 **Registration**

### Session A2: Recent important projects Zhonghua Hall 2

**Session Chair:** Prof. Zhanqing Yu, Tsinghua University, China

09:30 --- 10:00 Session chair speech: EME of UHVDC Transmission Lines in High Altitude Area

10:00 --- 10:15 **A2.1 (0094)**  
**HV SubModule Technology based on Press Pack IGBT for Largest Scale VSC-HVDC Application**

Paolo Bordignon, HAITAO ZHANG, WEI SHI, Nicola Serbia, Alessandro Premoli, Alberto Coffetti

10:15 --- 10:30 **A2.2 (0096)**  
**STATCOM control scheme for solving problems of Power and T&D systems**

Kenji Masaki, Koji Temma, Masashi Kitayama

10:30 --- 10:45 **A2.3 (0110)**  
**Research on Optimization of Valve Hall Grounding Switches Configuration in  $\pm 1100\text{kV}$  Converter Station**

Wenxia Sima, Xue Han, Ming Yang, Licheng Li, Rong Wang

10:45 --- 11:00 **A2.4 (0113)**  
**Stability of a modular multilevel converter based HVDC system considering dc side connections**

Tan Li, Ani Gole, Chengyong Zhao

11:00 --- 11:30 **Poster Session and Refreshments**

11:30 --- 11:45 **A2.5 (0140)**  
**Research on flexible graphite-cooper composited electrical grounding material**

R H Gong, J J Ruan, Y C Hu, Y C Wu, S Jin

11:45 --- 12:00 **A2.6 (0144)**  
**A calculation method for maximum steady-state loss of VSC-HVDC grounding resistor in Luxi back-back HVDC interconnector**

W H Huang, Y X Lu, X L Li, Y Huang, S K Xu, M Li, T Liu

12:00 --- 12:15 **A2.7 (0157)**  
**A fault redundancy strategy between bridge arms of the modularized APF**

Yifan Wang, QING yang, Hongyan Zhan, Jinlong Gong, Qunwei Xu

12:15 --- 12:30 **A2.8 (0161)**  
**Positive- and negative-sequence control strategy of grid-connected PV systems under balanced and unbalanced voltage sags**

C J Gu, H S Wei, K Jia, T S Bi, B H Liu

12:30 --- 14:00 **Poster Session and Lunch**

### Session A2 continue: Recent important projects Zhonghua Hall 2

**Session Chair:** Prof. Bo Zhang, Tsinghua University, China

14:00 --- 14:30 Session Chair Speech: Ion Flow Field Calculation of HVDC Transmission Lines

- 14:30 --- 14:45 **A2.11 (0223)**  
**System Stability Analysis of Xiamen Bipolar MMC-HVDC Project**  
H Ding, Y K Wu, Y Zhang, Y L Ma, R Kuffel
- 14:45 --- 15:00 **A2.12 (0065)**  
**The influence of UHV hybrid reactive compensation and its stray capacitances on the interrupting characteristics of circuit breaker at out-of-phase fault.**  
R Li, H Liu, J Lou, B Li, T LV, W Li, H Liu
- 15:00 --- 15:15 **A2.13 (0229)**  
**Synchronization of PCP and VBC for Xiamen Bipole MMC HVDC Project**  
Y K Wu, H Ding, Y Zhang, Y L Ma, R Kuffel
- 15:15 --- 15:30 **A2.14 (0230)**  
**Amelioration of the Ionized Field Distribution near the Field Mill under the HVDC Conductor**  
Zhilong Zou, Xiang Cui, Tiebing Lu
- 15:30 --- 15:45 **A2.15 (0231)**  
**Impact of Aerosols on the Ionized Field of Positive HVDC Conductor in a Cylindrical Corona Cage**  
Y J Zhu, Y Ju, T B Lu, X M Bian, Z L Zou, X Zhang
- 15:45 --- 16:00 **Poster Session and Refreshment**  
**End of session**

## Session B2: Future innovation and international projects

Zhejiang Hall

**Session Chair:** Yanming Ren, Beijing Sifang Automation, China

- 09:30 --- 10:00 *Session Chair Speech*
- 10:00 --- 10:15 **B2.1(0118)**  
**Control of two LCC-HVDC Interconnected through DC-DC Autotransformer**  
Shuangyang Lu, Weixing Lin, Wei Yao, Jinyu Wen
- 10:15 --- 10:30 **B2.2 (0122)**  
**Extended Topologies and Technologies of DC-DC Autotransformer**  
Weixing Lin, Wei Yao, Jinyu Wen, Ashok Nampally
- 10:30 --- 10:45 **B2.3 (0156)**  
**Reliability Evaluation and Comparison for Different Topologies of VSC-HVDC Distribution Networks Using Analytical and Simulation Methods**  
An Wen, Min Mou, Chenzhi Wei, Hua Yang, Shuairong Deng, Weifang Zhao, K. Liu
- 10:45 --- 11:00 **B2.4 (0177)**  
**Analysis and Control of Hybrid Modular Multilevel Converter with Scheduled DC Voltage Reducing in HVDC Systems**  
Kecheng Xu, Jiabing Hu
- 11:00 --- 11:30 **Poster Session and Refreshments**
- 11:30 --- 11:45 **B2.5 (0179)**  
**On Hybrid Modular Multilevel Converters with Active DC Fault Ride-Through Capability**  
Maozeng Lu, Jiabing Hu, Muchao Xiang
- 11:45 --- 12:00 **B2.6 (0181)**  
**Improved Autonomous Converter Control for Multi-Terminal HVDC Networks**

### Considering Line Impedance Effect in Long-Distance Interconnections

Wanning Zheng, Jiabing Hu, Meiqing Zhang, Miao Miao

- 12:00 --- 12:15 **B2.7 (0188)**  
**A VSC-HVDC based flexible controller for improving the performance of looped electromagnetic networks in Guangzhou power grid.**  
Y Liu, X Yu, K Wang, X Xie, W Xiong, H Shang
- 12:15 --- 12:30 **B2.8 (0199)**  
**PWM plus Phase-Shift Controlled DC-DC Converter for Use in Series-Connected DC Wind Farm**  
Changjiang Sun, Gang Shi, Jianwen Zhang, Xu Cai
- 12:30 --- 12:45 **B2.9 (0204)**  
**All-DC Offshore Wind Farm with Parallel Connection-An Overview**  
Gang Shi, Xu Cai, Changjiang Sun, Yiran Chang, Renxin Yang
- 12:45 --- 13:00 **B2.11 (0234)**  
**Hierarchical Control and Experimental Verification of a Novel DC Substation**  
Jianjun MA, Miao ZHU, Liangzhong YAO, Jianwen ZHANG, Xu CAI
- 13:00 --- 14:00 **Poster Session and Lunch**

### *Invited Session*

#### **Session Chair:**

Prof. Qixin Chen, Associate Professor at Department of Electrical Engineering, Tsinghua University, China

- 14:30 --- 15:00 **Session Chair 's introduction**  
Prof. Qixin Chen, Tsinghua University, China
- 15:00 --- 15:20 **Topic: Storage in the energy market**  
Speaker: Prof. Richard Green
- 15:20 --- 15:40 **Topic: Optimal storage investment and management under uncertainty – it is costly to avoid outages**  
Speaker: Dr. Joachim Geske
- 15:40 --- 16:00 **Poster Session and Refreshments**
- 16:00 --- 16:20 **Topic: Operation and Economics for Storage in Electricity Markets**  
Speaker: Prof. Qixin Chen
- 16:20 --- 16:40 **Topic: Value of energy storage with multiple service provision**  
Speaker: Dr. Fei Teng
- 16:40 --- 17:00 **Poster session**  
**End of Session**

## Session C2: Real implications and applications

Jiangsu Hall

**Session Chair:** Ziming Song, Chief specialist for HVDC at Toshiba international (Europe) Ltd

- 09:30 --- 09:45 **C2.1 (0109)**  
**Grid Power Flow Impact on the On-state Losses of the Modular Multilevel Converter**  
Abel António-Ferreira, Oriol Gomis-Bellmunt, Miquel Teixidó
- 09:45 --- 10:00 **C2.2 (0120)**  
**24-pulse rectifier for harmonic management in HVDC diode rectifier-connected wind power plants**  
Salvador Añó-Villalba, Soledad Bernal-Perez, Ruben Pena, Ricardo Vidal-Albalade, Enrique Belenguer, Nestor Aparicio, Ramon Blasco-Gimenez
- 10:00 --- 10:15 **C2.3 (0132)**  
**Fast, Simple, and Accurate Fundamental Frequency Estimation**  
Peerawat Yutthagowith, Anantawat Kunakorn
- 10:15 --- 10:30 **C2.4 (0133)**  
**Effective Circuit Parameter Determination in Lightning Impulse Voltage Tests of Air Core Inductors**  
Peerawat Yutthagowith, Piyapon Tuethong, Norasage Pattanadech
- 10:30 --- 10:45 **C2.5 (0173)**  
**Fault Line Detection Based on Optimized Cascaded Bistable System for Distribution Network**  
Jie Gao, Xiaowei Wang, Qiming Cheng, Xiangxiang Wei, Dechang Yang
- 10:45 --- 11:00 **C2.6 (0182)**  
**Commutation Failure Analysis Considering Direct Current Dynamics in LCC-HVDC Systems**  
Jun Lu, Jiabing Hu, Meiqing Zhang, Miao Miao
- 11:00 --- 11:30 **Poster Session and Refreshments**
- 11:30 --- 11:45 **C2.7 (0200)**  
**Nonlinear Load Characteristics of HVDC Converters**  
Yi Zhang, A. M. Gole
- 11:45 --- 12:00 **C2.10 (0214)**  
**Dielectric Diagnosis of 24kV XLPE Cable Using Polarization and Depolarization Current, Conventional Partial Discharge Measurements and High Frequency Current Measurement**  
P Nimsanong, N Pattanadech, P Yutthagowith
- 12:00 --- 14:00 **Poster Session and Lunch**