Buxin She

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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

- **Pacific Northwest National Laboratory** — Richland, USA
  Electrical Engineer II — *Sep 2023 - Now*
- **Argonne National Laboratory** — Chicago, USA
  Research Aide Technical — *Jul 2022 - Dec 2022*
- **The University of Tennessee, Knoxville** — Knoxville, USA
  Graduate Research Assistant — *Jan 2020 - Jul 2022 and Dec 2022 - Sep 2023*

Skills Summary

- **Power Knowledge**: Inverter-based resources (IBR) modeling and control, Security-constrained economic dispatch, Power system stability and resilience, Distribution system security region.
- **Techniques Knowledge**: Control theory, Convex optimization, Deep (reinforcement) learning, Large language model.
- **Power Simulator**: Matlab/Simulink, Andes, PSS/e, PSCAD, Pandapower/Matpower.
- **AI/Control/Optim. Toolbox**: Pytorch, Tensorflow, Sympy, Scipy, Gurobipy, CVX.

Project Experience and Summary

- **Project: Principal Investigator (PI)**
  I lead two Laboratory Directed Research and Development (LDRD) projects at PNNL.
  - **Resilience Metrics for Cyber-physical (Power) Systems**:
    Outage-based, topological, and operation envelope-based metrics are developed to quantify the resilience of cyber-physical power system. 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 wave and cold wave, considering the flexibiltiy from virtual power plants.
  - **Stability Characterization for Co-design of Power Electronics-dominant Power Systems**:
    This is an ongoing project. We will characterize the stability of power electronics-dominant power systems and develop stability criteria to guide their co-design. The project will quantify the relationships among co-design decision variables, controller parameters, and stability conditions.
- **Project: Task Lead**
  I worked as a task lead on the following projects.
  - **DOD-ESTCP – Model-Free Adaptive Control for Autonomous and Resilient Operation of Microgrids**:
    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.

Service and Awards

- **Editor**
  I am serving as the editor of the following journals.
  - Guest Editor: IET Renewable Power Generation
- **Reviewer**
  I am serving 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**
  I received the Best Reviewer award and the University Award.
  - Excellent Reviewer of Journal of Modern Power Systems and Clean Energy (MPCE) 2022, 2023
  - Best Reviewer of Open Access Journal of Power and Energy (OAJPE) 2020
  - University of Tennessee Knoxville: Volunteer of Distinction 2024; UT Chancellor's Fellowships 2022-2023.

Seclected Publications

Visit Buxin's Google Scholar for full list (26 journal papers and 7 conference papers)

"*" marks the corresponding author.

[1] **Buxin She**, Fangxing Li*, et.al. "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*, et.al. "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*, et.al. "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, Fangxing Li*, et.al. "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*, et.al. "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*, et.al. "Virtual Inertia Scheduling for Microgrids with Static and Dynamic Security Constraints". *IEEE Transaction on Sustainable Energy*, Accepted.

[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*, April 2022.

[8] **Buxin She***, Hisham Mahmood, Marcelo Elizondo, et.al. "Configuration and EMT Simulation of the 240-bus MiniWECC System Integrating Offshore Wind Farms (OWFs)", *arXiv preprint*, March 2023.

[9] **Buxin She***, Thiagarajan Ramachandran, et.al. "Dynamic Operating Envelopes of Distribution Systems with Virtual Power Plants Under Heat and Cold Waves", *American Control Conference 2025*, Under Review.

[10] **Buxin She**, Luanzheng Guo, et.al. "Sequential Software Log Data based Anomaly Detection Utilizing Call Graphs in Cyber-Physical Systems", *American Control Conference 2025*, Under Review.

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

[12] 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*, December 2021.

[13] Oroghene Oboreh-Snapps, **Buxin She**, et.al. "Virtual Synchronous Generator Control Using Twin Delayed Deep Deterministic Policy Gradient Method", *IEEE Transactions on Energy Conversion*, August 2023. (**ESI Highly Cited paper**)