Buxin She

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BIOGRAPHY

Dr. Buxin She is an Assistant Professor in the Department of Electrical and Computer Engineering at Kansas State University (KSU). Before joining KSU, he was a senior research engineer at Pacific Northwest National Laboratory (PNNL), where he leads projects totaling **$2,000,000** in funding. He serves as the PI for two PNNL Laboratory Directed Research and Development (LDRD) projects and as Co-PI on a project sponsored by the U.S. Department of Energy (DOE) Wind Energy Technologies Office.

He received the 2025 PNNL Outstanding Performance Award for leadership of the DOE OE Energy Storage program, and received the 2024 PNNL Exceptional Contribution Award in recognition of his success in external funding acquisition and project execution.

He serves as the **chair** of the IEEE PES Virtual Inertia Scheduling and Control Task Force and as a sub-team lead of the ESIG Large Load Task Force. He has served as an associate editor of **IEEE Data Description**. He has been recognized as an **Excellent Reviewer 5** times by **3** IEEE journals. He has mentored **5** interns and **3** junior staff members at PNNL.

He has published **32** journal papers, **8** conference papers, **2** technical reports and holds **1** U.S. patent. His research interests include modeling, control, and stability of inverter-based resources (IBRs); dynamics-informed power system operation; and AI applications in power systems.

EDUCATION

University of Tennessee Knoxville	Tennessee, USA
Ph.d Power System - Department of Electrical Engineering and Computer Science	*Jan 2020 - Dec 2023*
Tianjin University	Tianjin, China
Master Power System - School of Electrical and Information Engineering	*Sep 2017 - Dec 2019*
Tianjin University	Tianjin, China
Bachelor Power System - School of Electrical and Information Engineering	*Sep 2013 - Jun 2017*

WORKING EXPERIENCE

Kansas State University	Mananttan, USA
Assistant Professor	*Jan 2026 - Now*
Pacific Northwest National Laboratory	Richland, USA
Senior Research Engineer	*July 2025 - Jan 2026*
Pacific Northwest National Laboratory	Richland, USA
Research Engineer	*Sep 2023 - July 2025*
Argonne National Laboratory	Chicago, USA
Research Aide Technical	*Jul 2022 - Dec 2022*

PROJECT EXPERIENCE

- **PI/co-PI Projects – $2,000,000.**
  Lead two PNNL LDRD projects and co-lead one project sponsored by the DOE Wind Energy Technologies Office.

  - **Resilience Metrics for Cyber-physical (Power) Systems**: **$250,000**
    Outage-based, topological, and operation envelope-based metrics are developed to quantify the resilience of cyber-physical power systems. Outage results are developed based on EAGLE-I Outage Data and the EIA Annual Disturbance Events Data. A visualization tool was developed for visualizing the American results. Dynamic operation envelop is developed for quantifying resilience results under extreme heat waves and cold waves, considering the flexibility from virtual power plants.

  - **Stability Characterization for Co-design of Power Electronics-dominant Power Systems**: **$350,000**
    This project characterizes the stability of power electronics-dominant power systems and develop stability criteria to guide their co-design. The project quantifies the relationships among co-design decision variables, controller parameters, and stability conditions.

  - **Stability-Informed Co-Design for GFM Deployment in IBR-Dominant Power Systems**: **$1,400,000**
    This project is sponsored by DOE WETO. This project will develop a stability-informed co-design tool for optimal deployment of GFM inverters in IBR dominated bulk power systems. The project will study the interdependencies between GFM configurations, control strategies, and achievable system stability over a wide range of scenarios.

- **Task Lead Projects**
  Work as a task lead on the following projects.
    - **DOD-ESTCP – Model-Free Adaptive Control for Autonomous and Resilient Operation of Microgrids: $700,000**
      I conducted a few groups of work under this project, including: 1) Inverter PQ control with trajectory tracking capability based on physical-informed reinforcement learning; 2) Decentralized and coordinated V-f control for islanded microgrids considering DER adequacy and demand control; 3) Virtual inertia scheduling for real-time economic dispatch of IBR-penetrated power system; 4) Virtual inertia scheduling for microgrids with static and dynamic security constraints
    - **DOE – Large Scale Testbed for Cyber-physical Power Grid Simulation:**
      I contributed to the development large scale testbed (LTB) for cyber-physical power grid simulation. Specifically, a power market simulator AMS. Check teams on the website.
    - **DOE – Advanced Grid Modeling of Future Power Systems:**
      I developed an analytical EMT model of inverter-based microgrids and proposed a controller design approach with guaranteed large signal stability. The approach is validated through power hardware-in-the-loop experiments in CURENT HTB.
    - **PNNL-LDRD – Control Oriented Models for Co-design Optimization:**
      I developed an EMT model of a 240-bus miniWECC system in PSCAD, integrating offshore wind farms, IBRs, and HVDC/MTDC. This model was transformed from PSS/e using ETran. Additionally, I developed analytical and numerical wind turbine models in Python using Sympy.
    - **PNNL-LDRD – Multi-Objective Co-design Optimization for Pareto-Set Identification:**
      I developed dynamic constraints for power system co-design (planning) problems. This work is tailored for offshore wind farms connected to the main grid through HVDC/MTDC, and equipped with frequency support capabilities.
    - **PNNL-LDRD – Predictive Risk Informed Data-driven Resilient Controls:**
      I developed a dispatch-dynamic co-simulation platform for power systems. This platform emulates denial-of-service and false data injection attacks, integrating them into the workflow for batch data generation and computational attack detection.
    - **Others: Three DOE projects are currently ongoing but are not listed for confidentiality reasons:** N/A

SERVICE AND AWARDS

- **Task Force**
  Serve as the Chair of an IEEE PES Task Force and sub-team lead of an ESIG Task force
    - Chair of IEEE Task Force: Virtual Inertia Scheduling and Control for IBR-dominant Power Systems under the PSOPE T&I Subcommittee.
    - Sub-team lead of ESIG Task Force: the Modeling Requirements and Data Collection Subteam within the Large Loads Task Force.
- **Editor**
  Serve as the editor of the following journals.
    - Associate Editor: IEEE Data Description
    - Guest Editor: IET Renewable Power Generation
    - Guest Editor: International Journal of Electrical Power & Energy Systems
- **Reviewer**
  Serve as the reviewer of the following journals and conferences.
    - IEEE Transaction on Smart Grid/Power system/Sustainable Energy/Energy Conversion, et.al.
    - IEEE PES General Meeting/IAS Annual Meeting/American Control Conference
- **Awards**
  Received the following awards.
    - PNNL Outstanding Performance Award for leadership of the DOE OE Energy Storage program, 2025.
    - Excellent reviewer of IEEE Transactions on Sustainable Energy, 2025
    - Excellent reviewer of IET Energy Conversion and Economics, 2025
    - PNNL Exceptional Contribution Award, 2024.
    - University of Tennessee Knoxville Volunteer of Distinction 2024.
    - Excellent Reviewer of Journal of Modern Power Systems and Clean Energy (MPCE) 2022, 2023, and 2025
    - University of Tennessee Knoxville Chancellor's Fellowships 2022-2023.
    - Best Reviewer of Open Access Journal of Power and Energy (OAJPE) 2020

Publications and Patents

Journal Papers. Visit Google Scholar.

[1] **Buxin She**, Fangxing Li, Hantao Cui, Hang Shuai, Oroghene Oboreh Snapps, Rui Bo, Nattapat Praisuwanna, Jingxin Wang, Leon M. Tolbert, "Inverter PQ Control with Trajectory Tracking Capability for Microgrids Based on Physics-informed Reinforcement Learning", *IEEE Transactions on Smart Grid*, May 2023. (**ESI Highly Cited paper**)

[2] **Buxin She**, Fangxing Li, Hantao Cui, Jinning Wang, Min Liang, Oroghene Oboreh Snapps, Rui Bo, "Decentralized and Coordinated V-f Control for Islanded Microgrids Considering DER Adequacy and Demand Control ", *IEEE Transactions on Energy Conversion*, March 2023.

[3] **Buxin She**, Fangxing Li, Hantao Cui, Jingqiu Zhang, Rui Bo, "Fusion of Reinforcement Learning and Microgrid Control", *IEEE Transactions on Smart Grid*, November 2022. (**Popular paper on TSG**).

[4] **Buxin She**, Jianzhe Liu, Feng Qiu, Hantao Cui, Nattapat Praisuwanna, Jingxin Wang, Leon M. Tolbert, and Fangxing Li, "Systematic Controller Design for Inverter-based Microgrids with Certified Stability and Domain of Attraction", *IEEE Transactions on Smart Grid*, November 2023.

[5] **Buxin She**, Fangxing Li, Hantao Cui, Jinning Wang, Qiwei Zhang, Rui Bo, "Virtual Inertia Scheduling for Real-time Economic Dispatch of IBR-penetrated Power Systems". *IEEE Transaction on Sustainable Energy*, September 2023. (**Popular paper on TSTE**)

[6] **Buxin She**, Fangxing Li, Jinning Wang, Hantao Cui, Xiaofei Wang, Rui Bo, "Virtual Inertia Scheduling for Microgrids with Static and Dynamic Security Constraints". *IEEE Transaction on Sustainable Energy*, 2025. (**Popular paper on TSTE**)

[7] **Buxin She**, Yuqing Dong, Yilu liu. "Time Delay of Wide Area Damping Control in Urban Power Grid: Model-based Analysis and Data-driven Compensation ", *Frontiers in Energy Research*, 2022.

[8] Shah Fahad, **Buxin She**, Junjie Yin, Fangxing Li, Hantao Cui, and Rui Bo, "A Data-driven Adaptive Control Approach for Enhancing the Dynamic Response of VSGs in Varying Grid Conditions", *IEEE Transactions on Power Delivery*, 2025.

[9] Jinning Wang, Fangxing Li, Xin Fang, Hantao Cui, **Buxin She**, Hang Shuai, Qiwei Zhang, Kevin Tomsovic, "Dynamics-incorporated Modeling Framework for Stability Constrained Scheduling Under High-penetration of Renewable Energy", *IEEE Transactions on Sustainalbe Energy*, 2025.

[10] Jun Xiao, Yupeng Zhou, **Buxin She**, Zhenyu Bao, "A general simplification and acceleration method for distribution system optimization problems", *Protection and Control of Modern Power Systems*, 2025.

[11] Zaid Ibn Mahmood, Hantao Cui, **Buxin She**, Fangxing Fran Li, "Evaluating the Equivalent Inertia of Grid-Following and Grid-Forming Inverter-Based Resources", *IEEE Transactions on Energy Conversion*, 2024.

[12] Jun Xiao, Chengjin Li, **Buxin She**, Heng Jiao, Chuanqi Wang, Shihao Zhang, "Distribution System Security Region with Energy Storage Systems", *Energy*, 2024.

[13] Wei Qiu, Yuqing Dong, He Yin, Minjun He, **Buxin She**, Yilu Liu, "Rapid Monitoring and Defense Approach for Resilience Improvement of Grid Cyber Security", *IEEE Transactions on Industry Application*, 2024.

[14] Hang Shuai, **Buxin She**, Jinning Wang, Fangxing Li*, "Safe Reinforcement Learning for Grid-Forming Inverter Based Frequency Regulation with Stability Guarantee," *Journal of Modern Power Systems and Clean Energy*, 2024.

[15] Jinning Wang, Fangxing Li, Xin Fang, Wenbo Wang, Hantao Cui, Qiwei Zhang, and **Buxin She**, "Electric Vehicles Charging Time Constrained Deliverable Provision of Secondary Frequency Regulation," *IEEE Transactions on Smart Grid*, 2023.

[16] Shunbo Lei, Yichen Zhang, Mohammad Shahidehpour, Yunhe Hou, Mathaios Panteli, Xia Chen, Nazli Yonca Aydin, Liang Liang, Cheng Wang, Chong Wang, **Buxin She**. "Guest Editorial: Operational and structural resilience of power grids with high penetration of renewables", *IET Renewable Powr Generation*, 2024.

[17] Jun Xiao, Heng Jiao, Chenhui Song, Guoqiang Zu, Chengjin Li, Zhongwei Cai, **Buxin She**, "Judgment Theorem of Security Boundary for Distribution Systems," *International Journal of Electrical Power & Energy Systems*, 2024.

[18] Jun Xiao, Ruiwan Liu, **Buxin She**, Guowei He, Ziyu Liang, Zhongwei Cai, "The influence mechanism of substation transformer on total supply capability (TSC) of distribution networks", *Electric Power Systems Research*, 2024.

[18] Zhenglai Shen, Som Shrestha, Daniel Howard, Tianli Feng, Diana Hun, **Buxin She**, "Machine learning–assisted prediction of heat fluxes through thermally anisotropic building envelopes", *Building and Environment*, 2023.

[19] Oroghene Oboreh-Snapps, **Buxin She**, Shah Fahad, Haotian Chen, Jonathan Kimball, Fangxing Li, Hantao Cui, Rui Bo, "Virtual Synchronous Generator Control Using Twin Delayed Deep Deterministic Policy Gradient Method", *IEEE Transactions on Energy Conversion*, 2023. – (**ESI Highly Cited paper**)

[20] Jingqiu Zhang, **Buxin She**, Jimmy Chih-Hsien Peng*, Fangxing Li. "A distributed consensus-based optimal energy management approach in DC microgrids ", *International Journal of Electrical Power & Energy Systems*, 2022.

[21] Qiwei Zhang, Fangxing Li, Jin Zhao, **Buxin She**, "False Data Injection Attack and Corresponding Countermeasure in Multienergy Systems". *IEEE Transaction on Power System*, 2023.

[22] Hang Shuai, Fangxing Li, **Buxin She**, Xiaofei Wang, and Jin Zhao, "Post-storm repair crew dispatch for distribution grid restoration using stochastic Monte Carlo tree search and deep neural networks," *International Journal*

of Electrical Power & Energy Systems, vol. 140, Sep. 2023.

[23] Jun Xiao, Chuanqi Wang, **Buxin She**, Fangxing Li, et.al. "Total supply and accommodation capability curves for active distribution networks: Concept and model", *International Journal of Electrical Power & Energy Systems*, 2021 Dec 1;133:107279.

[24] Jun Xiao, Zhongwei Cai, Ziyu Liang, **Buxin She**. "Mathematical model and mechanism of TSC curve for distribution networks", *International Journal of Electrical Power & Energy Systems*, 2022 May 1;137:107812.

[25] Jun Xiao, Shihao Zhang, **Buxin She**, et.al. "Geometric property of distribution system security region: Size and shape ", *Electric Power Systems Research*, 2022.

[26] Jun Xiao, Yuqing Qu, **Buxin She**, Chenhui Song, "Operational boundary of flow network", *Reliability Engineering & System Safety*, 2022.

[27] Jun Xiao, Yuqing Qu, **Buxin She**, et.al, "Critical Flow-Based Fast Algorithm for the Total Supply Capability Curve of Distribution Networks", *Arabian Journal for Science and Engineering*, 2023.

[28] Jun Xiao, Yuqing Qu, **Buxin She**, et.al, "Complete Limits of Flow Network Based on Critical Flow: Concept, Model, Algorithm, Visualization, and Applications", *Arabian Journal for Science and Engineering*, 2023.

[29] Jun Xiao, Chenhui Song, Guoqiang Zu, Liangfu Lv, **Buxin She**, Xinsong Zhang, "Gas Transmission Capability Curve of Natural Gas System: Concept and Steady-state Model", *Journal of Natural Gas Science and Engineering*, 2021.

[30] Jun Xiao, Miaomiao Zhang, Linquan Bai, **Buxin She**, Baoqiang Zhang, "Boundary supply capability for distribution systems: concept, indices and calculation", *IET Generation, Transmission & Distribution*, February 2018, 12(2):499-506.

[31] Himanshu Sharma, Wei Wang, Bowen Huang, **Buxin She**, Thiagarajan Ramachandran, "Control co-design under uncertainty for offshore wind farms: Optimizing grid integration, energy storage, and market participation", Renewable Energy Focus, January 2026.

[32] **Buxin She**, Veronica Adetola, Ji Young Yun, "Descriptor: United States Event-Correlated Power Outage Dataset (USECPO)", IEEE Data Descriptions, August 2025.

Conference Papers. Visit Google Scholar.

[1] **Buxin She**, Wei Wang, Veronica Adetola, Di Wu, "Virtual Inertia Scheduling in Unit Commitment for IBR-Penetrated Low-Inertia Systems". *2025 IEEE Power & Energy Society General Meeting (PESGM)*.

[2] **Buxin She**, Thiagarajan Ramachandran, Laurentiu Marinovici, Wei Wang, and Veronica Adetola, "Dynamic Operating Envelopes of Distribution Systems with Virtual Power Plants Under Heat and Cold Waves", *2025 American Control Conference*.

[3] Wei Wang, Himanshu Sharma, Bowen Huang, **Buxin She**, Thiagarajan Ramachandran, and Veronica Adetola, "Co-design of Multi-Terminal DC Transmission Systems Topology and Energy Storage for Offshore Wind Farm Grid Interconnection", *2025 American Control Conference*.

[4] Brian Chen, Alvin Hoang, Luanzheng Guo, Rizwan A. Ashraf, **Buxin She**, and Nathan R. Tallent. "Empowering Scientific Datasets with Large Language Models". *The International Conference for High Performance Computing, Networking, Storage, and Analysis*, 2024.

[5] Nattapat Praisuwanna, Jingxin Wang, Leon M Tolbert, **Buxin She**, Fangxing Li, Min H Kao, "Converter-Based Microgrid Platform Development for Inverter Based Resource Control Parameters Testing", *2024 IEEE Applied Power Electronics Conference and Exposition (APEC)*.

[6] Oroghene Oboreh-Snapps, Rui Bo, **Buxin She**, Fangxing Fran Li, Hantao Cui, "Improving Virtual Synchronous Generator Control in Microgrids Using Fuzzy Logic Control ", 2022 *IEEE/IAS Industrial and Commercial Power System Asia (I&CPS Asia)*.

[7] Zhenglai Shen, Som Shrestha, Daniel Howard, Tianli Feng, Diana Hun, **Buxin She**, "Machine Learning Assisted Framework to Control Thermally Anisotropic Building Envelopes in Residential Buildings ", 2022 Buildings XV International Conference, United States, 2022.

[8] Jun xiao, Yuqing Qu, Chenhui Song, Baoqiang Zhang, **Buxin She**, and Qisi Lin, "Security Region and Total Supply Capability under N-0 for Urban Distribution Network ", *2020 IEEE Power & Energy Society General Meeting (PESGM)*, page 2-6, Dec. 2020.

Report

[1] ESIG Large Load Task Force Team, "Forecasting for Large Loads: Current Practices and Recommendations", available: ESIG: https://www.esig.energy/large-loads-task-force/forecasting/, 2025.

[2] Hisham Mahmood, **Buxin She**, Giancarlo Paramo, Roshan L Kini, Priya T Mana, Marcelo A Elizondo, "Control Oriented Models for Co-Design: Technical Overview of MT HVDC, MVDC, and Solid State Transformer Building Blocks", Pacific Northwest National Laboratory (PNNL), Richland, WA (United States)

Patent

[1] U.S. Patent: METHODS AND APPARATUS FOR CONTROLLING AN INVERTER. Inventors: Fangxing Li, **Buxin She**, Jinning Wang, Hantao Cui, Rui Bo.