BOLUN XU

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POSITIONS

Columbia University *January 2020 - Present*
Assistant Professor
Earth and Environmental Engineering

Massachusetts Institute of Technology *July 2018 - December 2019*
Postdoctoral Associate
MIT Energy Initiative and Lab for Info. & Decision Systems

EDUCATION

University of Washington *September 2014 - June 2018*
PhD in Electrical Engineering

Swiss Federal Institute of Technology Zurich *September 2011 - January 2014*
MS in Electrical Engineering

Shanghai Jiaotong University *September 2007 - August 2011*
BS in Electrical and Computer Engineering (Dual degree with University of Michigan, Ann Arbor)

JOURNAL PUBLICATIONS

1. Y. Bian, N. Zheng, Y. Zheng, B. Xu, and Y. Shi, "Predicting strategic energy storage behaviors," *IEEE Transactions on Smart Grid*, 2023
2. J. Jaworski, N. Zheng, M. Preindl, and B. Xu, "Vehicle-to-grid fleet service provision considering nonlinear battery behaviors," *IEEE Transactions on Transportation Electrification*, 2023
3. X. Qin, B. Xu, I. Lestas, Y. Guo, and H. Sun, "The role of electricity market design for energy storage in cost-efficient decarbonization," *Joule*, 2023
4. Y. Baker, N. Zheng, and B. Xu, "Transferable energy storage bidder," *IEEE Transactions on Power Systems*, 2023
5. N. Zheng, X. Qin, D. Wu, G. Murtaugh, and B. Xu, "Energy storage state-of-charge market model," *IEEE Transactions on Energy Markets, Policy and Regulation*, 2023
6. B. Xu, "The role of modeling battery degradation in bulk power system optimizations," *MRS Energy & Sustainability*, pp. 1–14, 2022
7. U. Salman, S. Belaish, Z. Ji, D. Huang, N. Zheng, and B. Xu, "Comparing the economic value of lithium-ion battery technologies in the nine wholesale electricity markets in north america," *iEnergy*, vol. 1, no. 3, pp. 363–373, 2022
8. N. Zheng, J. J. Jaworski, and B. Xu, "Arbitraging variable efficiency energy storage using analytical stochastic dynamic programming," *IEEE Transactions on Power Systems*, 2022
9. B. Xu, "Dynamic valuation of battery lifetime," *IEEE Transactions on Power Systems*, 2021
10. I. Mathews, B. Xu, W. He, V. Barreto, T. Buonassisi, and I. M. Peters, "Technoeconomic model of second-life batteries for utility-scale solar considering calendar and cycle aging," *Applied Energy*, vol. 269, p. 115127, 2020

11. Y. Liu, B. Xu, A. Botterud, N. Zhang, and C. Kang, "Bounding regression errors in data-driven power grid steady-state models," *IEEE Transactions on Power Systems*, vol. 36, no. 2, pp. 1023–1033, 2020

12. B. Xu, Y. Shi, D. S. Kirschen, and B. Zhang, "Optimal battery participation in frequency regulation markets," *IEEE Transactions on Power Systems*, vol. 33, no. 6, pp. 6715–6725, 2018

13. B. Xu, J. Zhao, T. Zheng, E. Litvinov, and D. S. Kirschen, "Factoring the cycle aging cost of batteries participating in electricity markets," *IEEE Transactions on Power Systems*, vol. 33, no. 2, pp. 2248–2259, 2017

14. Y. Dvorkin, R. Fernandez-Blanco, Y. Wang, B. Xu, D. S. Kirschen, H. Pandžić, J.-P. Watson, and C. A. Silva-Monroy, "Co-planning of investments in transmission and merchant energy storage," *IEEE Transactions on Power Systems*, vol. 33, no. 1, pp. 245–256, 2017

15. Y. Wang, Y. Dvorkin, R. Fernandez-Blanco, B. Xu, T. Qiu, and D. S. Kirschen, "Look-ahead bidding strategy for energy storage," *IEEE Transactions on Sustainable Energy*, vol. 8, no. 3, pp. 1106–1117, 2017

16. Y. Shi, B. Xu, D. Wang, and B. Zhang, "Using battery storage for peak shaving and frequency regulation: Joint optimization for superlinear gains," *IEEE Transactions on Power Systems*, vol. 33, no. 3, pp. 2882–2894, 2017

17. B. Xu, Y. Wang, Y. Dvorkin, R. Fernández-Blanco, C. A. Silva-Monroy, J.-P. Watson, and D. S. Kirschen, "Scalable planning for energy storage in energy and reserve markets," *IEEE Transactions on Power systems*, vol. 32, no. 6, pp. 4515–4527, 2017

18. B. Xu, A. Oudalov, A. Ulbig, G. Andersson, and D. S. Kirschen, "Modeling of lithium-ion battery degradation for cell life assessment," *IEEE Transactions on Smart Grid*, vol. 9, no. 2, pp. 1131–1140, 2016

19. R. Fernández-Blanco, Y. Dvorkin, B. Xu, Y. Wang, and D. S. Kirschen, "Optimal energy storage siting and sizing: A wecc case study," *IEEE Transactions on Sustainable Energy*, vol. 8, no. 2, pp. 733–743, 2016

20. T. Qiu, B. Xu, Y. Wang, Y. Dvorkin, and D. S. Kirschen, "Stochastic multistage coplanning of transmission expansion and energy storage," *IEEE Transactions on Power Systems*, vol. 32, no. 1, pp. 643–651, 2016

CONFERENCE PAPERS

1. N. Zheng, X. Liu, B. Xu, and Y. Shi, "Energy storage price arbitrage via opportunity value function prediction," *IEEE Power and Energy Society General Meeting*, 2023

2. N. Zheng and B. Xu, "Impact of bidding and dispatch models over energy storage utilization in bulk power systems," in *IREP Symposium on Bulk Power System Dynamics and Control*, vol. 2022, 2022

3. Y. Bian, N. Zheng, Y. Zheng, B. Xu, and Y. Shi, "Demand response model identification and behavior forecast with optnet: a gradient-based approach," in *Proceedings of the Thirteenth ACM International Conference on Future Energy Systems*, pp. 418–429, 2022

4. W. Ma and B. Xu, "A data-driven nonlinear recharge controller for energy storage in frequency regulation," in *2021 IEEE Power & Energy Society General Meeting (PESGM)*, pp. 1–5, IEEE, 2021

5. B. Xu, M. Korpås, and A. Botterud, "Operational valuation of energy storage under multi-stage price uncertainties," in *2020 59th IEEE Conference on Decision and Control (CDC)*, pp. 55–60, IEEE, 2020

6. B. Xu, M. Korpås, A. Botterud, and F. OSullivan, "A lagrangian policy for optimal energy storage control," in *2020 American Control Conference (ACC)*, pp. 224–230, IEEE, 2020
7. Y. Wang, Y. Dvorkin, R. Fernández-Blanco, B. Xu, and D. S. Kirschen, "Impact of local transmission congestion on energy storage arbitrage opportunities," in *2017 IEEE Power & Energy Society General Meeting*, pp. 1–5, IEEE, 2017
8. B. Xu, Y. Shi, D. S. Kirschen, and B. Zhang, "Optimal regulation response of batteries under cycle aging mechanisms," in *2017 IEEE 56th Annual Conference on Decision and Control (CDC)*, pp. 751–756, IEEE, 2017
9. Y. Shi, B. Xu, Y. Tan, and B. Zhang, "A convex cycle-based degradation model for battery energy storage planning and operation," in *2018 Annual American Control Conference (ACC)*, pp. 4590–4596, IEEE, 2018
10. Y. Shi, B. Xu, B. Zhang, and D. Wang, "Leveraging energy storage to optimize data center electricity cost in emerging power markets," in *Proceedings of the Seventh International Conference on Future Energy Systems*, pp. 1–13, 2016
11. B. Xu, Y. Dvorkin, D. S. Kirschen, C. A. Silva-Monroy, and J.-P. Watson, "A comparison of policies on the participation of storage in us frequency regulation markets," in *2016 IEEE Power and Energy Society General Meeting (PESGM)*, pp. 1–5, IEEE, 2016
12. B. Xu, A. Oudalov, J. Poland, A. Ulbig, and G. Andersson, "Bess control strategies for participating in grid frequency regulation," *IFAC Proceedings Volumes*, vol. 47, no. 3, pp. 4024–4029, 2014
13. B. Xu, A. Ulbig, and G. Andersson, "Impacts of dynamic line rating on power dispatch performance and grid integration of renewable energy sources," in *IEEE PES ISGT Europe 2013*, pp. 1–5, IEEE, 2013

INVITED SEMINARS

1. RWTH Aachen University, July 2023
2. University of Texas Austin, April 2023
3. University of Houston, October 2022
4. Temple University, March 2022.
5. EPRI ISO/RTO Energy Storage Market Modeling Technical WG, December 2021.
6. John Hopkins University Energy Seminar, December 2020.
7. Stanford Smart Grid Seminar, November 2020.

AWARDS

Excellence Student Scholarship, Shanghai Jiaotong University, 2008
Best Poster Award, IEEE 4th European ISGT Conference at Copenhagen, 2013
Grainger Foundation Fellowship, 2014
Clean Energy Institute Graduate Fellowship, 2015
Clean Energy Institute Scientific Achievement Award, 2018
Outstanding Reviewer, IEEE Transactions on Sustainable Energy, 2018
Outstanding Reviewer, IEEE Transactions on Power Systems, 2020, 2022
CAREER Award, National Science Foundation, 2022
Outstanding Young Investigator Award, Institute of Industrial & Systems Engineers, Energy Systems Division, 2023

GRANTS

1. Co-PI (Columbia Lead), Department of Energy, "Western-Based Analysis of Distributed Battery Storage System Emission Benefits and Tradeoffs", $1.5M (My budget: $300k), 2023-2026
2. Co-PI (Columbia Lead), Department of Energy, "Smart Energy Storage Integration and Management Platform for Buildings (SESIMP-B)", Co-PI (Columbia Lead), $1.5M (My budget: $175k), 2023-2026
3. Co-PI, Columbia Engineering, "Intermediate-Temperature Na-K/S Batteries for Long-duration Energy Storage", Co-PI, $85k (My budget: $42k), 2023-2024
4. Co-PI (Columbia Lead), Department of Energy, "Advanced ISO Models for Storage and Hybrid Resources Operation", $900k (My budget: $300k), 2023-2026
5. Single PI, Red River Clean Energy, "Machine learning for energy storage bidding in real-time wholesale energy markets", $150k, 2023-2025
6. Single PI, National Science Foundation, "CAREER: Computation-efficient Algorithms for Grid-scale Energy Storage Control, Bidding, and Integration Analysis", $500,557, 2023-2028
7. Co-PI (Columbia Lead), Department of Energy, "Assessing Energy Storage Bidding Models in CAISO Wholesale Electricity Markets", $80k (My budget: $80k), 2022-2023
8. PI, Columbia Data Science Institute, "Positioning Energy Storage Technologies under Stochastic Climate Scenarios", $150k (My budget: $150k), 2021-2023

INDUSTRY EXPERIENCE

Doosan Gridtech, WA USA — *June 2017 - September 2017*
Power System Research Engineer Intern

ISO New England, MA USA — *June 2016 - August 2016*
Research Intern Business Architecture & Technology Group

China Electric Power Research Institute, Beijing China — *February 2014 - August 2014*
Research Intern in Distributed Energy Resource Group

ABB Corporate Research Center, Baden Switzerland — *February 2012 - August 2012*
Research Intern in Utility Solutions Group

INDUSTRY ADVISOR ROLES

Recurrent Motors, 2020-2021
Sensai Analytics, 2021-
Storlytics, 2022-

PROFESSIONAL ENGAGEMENTS

Reviewer for IEEE Transactions on Power Systems, IEEE Transactions on Smart Grid, IEEE Transactions on Sustainable Energy, IEEE IAS, Applied Energy, IET Generation, Transmission & Distribution, PES General Meeting, CDC, IFAC