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RESEARCH INTERESTS

Modeling, Protection and Resilience of Power Electronics based Power Systems, Renewable Energy Integration, MMC-HVDC Control and Operation, and Machine Learning Applications in Power Electronics based Power Systems.

EDUCATION

- Ph.D. in Electrical Engineering**, University College Dublin, Ireland Feb 2014
Advisor: Professor Chen-Ching Liu
Thesis title: *System security and protection coordination of AC grids with wind power integration*
- Master in Electrical Engineering**, Huazhong University Sci & Tech, China Jun 2009
Advisor: Professor Chengxiong Mao
Thesis title: *A novel VSC-based excitation system*
- Bachelor in Electrical Engineering**, Huazhong University Sci & Tech, China Jun 2007
Thesis title: *WAMS-based rotor angle stability detection*

QUALIFICATIONS

13 years' R&D Experience+5 years' International Industry Experience

- 13 years' R&D experience in renewable energy integration, power electronics and its applications in power systems, wide-area control and protection, PMU, smart grid, and electromagnetic transients
- 5 years' international industrial experience in **leading Utility (SGCC) and Vendor (Siemens AG)**
- Comprehensive knowledge on of power systems, power electronics, and high voltage engineering

WORKING EXPERIENCE

- *Assistant Professor*, University of Illinois at Chicago Jan 2018-Present
- *Senior Consultant*, Siemens PTI, MN, USA Apr 2017-Dec 2017
- *Project Manager and Consultant*, Siemens Headquarters, Erlangen, Germany Aug 2014-Mar 2017
- *Research Scholar*, Washington state University, Pullman, WA, USA Apr 2013-Oct 2013
- *Electrical Engineer*, State Grid Corporation of China, Tianjin, China Jul 2009-Feb 2010

MAJOR AWARDS AND HONORS

- **Best Paper of 2016 IEEE PES General Meeting** (IEEE Power & Energy Society - 2016)
- **Outstanding Reviewer of IEEE Trans. on Power Systems** (IEEE Power & Energy Society - 2014)
- **Outstanding Teaching Assistant** (University College Dublin, School of EECE – 2012/2013)
- **Top Academic Award** (Huazhong University, College of EE - 2004, 2005, 2006, 2007, 2008)
- **NARI ELECTRIC Award** (Huazhong University, 2008)
- **Outstanding Master/Bachelor Thesis** (Huazhong University, College of EE – 2009/2007)

PATENTS

- [1] Lina He, “Intelligent adaptive relay for protection coordination of hybrid ac/dc microgrids,” filed on April 28th, 2020.
- [2] “Paralleled multiple voltage source converter based self-shunt excitation system,” (with C. Mao, et al); **Granted Patent**, Patent Publication No.: ZL200910061371.X (CN101521446 B), filed on Apr. 1st 2009, published on Apr. 20th 2011.
- [3] “Paralleled multiple current source converter based self-shunt excitation system,” (with C. Mao, et al); **Granted Patent**, Patent Publication No.: ZL200910061370.5 (CN101593982 B), filed on Apr. 1st 2009, published on Nov. 30th 2011.

GRANT

- Co-PI, Unified Universal Control and Coordination of Inverter-Based Resources, AI Forecasting, and Demonstration for PV+Battery Hybrid Plants, SETO DOE (2021-2024)

INDUSTRIAL EXPERIENCE

Senior Consultant at Siemens PTI US, MN, USA Apr 2017 – Dec 2017

- Served as a technical lead on renewable energy integration, including solar and wind.
- Wind turbine modeling for integration studies with MISO, NYISO and Minnesota Power
- Protection coordination studies with Entergy
- Wind farm interconnection studies with NYISO
- EMTP studies with Scottish Power, including HVDC transformer energization, HVDC feeder transient recovery overvoltage (TRV)

Project Manager and Consultant at Siemens Headquarters, Erlangen, Germany Aug 2014- Mar 2017

- Served as a **Project Manager** and **Technical lead**
- Multi-time-scale offshore/onshore wind turbine generator modeling and simulation
- MMC-HVDC (HVDC PLUS) control, protection and modeling (dynamic and electromagnetic).
- Electromagnetic transient (EMT) modeling and simulation, including DC component analysis, transformer energization, very fast transient overvoltages (VFTOs) of switchgear, CB transient recovery overvoltage, etc.

Electrical Engineer in State Grid Corporation of China (SGCC), Tianjin Jul 2009-Feb 2010

- Renewable energy integration (including wind and photovoltaics).
- Transmission planning, including power flow calculation, N-1 contingency analysis, transient stability analysis, and small-signal stability analysis;

ACADEMIC EXPERIENCE

UNIVERSITY OF ILLINOIS AT CHICAGO, Chicago, IL, USA Jan 2018-Present

Assistant Professor

*I have established the **Power Energy Innovation (PEI) Lab** in the ECE department at UIC, which supports a **strategic multidisciplinary program** in the areas of power systems and power electronics to achieve a smarter, securer, more efficient, and more resilient power grid.*

The active research in my Lab includes:

- **Intelligent online modeling of power electronics based power systems with renewable energy integration**
- **Integration strategies of renewable energy (PV and wind), including protection and control**
- **Resilience of power systems with inverter based DER integration**
- **Wide-area protection and cybersecurity of power electronics based power systems**

WASHINGTON STATE UNIVERSITY, Pullman, WA, USA

Apr 2013- Oct 2013

Research Scholar, collaborated with Prof. Chen-Ching Liu

- Developed a centralized load shedding scheme to achieve wide-area voltage protection;

UNIVERSITY COLLEGE DUBLIN, Dublin, Ireland

Jan 2010-Feb 2014

Research Assistant, served as a technical lead on the “TWENTIES” Project (total budget: €56.8 Million) sponsored by EU FP-7, in collaboration with University of Strathclyde (UK), Siemens (Germany), RTE (France), Alstom (UK), etc;

Wide-area voltage protection of AC grids with large-scale offshore wind power integration

- Proposed a **PMU-based HVDC model** that can be applied in **AC/DC systems** on respects of online stability detection, fault location, load shedding determination, etc;
- Applied the developed HVDC model to online **detect voltage instability** of an AC grid with HVDC connected wind generators using Thevenin impedance matching;
- Developed a **load shedding algorithm** based on Zbus approach to determine minimum load shedding amount for voltage instability mitigation.

Protection Coordination of AC grids with large-scale offshore wind power integration

- Presented an **apparent impedance calculation algorithm** based on Zbus approach, to identify potential mis-coordinated distance relays on AC grids with HVDC connected offshore wind generators;
- Identified **protective device settings** on an AC grid that need to be adjusted due to **HVDC control** of offshore wind generators.

Impact of DFIG LVRT capability on distance protection of AC grids

- Modeled DFIG LVRT capability based on FERC order 661;
- Demonstrated **mis-coordinated operation of distance relays** on AC grids due to **reactive power characteristic** of DFIGs during crowbar connection.

System restoration using HVDC connected offshore wind generators as a blackstart unit

- Explored black-start control strategies of HVDC connected DFIGs during major outages;
- Validated effectiveness of **VSC-HVDC control** in alleviating steady-state and transient overvoltages during system restoration.

HUAZHONG UNIVERSITY OF SCIENCE & TECHNOLOGY, Wuhan, China

Sep 2007-Jun 2009

Research Assistant, served as a major contributor to the feasibility study of the “EHV” (1000 kV) connection from Central China to North China, in collaboration with **State Grid Corporation of China**;

- Proposed a **novel excitation system based on VSC technology** to achieve fast and wide-ranging excitation regulation;
- Conducted small-signal stability analysis for interconnected system to identify system low frequency oscillation modes;

PUBLICATIONS

Journals

- [1] S. Rong, **L. He**, L. Du, Z. Li, and S. Yu, “Intelligent detection of vegetation encroachment of power lines with advanced stereovision,” *IEEE Transactions on Power Delivery*, 2020. (Accepted)
- [2] S. Wang, L. Du, J. Ye and **L. He**, “Noncooperative social welfare optimization with resiliency against network anomaly,” *IEEE Transactions on Industrial Informatics*, vol. 16, no. 4, Apr. 2020.
- [3] **L. He** and C.-C. Liu, “Parameter identification with PMUs for instability detection in power systems with HVDC integrated offshore wind energy,” *IEEE Transactions on Power Systems*, vol. 29, no. 2, Mar. 2014.
- [4] **L. He**, C.-C. Liu, A. Pitto, and D. Cirio, “Distance protection of AC grid with HVDC connected offshore wind generators,” *IEEE Transactions on Power Delivery*, vol. 29, no. 2, Apr. 2014.
- [5] **L. He**, C. Mao, J. Lu, and D. Wang, “Novel excitation system using high power electronics full-controlled device rectifier,” *High Voltage Engineering*, vol. 35, no. 7, pp. 1711-1717, 2009.
- [6] **L. He**, C. Mao, J. Lu, and D. Wang, “The new scheme of direct measurement of hydro power generator speed and power angle,” *Water Resources and Power*, vol. 26, no. 3, pp. 156-159, 2008.
- [7] J. Wu, **L. He**, C. Mao, J. Lu, and D. Wang, “Novel excitation system of the synchronous generator,” *Journal of Electric Power Science and Technology*, vol. 24, no. 1, pp.12-18, 2009.
- [8] Y. Luo, Y. Wang, W. Wan, B. Zhang, H. Cai, G. Liu, H. Li, **L. He**, and Y. Yi, “Fault chain model of cascading failure in AC grids,” *Automation of Electric Power Systems*, vol. 33, no. 24, pp.1-5, 2009.

Conferences

- [9] S. Rong, and **L. He**, “Impact of photovoltaic generation integration on protection of distribution systems,” 2020 “MIT A+B” *Applied Energy Symposium*, Massachusetts Institute of Technology, USA, Aug. 2020.
- [10] **L. He**, S. Rong, and C. Liu, “Intelligent overcurrent protection algorithm of distribution systems with integration of PV generation,” 2020 *IEEE Energy Conversion Congress & Expo*, Oct. 2020.
- [11] S. Rong, and **L. He**, “A joint faster RCNN and stereovision algorithm for vegetation encroachment detection in power line corridors,” 2020 *IEEE PES General Meeting*, Aug. 2020
- [12] **L. He**, “Bypassing transients of pre-insertion resistor during energization of MMC-HVDC,” 2018 *IEEE Power and Energy Conference at Illinois (PECI)*, Chicago, IL, Feb. 2018.
- [13] **L. He**, “Effects of pre-insertion resistor on energization of MMC-HVDC stations,” 2017 *IEEE PES General Meeting*, Chicago, IL, Jul. 2017.
- [14] **L. He** and R. Voelzke, “Effects of pre-insertion resistor on energization of compensated Lines,” 2016 *IEEE PES General Meeting*, Boston, MA, Jul. 2016. **(Best Paper, Top 5%)**

- [15] **L. He** and C.-C. Liu, "Effects of HVDC connection for offshore wind turbines on AC grid protection," *2013 IEEE PES General Meeting*, Vancouver, BC, Canada, Jul. 2013.
- [16] **L. He** and C.-C. Liu, "Impact of LVRT capability of wind turbines on distance protection of AC grids," *2013 IEEE PES Innovative Smart Grid Technologies (ISGT)*, Washington DC, Feb. 2013.
- [17] **L. He** and C.-C. Liu, "Protection coordination between a HVDC offshore wind system and AC grid," *2011 CIGRE Symposium "The Electric Power System of the Future"*, Bologna, Italy, Sep. 2011.
- [18] E. Ciapessoni, D. Cirio, A. Gatti, A. Pitto, A.M. Denis, **L. He**, C.-C. Liu, C. Moreira, and B. Silva, "Impact of HVDC grid on AC system stability and operation," *2014 CIGRE*, Paris, France, Aug. 2014.
- [19] E. Ciapessoni, D. Cirio, A. Gatti, A. Pitto, A.M. Denis, O. Despouys, **L. He**, C.-C. Liu, et al, "Dynamics and control of multi-terminal HVDC networks for integration of large offshore wind parks into AC grids," *2012 CIGRE*, Paris, France, Aug. 2012.
- [20] K. Bell, D. Cirio, A.M. Denis, **L. He**, C.-C. Liu, C. Moreira, and P. Panciatici, "Economic and technical criteria for designing future offshore HVDC grids," *2010 Europe IEEE Innovative Smart Grid Technologies (ISGT Europe)*, Sweden, Oct. 2010.

Technical Reports

- [21] C.-C. Liu, **L. He**, S. Finney, G. P. Adam, J.-B. Curis, O. Despouys, et al, "Preliminary analysis of HVDC networks for off-Shore wind farms and their coordinated protection," TWENTIES WP5 Deliverable No. 5.1, European Commission, Mar. 2011.
- [22] E. Ciapessoni, D. Cirio, A. Gatti, A. Pitto, C. Moreira, B. Silva, Y. Phulpin, F. Resende, A.-M. Denis, O. Despouys, T. Prevost, C.-C. Liu, and **L. He**, "Principles of an optimal operation of the AC/DC interconnected power systems – Specification of the requirements for the HVDC grid (DCG) injections to the AC grid," TWENTIES WP5 Deliverable No. 5.2-b, European Commission, Dec. 2011.
- [23] A.-M. Denis, O. Despouys, D. Cirio, A. Pitto, C. Moreira, B. Silva, F. Resende, H. Vasconcelos, C.-C. Liu, **L. He**, et al, "Advanced results of simulations of control and protection of HVDC networks: behavior and optimization," TWENTIES WP5 Deliverable No. 5.3, European Commission, Mar. 2013.
- [24] K. Bell, A.-M. Denis, O. Despouys, S. Nguéfeu, J. Tazine, L. Violleau, J. Curis, W. Grieshaber, D. Cirio, A. Pitto, G. Migliavacca, R. Calisti, C. Moreira, B. Silva, C.-C. Liu, **L. He**, et al, "DC grids: motivation, feasibility and outstanding issues," TWENTIES WP5 Deliverable No. 5.4, European Commission, Sep. 2013

INVITED TALKS

- [1] 2019 Academic Seminar at Pacific Northwest National Laboratory, "Protection, security and restoration of power electronics based power systems," Richland, WA, Nov. 2019.
- [2] 2019 Academic Seminar at Siemens Corporation, "Security and protection of power electronics based power systems," Princeton, NY, Oct. 2019.
- [3] 2019 GE Symposium, "Non-blackbox data-driven online modeling of power electronics for real-time security detection," Niskayuna, NY, Sep. 2019.
- [4] 2018 Academic Seminar at Illinois Institute of Technology, "Security of Future Power Grid with Renewable Energy Integration," Chicago, IL, Sep. 2018.
- [5] 2018 Academic Seminar in SC&C company, "Security of Future Power Grid with Renewable Energy Integration," Chicago, IL, Sep. 2018.

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- [6] 2018 Academic Seminar at North China Electric Power University, “Security of Future Power Grid with Renewable Energy Integration,” Beijing, China, Jun. 2018.
- [7] 2018 Academic Seminar at Wuhan University, “Security of Future Power Grid with Renewable Energy Integration,” Wuhan, Hubei, China, May 2018.
- [8] 2018 Academic Seminar at Huazhong University of Science and Technology, “Security of Future Power Grid with Renewable Energy Integration,” Wuhan, Hubei, China, May 2018.
- [9] 2018 Integrated Energy and Smart Micro-grid Technology, “Smart Grid - Offshore Wind Power Integration,” Baoding, Hebei, China, May 2018.
- [10] 2018 Academic Seminar at Virginia Tech, “Security of Future Power Grid with Renewable Energy Integration,” Blacksburg, VA, Mar. 2018.
- [11] 2018 IEEE Power and Energy Conference Illinois (PECI), “Bypassing transients of pre-insertion resistor during energization of MMC-HVDC,” Urbana, IL, Feb. 2018.
- [12] 2017 TechX Talk at Siemens DG Headquarter, “Voltage security of the future power grid with renewable energy integration,” Minnetonka, MN, Oct. 2017.
- [13] The 5th East Lake International Forum, “System security and protection coordination of AC grids with wind power integration,” Wuhan, China, Dec. 2016.
- [14] 2016 Summer Seminar at Arizona State University, “Offshore wind power integration,” Tempe, AZ, Jul. 2016.
- [15] 2016 IEEE PES General Meeting on Best Paper Session of Power System Modeling and Analysis, “Effects of pre-insertion resistor on energization of compensated Lines,” Boston, MA, Jul. 2016.
- [16] 2013 IEEE PES General Meeting, “Effects of HVDC connection for offshore wind turbines on AC distance protection,” Vancouver, BC, Canada, Jul. 2013;
- [17] 2013 IEEE PES Innovative Smart Grid Technologies (ISGT), “Impact of LVRT capability of wind turbines on distance protection of AC grids,” Washington DC, Feb. 2013.
- [18] 2013 BOC Symposium at University College Dublin, “Challenges of offshore wind integration for the Irish grid,” Dublin, Ireland, Feb. 2013.
- [19] 2011 CIGRE Symposium “The Electric Power System of the Future”, “Protection coordination between a HVDC offshore wind system and AC grid,” Bologna, Italy, Sep. 2011
- [20] 2011 IEEE PES General Meeting, “Impact of AC grid faults on VSC-HVDC offshore wind network,” Detroit, MI, Jul. 2011.

TEACHING EXPERIENCE

- ECE 491 Fundamentals of Power Systems
- ECE 491 Power System Analysis
- ECE 594 Modern Distributed Power Systems

PROFESSIONAL SERVICE

IEEE Society Service

- **Secretary**, IEEE PES Distribution System Operation and Planning Subcommittee, 2019 – present

Referee Service

- **Associate Editor**, IEEE Open Journal of Power Electronics, 2019 – present
- **Associate Editor**, International Journal of Electrical Power and Energy Systems, 2020 - present
- Reviewer of top journals and leading conferences, including *IEEE Transactions on Power Systems*, *IEEE Transactions on Power Delivery*, *IEEE Transactions on Smart Grid*, *IEEE Transactions on Industrial Electronics*, *Journal of Modern Power Systems and Clean Energy*, *IET Generation, Transmission & Distribution*, *IET Renewable Power Generation*, *International Transactions on Electrical Energy Systems*, *CPSS Transactions on Power Electronics and Applications*, *2020 IEEE PES General Meeting*, *2018 IEEE Energy Conversion Congress and Exposition (ECCE)*, *IEEE PES PowerTech 2017*.

Conference Service

- Session Chair, 2020 IEEE PES General Meeting, “Managing Power Electronic based Power Systems”, Montreal, Canada, Aug. 2020.
- Session Chair, 2020 IEEE Innovative Smart Grid Technologies (ISGT), “Physical and Cyber Security of Power Electronic based Power Systems”, Washington DC, Feb. 2020.
- Topic Chair, 2018 IEEE Energy Conversion Congress and Exposition (ECCE), "Sustainable Energy Systems", Portland, OR, Sep. 2018.
- Session Chair, 2018 Integrated Energy and Smart Micro-grid Technology, “Renewable Energy Forecasting”, Baoding, Hebei, China, May 2018.

PROFESSIONAL ORGANIZATION

- Member of Institute of Electrical and Electronics Engineers (*IEEE*)
- Member of Power Energy Society (*PES*)
- Member of Power Electronics Society (*PELS*)

PHD ADVISOR

- Dr. Chen-Ching Liu (Member of National Academy of Engineering, IEEE Fellow)
American Electric Power Professor
Director, Power and Energy Center
The Bradley Department of Electrical and Computer Engineering
Virginia Tech
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