Zehao Song

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Affiliation

Smart Grid and Renewable Energy Laboratory & Energy Management System Laboratory, Department of Electrical Engineering, Tsinghua University.
Head of the Lab: Prof. Hongbin Sun

RESEARCH INTERESTS

Power system optimization, decarbonization of the power system, renewable energy integration, virtual power plant, distributionally robust optimization, distributed optimization.

RESEARCH DESCRIPTION

The power system is undergoing an evolutionary transition for a more sustainable future under the goal of decarbonization. My research focuses on the power system operation problem with ever-increasing distributed energy resources (DERs) like renewable energy resources (RESs), energy storage systems (ESSs) and electric vehicles (EVs) integration on the demand-side.

- *Decarbonization of the Power System:* Design effective carbon emission reduction paradigm to promote **low-carbon operation of the power system** based on **carbon emission flow (CEF)** theory and distributional locational carbon emission factor.
- *Uncertainty Problem:* Handle with uncertainty problem associated with RES during power system operation. My current research interest is on **distributionally robust optimization (DRO)** based approaches.
- *Distributed Optimization in Smart Grid:* Decentralized and distributed operation mode to **fully exploit the flexibility and edge-intelligence** of numerous DERs and promote demand-side users to participate in demand response (DR).

EDUCATION

Tsinghua University Sept. 2022 — Now
Master of Science in Electrical Engineering
Cumulative GPA: 3.81/4.00
Advisor: Prof. Yinliang Xu

Zhejiang University of Technology Sept. 2018 — Jun. 2022
Bachelor of Science in Electrical Engineering with honor
Cumulative GPA: 3.88/5.00 or equal to 3.56/4.00
Advisor: Prof. Youbing Zhang

PUBLICATIONS

Journal paper

Published in English

- Xiaodong Yang, **Zehao Song**, Jinyu Wen, Lijian Ding, Menglin Zhang, Qiuwei Wu, Shijie Cheng. "Network-Constrained Transactive Control for Multi-Microgrids-Based Distribution Networks With Soft Open Points," in *IEEE Transactions on Sustainable Energy*, vol. 14, no. 3, pp. 1769-1783, July 2023. DOI:10.1109/TSTE.2023.3246360.

  Remark. *I completed the model formulation and numerical simulation (coding and programming) and paper revision in this work. The first author completed the organization of this paper.*

- **Zehao Song**, Yinliang Xu, Lun Yang, Hongbin Sun. "Carbon-aware Peer to Peer Joint Energy and Reserve Trading Market for Prosumers considering Network Security Constraints and Uncertainty," *IEEE Internet of Things Journal*, Early Access, Feb. 2024. DOI: 10.1109/JIOT.2024.3367361.

- Ruifeng Zhao, **Zehao Song**, Yinliang Xu, Jiangang Lu, Wenxin Guo, Haobin Li. "Low-carbon demand response program for power systems considering uncertainty based on the data-driven distributionally robust chance constrained optimization," *IET Renewable Power Generation*, Jun. 2024. DOI: 10.1049/rpg2.13021.

Remark. *I am the co-first author and communication author of this paper. Ruifeng Zhao et al. funded this work.*

Published in Chinese

- **Zehao Song**, et al. "Low-carbon Scheduling Strategy of Distributed Energy Resources Based on Node Carbon Intensity for Distribution Networks," in *High Voltage Engineering*, (EI Index), June, 2023, 49(06):2318-2328. DOI:10.13336/j.1003-6520.HVE.20230216.

PROJECTS

Research on the interactive regulation of urban power grid and massive electric vehicles for group intelligent clustering and aggregation. *Supported by the Shenzhen Natural Science Foundation.*
Role: Main participant Dec. 2023 — Dec. 2025

Key Technology and Application of Virtual Power Plant Construction and Scheduling for Urban Massive Flexible Resource Aggregation. *China Southern Power Grid Scientific Project. Received the Second-class prize of Shenzhen Scientific and Technological Progress.*
Role: Main participan. Jun. 2022 — Aug. 2023

Research on distributed energy resources aggregation and optimized scheduling technique of virtual power plant for decarbonization. *China Southern Power Grid Scientific Project.*
Role: Main participant Jun. 2022 — Aug. 2023

Urban power grid scheduling technique with large-scale electric vehicle integration research. *State Grid Corporation of China Scientific Project.*
Role: Participant Jan. 2021 — Dec. 2022

Cloud-Cluster-End coordinated virtual power plant optimal operation research. *China Southern Power Grid Scientific Project.*
Role: Participant Nov. 2021 — Dec. 2022

TECHNIQUES

Programming: Matlab, Gurobi, CPLEX, YALMIP. **Language:** Chinese (Native), English (TOEFL 106/120).

AWARDS

As Graduate Student

- **Excellent Comprehensive Scholarship of Tsinghua University** Tsinghua University, Nov. 2023
- **Best Poster Award in 2023 TBSI Retreat Conference** Tsinghua University, July. 2023

As Undergraduate Student

- **Zhejiang Provincial Government Scholarship** Education Department of Zhejiang Province, Dec. 2019
- **Outstanding Undergraduate Student** Zhejiang University of Technology, Jun. 2022
- **Outstanding Student First Class Scholarship** Zhejiang University of Technology, Nov. 2019
- **First Class Study Scholarship** Zhejiang University of Technology, Nov. 2019
- **Best Paper Award of the Chinese Academy of Sciences Undergraduate Students' Summer School**

Institue of Electrical Engineering, Chinese Academy of Sciences, July. 2021

Talks & Presentations

- **"Network-Constrained Transactive Control for Multi-Microgrids-based Distributio Networks with Soft Open Points".** At the 15th Guangdong-Hong Kong-Macao Greater Bay Area Academic Forum for Doctoral Students in conjunction with the 706th Tsinghua University Academic Forum. Tsinghua University, China, May. 2023.
- **"Carbon-aware Peer to Peer Joint Energy and Reserve Trading Market for Prosumers considering Network Security Constraints and Uncertainty".** At the 2024 IEEE Power and Energy Society General Meeting (PES GM), Seattle, Washington, USA, Jul. 2024.

Selected Graduate Courses

- Introduction of Smart Grids, given by *Prof. Qiuwei Wu, Tsinghua University.*
- Optimization methods for power systems, given by *Prof. Javad Lavaei, University of California Berkeley.*