Xinzhuo Zhang

+44 7821 128088 | xinzhuo.zhang@durham.ac.uk | Durham Staff Page

Google Scholar | LinkedIn | GitHub | ORCID | xinzhuozhang.cc

Department of Engineering, Durham University, Durham, DH1 3LE, UK

Research Profile

My research addresses the challenge of maintaining reliable microgrid operation during transitions between grid-following and grid-forming converter control modes. I develop adaptive event detection and fault classification methods that enable seamless mode switching in converter-dominated networks with high renewable penetration. This work is informed by two years of operational experience at State Grid China, dispatching a 56–60 GW provincial network with 44% renewable capacity, and is validated through simulation (MATLAB/Simulink, PSCAD/EMTDC) and hardware-in-the-loop testing.

Education

- **Durham University** *2022 – 2026*
  Ph.D. in Electrical Engineering Durham, UK
  - Thesis: "Adaptive Event Detection and Fault Classification for Microgrids under Grid-Following-to-Grid-Forming Transition"
  - Submitted March 2026. Supervisor: Prof. Hongjian Sun
- **The University of Manchester** *2017 – 2018*
  MSc in Renewable Energy and Clean Technology Manchester, UK
  - Degree Classification: Merit
- **University of Liverpool & XJTLU** *2013 – 2017*
  BEng in Electrical and Electronic Engineering (2+2 Joint Programme) UK & China
  - Degree Classification: Upper Second-Class Honours (2.1)

Publications

[1] **X. Zhang**, J. Liu, and H. Sun. **"Dynamic Control of Microgrids with Battery Energy Storage Systems: Grid-Forming and Grid-Following Modes with Adaptive Disconnection Criteria,"** in *Proc. 9th Int. Conf. on Green Energy and Applications (ICGEA)*, Singapore, Mar. 2025, pp. 1–5. IEEE.

[2] N. Sarma, K. Akpinar, H. Sun, **X. Zhang**, and O. Tor. **"Grid-Forming Technologies and Regulatory Frameworks: Global Overview for Türkiye,"** *Journal of Modern Power Systems and Clean Energy*, 2025. (Under Review)

[3] **X. Zhang** and H. Sun. **"Adaptive Fault Detection and Intelligent Event Classification for Seamless GFL/GFM Transitions in Converter-Dominated Microgrids,"** Target journal: *IEEE Transactions on Smart Grid*. (Manuscript in preparation; submission expected Q2 2026)

Awards & Funding

- **Durham Doctoral Studentship**, Department of Engineering, Durham University *2022 – 2026*
- **TESTBED2 Travel Grant**, IEEE ICGEA 2025, Singapore — funded by EU Horizon 2020 MSCA-RISE *2025*

Professional Experience

- **Chinese Academy of Sciences** *Jan – Jun 2025*
  Visiting Researcher Beijing, China
  - Secondment under the EU Horizon 2020 MSCA-RISE (TESTBED2) programme, collaborating with Prof. Wei Pei's research group at the Institute of Electrical Engineering, CAS.
  - Refined grid-forming VSC simulation models through technical exchange with CAS researchers, incorporating feedback on converter modelling approaches for improved representation of voltage regulation dynamics.
  - Co-authored a conference paper on dynamic microgrid control with BESS, presented at IEEE ICGEA 2025, Singapore [1].
- **State Grid Corporation of China, Dispatch Centre** *2019 – 2021*
  Grid Dispatch Engineer Yinchuan, China
  - Operated real-time dispatch for Ningxia's provincial grid (56–60 GW installed capacity), coordinating ∼30 GW thermal, 14 GW wind, and 12 GW solar generation assets at the control centre.
  - Managed renewable energy dispatch scheduling for a system with 43–44% renewable penetration (ranked 3rd nationally), contributing to a 97.6% new energy utilisation rate (1st in Northwest China).
  - Coordinated cross-provincial power exports via two UHVDC corridors (±660 kV and ±800 kV, combined 12 GW capacity), delivering 80–90 TWh/year to Shandong and Zhejiang.
  - Supported grid balancing during high-renewable events, including periods where instantaneous renewable output exceeded 59% of total grid load.

Research Projects

- **TESTBED2 Project (EU Horizon 2020 MSCA-RISE)** *Mar 2022 – Mar 2025*
  Testing and Evaluating Sophisticated ICT for Enabling Scalable Smart Grid Deployment | Durham University
  - Developed GFM/GFL inverter control models for microgrid and distributed generation applications using MATLAB/Simulink and PSCAD/EMTDC.
  - Designed adaptive disconnection criteria for seamless GFM/GFL mode transitions, validated through time-domain simulation under IEEE 1547 test scenarios.
  - Investigated optimal energy management strategies for hybrid AC microgrids with battery energy storage integration.
  - Contributed to EU Horizon 2020 MSCA-RISE project deliverables in collaboration with 8 international academic and industrial partners.

Conference Presentations

- **Oral:** "Dynamic Control of Microgrids with BESS: Grid-Forming and Grid-Following Modes with Adaptive Disconnection Criteria," 9th Int. Conf. on Green Energy and Applications (ICGEA), Singapore. *Mar. 2025*
- **Oral:** "Grid-Forming and Grid-Following Control Strategies for Converter-Dominated Microgrids," Int. Conf. on Green Energy and Resources (ICGER), Shandong University, China. *Aug. 2025*

Teaching Experience

- **Durham University** *Oct 2022 – Present*
  Demonstrator / Workshop Leader Durham, UK
  - **Associate Fellow of the Higher Education Academy (AFHEA)**, Advance HE *Oct 2025*
  - **Workshop Leader**, "Introduction to Systems Modelling" (UG, ∼20 students) *Jan 2025*
  - **Demonstrator**, "Computer Programming" (UG, ∼50 students) *Oct 2024*
  - **Demonstrator**, "Dynamic Simulation" (UG, ∼20 students) *Jan 2024*
  - **Lab Assistant**, "DC and Induction Motor Laboratory" (UG, ∼20 students) *May 2023*
  - **Demonstrator**, "Control and Signal Processing" (UG, ∼20 students) *Oct 2022*

Academic Service

- **Peer Reviewer**, *IEEE Transactions on Smart Grid* (IF 8.6) *2025 – Present*

Professional Development

- **Imperial College London** *Sep 2024*
  Summer School — Inverter Based Resources Dominated Power Systems London, UK

Technical Skills

- **Simulation Tools:** MATLAB/Simulink, PSCAD/EMTDC, RTDS (Hardware-in-the-Loop), Simscape Electrical
- **Programming:** Python (data analysis, optimisation), C++, MATLAB
- **Power Electronics & Control:** VSC modelling and control, grid-forming/grid-following inverters, power system stability analysis
- **Microgrids & Energy Systems:** Microgrid energy management, battery energy storage systems, renewable energy integration
- **Grid Operations:** AC network modelling, grid dispatch operations, load balancing
- **Languages:** English (Fluent), Mandarin (Native)
- **AI-Assisted Research Workflow:** Claude Code, GitHub Copilot, Cursor (LLM-assisted scripting for MATLAB/Python data analysis and simulation post-processing); ChatGPT, Perplexity (literature triage, code debugging); prompt engineering for reproducible research automation
- **Productivity Tools:** LaTeX, Zotero, Git

Referees

Prof. Hongjian Sun
Professor, Director of Research
Chair in Smart Grid; Editor-in-Chief, *IET Smart Grid*
Department of Engineering
Durham University, DH1 3LE, UK
hongjian.sun@durham.ac.uk

Dr Mahmoud Shahbazi
Associate Professor, Deputy Director of Research
Node Leader, Electrical Power
Department of Engineering
Durham University, DH1 3LE, UK
mahmoud.shahbazi@durham.ac.uk