

Taoyi Qi

Ph.D. Candidate

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Major: Electrical Engineering

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Education

09/2016-06/2020

B.E. in Electrical Engineering

College of Electrical Engineering, **Zhejiang University**

Supervisor: Prof. Yi Ding

09/2020-03/2023

M.E. in Electrical Engineering

College of Electrical Engineering, **Zhejiang University**

Supervisors: Prof. Yi Ding & Chengjin Ye

08/2023-Present

Ph.D. in Electrical Engineering

Faculty of Science and Technology, **University of Macau**

Supervisors: Prof. Yonghua Song & Hongxun Hui



Research Interests

- **Climate-Energy Coupling System:** Flexible Resource Endowment and Optimal Allocation; Low-Carbon Transformation Path Planning
- **Power Demand Side Management:** Flexible Load Modeling, Optimization, and Control; Market Mechanism Design
- **Low-Carbon Cities and Energy:** Photovoltaic, Energy Storage, Direct Current, and Flexibility Buildings; Vehicle-to-Grid Interaction



Selected Papers

1. **T. Qi**, H. Hui, and Y. Song, "Exploring the Feasible Regulation Region of Building HVAC Systems within Hygro-Thermal Comfort," **IEEE Trans. on Smart Grid**, vol. 16, no. 4, pp. 2926-2939, July 2025.
2. **T. Qi**, H. Hui, C. Ye, Y. Ding, Y. Zhao, and Y. Song, "Bidding Mechanism Design for Building Virtual Power Plant to Participate in Demand Response Markets", **Automation of Electric Power System**, vol. 48, no. 18, pp. 14-24, Oct. 2024.
3. **T. Qi**, H. Hui, and Y. Song, "Chance Constrained Economic Dispatch of Central Air Conditionings in Large-Scale Commercial Buildings Considering Demand Response," **Energy and Buildings**, vol. 320, p. 114607, Oct. 2024.
4. **T. Qi**, C. Ye, H. Hui, and Y. Zhao, "Fast Frequency Regulation Utilizing Non-Aggregate Thermostatically Controlled Loads Based on Edge Intelligent Terminals," **IEEE Trans. on Smart Grid**, vol. 15, no. 4, pp. 3571-3584, Jul. 2024.
5. **T. Qi**, C. Ye, Y. Zhao, L. Li, and Y. Ding, "Deep Reinforcement Learning Based Charging Scheduling for Household Electric Vehicles in Active Distribution Network," **Journal of Modern Power Systems and Clean Energy**, vol. 11, no. 6, pp. 1890-1901, Nov. 2023.



Key Projects

Project 1: Principal Investigator, 01/2025-12/2026

Demand Response Capacity Evaluation and Optimal Operation of Building Air Conditionings in Guangdong-Hong Kong-Macao Greater Bay Area under High Temperature and Humidity Conditions

Supported by National Natural Science Foundation of China (No. 524B2100)

Project 2: Student Investigator, 01/2025-12/2029

Low-Carbon and Highly Reliable Urban Power Distribution System Demonstration

Supported by National Energy Administration of China (No. 2024ZD0800700)

Project 3: Principal Student Investigator, 10/2021-10/2024

Research on Key Technologies and Applications of Intelligent Collaborative Management and Protection for Integrated Energy Internet of Things

Supported by Science and Technology Development Fund of Macau (No. 0003/2020/AKP)

Project 4: Principal Student Investigator, 12/2021-11/2024

Human-machine augmented large-scale multi-agent quantitative evaluation and autonomous evolution technology

Supported by National Key R&D Program of China (No.2021ZD0112700)

Project 5: Student Investigator, 07/2016-06/2020

Friendly Interactive Smart Grid Between Supply-and Demand-Sides

Supported by Ministry of Science and Technology of China (No. 2016YFB0901100)



Standards

1. China Association for Engineering Construction Standardization. Technical Specifications for Demand Side Management in Public Buildings, 2025.
2. China Association for Engineering Construction Standardization. Standard for Assessment of Load Flexibility Performance of Building Air Conditioning, 2025.



Patents

1. Ding Yi, **Qi Taoyi**, Yu Hongfei, Ouyang Xinyu, Zhong Yinan, Ji Shangjin; A Multi-channel Integrated Monitoring Method for Carbon Emissions, July 8, 2025, China, ZL202210811684.8.
2. Ye Chengjin, **Qi Taoyi**, Ding Yi, Song Yonghua, Fang Youtong; Composite Energy Storage Control Method Based on Inverter Air Conditioner and Energy Storage Battery, February 14, 2025, China, ZL202111412665.X.
3. Zhu Bingquan, Xu Lizhong, **Qi Taoyi**, Zheng Xiang, Meng Zhiquan, Yang Kan, Jin Xueqi, Yin Xunhu, Ding Yi; Optimal Method for Demand-side Load Resources Participation in Grid Supply-Demand Interaction, July 5, 2024, China, ZL202210220164.X.
4. Zhu Bingquan, Gu Wei, Xiang Zhongming, Wu Huahua, Su Yijing, Lu Mengke, Que Lingyan, Cui Jianye, Ma Xiang, Lü Leiyan, Fang Xuan, Huang Jianfeng, Liu Donghong, Wu Minmin, Yao Jianfeng, **Qi Taoyi**, Xie Kang, Ding Yi; Ancillary Service Method and System Combining Inverter Air Conditioner with Energy Storage Battery, July 26, 2022, China, ZL202110597127.6.
5. Kong Weijie, Weng Wanying, **Qi Taoyi**, Yang Yiheng, Li Luoqiu, Li Xiang, Meng Jun; Wearable Device with Preventive Vision Monitoring and Vision Training Function, July 28, 2020, China, CN201910304933.2.



Awards

1. First Prize Poster, the 4th Macao International Conference on Smart City Technologies, 2024.
2. First Prize Paper, the Integrated Smart Energy Conference, Jul. 2023.
3. Best Presentation Award, the 5th International Conference on Energy, Electrical and Power Engineering, 2022.



Reviewer

- IEEE Trans. on Power Systems, IEEE Trans. on Smart Grid
- Applied Energy, Energy
- Protection and Control of Modern Power Systems
- Scientific Reports
- Engineering Reports



Part-time Academic Contributions

1. Section Co-Lead for IEEEExtream 18.0, 2025.
2. Vice Chair, IEEE 7th Student Conference on Electric Machines and Systems (SCEMS), 2024.



First/Corresponding Author (Journal)

1. **T. Qi**, H. Hui, and Y. Song, "Exploring the Feasible Regulation Region of Building HVAC Systems Within Hygro-Thermal Comfort," **IEEE Transactions on Smart Grid**, vol. 16, no. 4, pp. 2926-2939, July 2025.
2. **T. Qi**, H. Hui, and Y. Song, "Chance Constrained Economic Dispatch of Central Air Conditionings in Large-Scale Commercial Buildings Considering Demand Response," **Energy and Buildings**, vol. 320, p. 114607, Oct. 2024.
3. **T. Qi**, H. Hui, C. Ye, Y. Ding, Y. Zhao, and Y. Song, "Bidding Mechanism Design for Building Virtual Power Plant to Participate in Demand Response Markets", **Automation of Electric Power System**, vol. 48, no. 18, pp. 14-24, Oct. 2024.
4. **T. Qi**, C. Ye, H. Hui, and Y. Zhao, "Fast Frequency Regulation Utilizing Non-Aggregate Thermostatically Controlled Loads Based on Edge Intelligent Terminals," **IEEE Transactions on Smart Grid**, vol. 15, no. 4, pp. 3571-3584, July 2024.
5. **T. Qi**, C. Ye, Y. Zhao, L. Li, and Y. Ding, "Deep Reinforcement Learning Based Charging Scheduling for Household Electric Vehicles in Active Distribution Network," **Journal of Modern Power Systems and Clean Energy**, vol. 11, no. 6, pp. 1890-1901, Nov. 2023.
6. C. Zhang, B. Gao, **T. Qi***, W. Qian, and C. Feng. "Modelling and control of virtual energy storage based on the inverter air conditioner" **Journal of Electric Power Science and Technology**, vol. 38. no. 04, pp. 240-249.
7. Y. Sun, **T. Qi***, L. Zhang, Y. Hu, and C. Yu, "Optimal Operation of Integrated Energy System Including Ice-Storage Air-Conditioning in Power Market," **Southern Power System Technology**, vol. 16, no. 04, pp. 95-104.
8. **T. Qi**, C. Zhang, C. Ye, P. He, Y. Ding, C. Zhu, and W. Bao, "Complementary Energy Storage Operation Strategy of Battery and Inverter Air Conditioners for Buildings With Integrated Photovoltaic System," **Power System Technology**, vol. 46, no. 11, pp. 4247-4255, Jan. 2022.
9. **T. Qi**, H. Hui, L. Xu, X. Ma, and Y. Ding, "Modeling and Control of Generalized Demand Response in Micro-grids Based on GridLAB-D," **Distribution & Utilization**, vol. 37, no. 07, pp. 3-10, July 2020.

Co-author (Journal)

1. X. Liu, **T. Qi**, and H. Hui, "Performance Evaluation and Market Clearing Method for Load Aggregator Demand Response towards Precise Regulation," **Power System Protection and Control**, vol. 53, no. 13, pp. 1-10, Jun. 2025.
2. Y. Sun, H. Hui, **T. Qi**, and L. Chen, "Multitime Scale Optimization of Urban Micro-Grids Considering High Penetration of PVs and Heterogeneous Energy Storage Systems," **IEEE Internet of Things Journal**, vol. 11, no. 14, pp. 24428-24438, July, 2024.
3. Y. Sun, **T. Qi**, Y. Zhao, C. Ye, and H. Hui, "Siting and sizing of electric vehicle charging stations under the coupling of transport and power networks considering V2G potential," **Integrated Intelligent Energy**, vol. 46, no. 1, Jan. 2024.



First Author (Conference)

1. **T. Qi**, H. Hui, and L. Gao, "Enhancing Power System Frequency Resilience to Extreme Weather through Photovoltaics and Integrated Flexible Direct Current Buildings," Applied Energy Symposium and Forum: Low-Carbon Cities and Urban Energy Systems (CUE 2025), Kitakyusu, Japan, 2025.
2. **T. Qi** and H. Hui, "Bidding Mechanism of Aggregated Buildings with Various Flexible Loads Participating in Demand Response Market," 2023 IEEE 7th Conference on Energy Internet and Energy System Integration (EI2), Hangzhou, China, 2023, pp. 4391-4397.

Key Projects

Principal Investigator, 01/2025-12/2026
Demand Response Capacity Evaluation and Optimal Operation of Building Air Conditionings in Guangdong-Hong Kong-Macao Greater Bay Area under High Temperature and Humidity Conditions
Supported by National Natural Science Foundation of China (No. 524B2100)
Student Investigator, 01/2025-12/2029
Low-Carbon and Highly Reliable Urban Power Distribution System Demonstration
Supported by National Energy Administration of China (No. 2024ZD0800700)
Principal Student Investigator, 10/2021-10/2024
Research on Key Technologies and Applications of Intelligent Collaborative Management and Protection for Integrated Energy Internet of Things
Supported by Science and Technology Development Fund of Macau (No. 0003/2020/AKP)
Principal Student Investigator, 12/2021-11/2024
Human-machine augmented large-scale multi-agent quantitative evaluation and autonomous evolution technology
Supported by National Key R&D Program of China (No.2021ZD0112700)
Student Investigator, 07/2016-06/2020
Friendly Interactive Smart Grid Between Supply-and Demand-Sides
Supported by Ministry of Science and Technology of China (No. 2016YFB0901100)

Other Projects

Principal Student Investigator, 11/2022-02/2025
Research and Verification of Load Participation in Flexible Interaction between Public Buildings and the Power Grid under a Zero-carbon Background
Supported by China Southern Power Grid Corporation (No. 090000KK52220020)
Principal Student Investigator, 06/2022-09/2024
Research and Application of Key Technologies for Interaction between Urban Buildings and Power Grids for Large-scale Renewable Energy Consumption
Supported by China Southern Power Grid Corporation (No. 090000K52210134)
Principal Student Investigator, 10/2021-10/2022
Research on Key Technologies of Virtual Energy Storage Control in Distribution Network for Power Systems
Supported by State Grid Zhejiang Electric Power Co., Ltd. (No. 5211JX190065)
Principal Student Investigator, 12/2021-11/2024
Research on Key Technologies and Business Models of Demand-side Resource Cluster Response in the Ubiquitous Power Internet of Things Environment
Supported by State Grid Zhejiang Electric Power Co., Ltd. (No. 5211JY19000V)

Other Projects

Principal Student Investigator, 01/2021-12/2021
Research on Demand Response Technology of Massive Residential Users based on Data-driven Highly Elastic Power Grid
Supported by State Grid Zhejiang Electric Power Co., Ltd. (No. 5211YF200055)
Principal Student Investigator, 05/2020-12/2022
Research on Key Technologies and Business Models of Large-scale Load Resources Participating in Demand Response
Supported by State Grid Zhejiang Electric Power Co., Ltd., (No. 5211JH1900M7)