Yuanzhu Chang

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ACADEMIC BACKGROUND

- **Postdoctoral Fellow in Electrical Engineering** Nov. 2020—Jun. 2022
  Department of Electrical Engineering, Polytechnique Montréal, Université de Montréal
  Project: Development of industrial level wind park and DFIG models for steady state and transient studies.
  Supervisors: Prof. Ilhan Kocar (*IEEE Senior Member*) and Prof. Jean Mahseredjian (*IEEE Fellow*)
  Contribute to NSERC/Hydro-Québec/RTE/EDF/OPAL-RT Industrial Research Chair Program.
- **Ph.D in Electrical Engineering**. Sep. 2014—Jun. 2020
  Huazhong University of Science and Technology.
  Dissertation: Transient characteristics and fault current of DFIG-based wind turbines during short circuits.
  Supervisor: Prof. Jiabing Hu (*IEEE Senior Member, IET Fellow*).
  Contribute to:
  National Key R&D Program: System planning and operation under high penetration of renewable power;
  National Basic Research (973) Program: Large-scale grid integration of wind power and its basic issues;
- **Bachelor in Electrical Engineering.** Sep. 2010—Jun. 2014
  Huazhong University of Science and Technology.

HONORS AND AWARDS

- New IEC Standardization Expert, International Electrotechnical Commission (IEC). 2021
- National Young Professionals Training, IEC. 2021
- Star Reviewer, IEEE Transactions on Energy Conversion. 2020
- 1st Scientific and Technological Advancement Award, State Grid Corporation of China. 2020
- 1st Scientific and Technological Advancement Award, China Electric Power Research Institute. 2020
- Best Conference Paper Award, the International Conference on Renewable Power Generation, IET. 2019
- Best Oral Speaker, Tsinghua University-IET Electrical Engineering Academic Forum. 2018
- Best Paper Award, Wuhan Power Supply Society General Meeting. 2018
- Star Reviewer, IEEE Transactions on Energy Conversion. 2017–2018
- Best Conference Paper Award, the International Conference on Renewable Power Generation, IET. 2017
- Best Oral Speaker, Wuhan University Electrical Engineering Forum. 2016
- Excellent Bachelor Degree Thesis of Hubei Province, Hubei Ministry of Education 2014
- National First Prize in National Undergraduate Electronic Design Contest. 2013

SCIENTIFIC ACHIEVEMENTS

- ***Journal Papers***

[1] **Y. Chang**, I. Kocar, U. Karaagac, J. Mahseredjian, "Analytical Characterization of DFIG Response to Asymmetrical Voltage Dips for Efficient Design," in ***Electric Power Systems Research***. (Under Review)

[2] **Y. Chang**, M. Zhao, I. Kocar, "The Impact of DFIG Control Schemes on Negative-Sequence based Differential Protection Elements," in ***Electric Power Systems Research***. (Under Review)

[3] **Y. Chang**, I. Kocar, J. Hu, U. Karaagac, K. W. Chan and J. Mahseredjian, "Coordinated Control of DFIG Converters to Comply with Reactive Current Requirements in Emerging Grid Codes," in ***Journal of Modern Power Systems and Clean Energy***, vol. PP, no. 99, pp. 1-12, Oct. 2021.

[4] **Y. Chang**, J. Hu, G. Song; X. Kong, Y. Yuan, "Impact of DFIG-based wind turbine's fault current on distance relay during symmetrical faults," in ***IET Renewable Power Generation***, vol. 14, no. 16, pp. 3097-3102, Dec 2020.

[5] Z. He, J. Hu, L. Lin, **Y. Chang**, Z. He, "Pole-to-ground Fault Analysis for HVDC Grid Based on Common- and Differential-mode Transformation," in ***Journal of Modern Power Systems and Clean Energy***, vol. 8, no. 3, pp. 521-530, May 2020.

[6] **Y. Chang**, J. Hu and X. Yuan, "Mechanism Analysis of DFIG-Based Wind Turbine's Fault Current During LVRT With Equivalent Inductances," in ***IEEE Journal of Emerging and Selected Topics in Power Electronics***, vol. 8, no. 2, pp. 1515-1527, June 2020.

[7] **Y. Chang**, J. Hu, X. Kong and Y. Yuan, "Characteristics Analysis of DFIG-based Wind Turbine's Stator Fault Current During Crowbar Protection by Operational Inductance," in ***Proceedings of the Chinese Society for Electrical Engineering (CSEE)***, vol. 39, no. 21, pp. 6192-6199, Nov 2019.

[8] **Y. Chang**, J. Hu, W. Tang, G. Song, "Fault Current Analysis of Type-3 WTs Considering Sequential Switching of Internal Control and Protection Circuits in Multi Time Scales during LVRT," in ***IEEE Transactions on Power Systems***, vol. 33, no. 6, pp. 6894-6903, Nov. 2018.

[9] W. Tang, J. Hu, **Y. Chang**, F. Liu, "Modeling of DFIG-based WT for System Transient Response Analysis in Rotor Speed Control Timescale," in ***IEEE Transactions on Power Systems***, vol. 33, no. 6, pp. 6795-6805, Nov. 2018.

[10] **Y. Chang**, X. Kong, "Linear demagnetizing strategy of DFIG-based WTs for improving LVRT responses," in ***The Journal of Engineering***, vol. 2017, no. 13, pp. 2287-2291, 2017.

[11] J. Liu, J. Hu, **Y. Chang**, W. Tang, H. Tang, "Short-circuit current analysis of grid-connected LCL VSC by operational inductance," in ***The Journal of Engineering***, vol. 2017, no. 13, pp. 1101-1105, 2017.

- ***Selected Conference Publications***

[12] **Y. Chang**, I. Kocar, U. Karaagac (Panel Session), "Generic Wind Turbine models and grid codes," ***2022 IEEE Power & Energy Society General Meeting***, Denver, Colorado, 2022. (Under Review)

[13] I. Kocar, **Y. Chang**, R. Furlaneto, A. Pavani, A. Haddadi and E. Farantatos, "Nonlinear Network Equivalents of Systems with Inverter Based Resources to Study Unbalanced Faults in Steady State," ***2022 IEEE Power & Energy Society General Meeting***, Denver, Colorado, 2022. (Under Review)

[14] **Y. Chang**, J. Hu, X. Liu and G. Song (Best Paper Award), "Impact of DFIG-based wind turbine's fault current on distance relay during symmetrical faults," ***8th International Conference on Renewable Power Generation (RPG)***, Shanghai, China, 2019, Shanghai, China.

[15] X. Yu, **Y. Chang**, J. Hu and L. Shang, "Fault Current Analysis of Type-3 Wind Turbine Considering Dynamic Influence of Phase Locked Loop," ***2019 10th International Conference on Power Electronics and ECCE Asia (ICPE 2019 - ECCE Asia)***, Busan, Korea (South), 2019.

[16] **Y. Chang** (Invited Panelist), "Fault Current Analysis of DFIG-based WT: Operational Inductance and The Analytical Method," Panel: Invited Young Scholars' Forum, ***the 2nd IEEE Conference on Energy Internet and Energy System Integration***, 2018, Beijing, China.

[17] **Y. Chang**, J. Hu, E. Zhang and X. Zhang, "Impact of Nonlinearity on Type-3 WT's Fault Current," *2018* ***IEEE 4th Southern Power Electronics Conference***, Singapore, 2018, pp. 1-7.

[18] **Y. Chang** (Best Paper Award), "Sequential Switching Characteristic of DFIG-based Wind Turbine during LVRT and the Fault Current Analytical Method based on Operational Inductance," ***Wuhan Power Supply Society General Meeting 2018***, Wuhan, China.

[19] **Y. Chang**, "Characteristics Analysis to DFIG-based Wind Turbine's Stator Current During Crowbar Protection and Symmetrical Fault by Operational Inductance," ***Tsinghua University-IET Electrical Engineering Academic Forum 2018***, Beijing, China. (Best Oral Speaker)

[20] **Y. Chang** and X. Kong, "Linear demagnetizing strategy of DFIG-based wind turbines for improving LVRT responses," ***6th International Conference on Renewable Power Generation (RPG)***, Wuhan, 2017. (Best Conference Paper Award)

[21] **Y. Chang** and J. Hu, "Modeling, analysis and parameters design of rotor current control in DFIG-based wind turbines for dynamic performance optimizing," ***2017 IEEE Energy Conversion Congress and Exposition (ECCE)***, Cincinnati, OH, 2017, pp. 3303-3308.

[22] **Y. Chang**, J. Hu, W. Tang and H. Tang, "Operational inductance of DFIG-based wind turbines for fault current analysis during LVRT," ***2017 IEEE Power & Energy Society General Meeting***, Chicago, IL, 2017.

[23] W. Tang, J. Hu, **Y. Chang** and X. Kong, "Short-circuit current of grid-connected voltage source converters: Multi-timescale analysis method," ***2017 IEEE Power & Energy Society General Meeting***, Chicago, IL, 2017.

[24] **Y. Chang** (Best Oral Speaker), "Study of Fault Ride Through Operation in DFIG-based Wind Turbines," ***Wuhan University Electrical Engineering Forum 2016***, Wuhan, China.

[25] H. Tang, **Y. Chang**, Y. Chi, B. Wang, Y. Li and J. Hu, "Analysis and control of doubly fed induction generator for zero voltage ride through," ***2016 19th International Conference on Electrical Machines and Systems (ICEMS)***, Chiba, 2016, pp. 1-5.

- ***Patents***

[26] Y. Li, Y. Chi, J. Hu, H. Tang, X. Tian, **Y. Chang** and Y. Lei, "A kind of Group Dividing Method and System for Renewable Power Generators," China Patent (Application Number CN201910898929.3), Mar. 2021. (Published)

[27] Y. Li, Y. Chi, J. Hu, H. Tang, X. Tian, **Y. Chang** and Y. Lei, "A kind of Fault Current Calculation Method and System for Full-scale Converter Based Wind Trubines," China Patent (Application Number CN201910627700.6), Nov. 2019. (Published)

[28] J. Hu, **Y. Chang**, E. Zhang and X. Yuan, "AC Excitation Synchronous Condenser and Control Method," US Provisional Patent (Patent No. 10411627), Dec. 2017. (Granted)

[29] J. Hu, **Y. Chang**, E. Zhang and X. Yuan, "AC Excitation Synchronous Condenser and its Control Method," China Patent ZL 2017 1 1416473.X, Dec. 2017. (Granted)

[30] J. Hu, **Y. Chang**, Q. Li and J. He, "A kind of quantitative method of interaction among multi renewable power stations," China Patent ZL 2016 1 0377589.6, Oct. 2016. (Granted)

- ***Book Chapters***

[31] "Fault Ride Through Strategies of Modern Wind Power Generators," in *Dynamic Analysis of Wind Power Generator and Its Integration System*, Science Press, 2021, 1(1). ISBN 978-7-03-068211-6.

[32] "Single-phase AC/DC Converter," in *Awarded Works of 11th National Undergraduate Electronic Design Contest*, Beijing Institute of Technology Press, 2015, 1(1): 3-10. ISBN 978-7-5682-0173-5.

- ***Research Reports***

[33] "Impact of Renewables on System Protection: Short Circuit Network Equivalents of Systems with Inverter-based Resources". Palo Alto, CA: EPRI, 2021.

[34] "Behavior of Inverter-Based Resources in Response to Bulk Grid Faults," IEC SC 8A Joint Working Group 5 Technical Report, IEC TR 63401-4, 2021.

TEACHING EXPERIENCES

- Power Conversion and Control of Modern Wind Energy Systems. Sep.-Nov. 2019
  Role: Teaching Assistant; Course Level: Graduate
  School of Electrical and Electronic Engineering, Huazhong University of Science and Technology
- Power Electronic Training for National Undergraduate Electronic Design Contest. Apr.-Jun. 2015
  Role: Instructor; Course Level: Undergraduate
  Qiming College, Huazhong University of Science and Technology

ACADEMIC SERVICES

- **Delegate**, Standards Council of Canada (SCC) in IEC/TC 8/SC 8A. 2021—Present
- **Expert**, IEC SC 8A Working Group 8. 2021—Present
  Modeling of renewable energy generation for power system dynamic analysis.
- **Assistant Secretary and Expert**, IEC SC 8A Joint Working Group 5. 2018—Present
  System issues regarding integration of wind and PV generation into bulk electrical grid.
- **Report contributor**, CIGRE Working Group B5.48. 2018—Present
  Protection for developing network with limited fault current capability of generation.
- **Member of Technical Program Committee**. 2020
  The 23rd International Conference on Electrical Machines and Systems (ICEMS 2020).
- **Reviewer** for IEEE Transactions on Energy Conversion, IEEE Journal of Emerging and Selected Topics in Power Electronics, IEEE Transactions on Industrial Electronics, IEEE Transactions on Power Delivery, IET Renewable Power Generation, IET Generation, Transmission, Distribution, IET Electric Power Applications, Journal of Modern Power Systems and Clean Energy, Electric Power Systems Research, International Transactions on Electrical Energy Systems, IEEE Power Engineering Letters Records
- **Member**, Societies of Power & Energy, Power Electric and Young Professionals, IEEE. 2017—Present