



# Sheng Wang

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## RESEARCH INTERESTS

- Modeling, optimization, and reliability evaluation of multi-energy systems with hydrogen
- Low-carbon pathway design for smart cities

## PROFESSIONAL EXPERIENCE

2022.7-present	<b>University of Macau</b> - Post-doctoral fellow (Supervisor: Prof. Yonghua Song)	<b>Macao, China</b>
2021.8 – 2022.6	<b>State Grid City &amp; Energy Research Institute</b> - Engineer in strategic urban planning	<b>Suzhou, China</b>
2016.8 – 2021.6	<b>Zhejiang University (QS ranking: no.42)</b> - Ph.D. in Electrical Engineering (Supervisor: Prof. Yi Ding)	<b>Hangzhou, China</b>
2012.9 - 2016.6	<b>Zhejiang University</b> - B.S. in Electrical Engineering and Automation	<b>Hangzhou, China</b>

## PUBLICATION RECORD

<b>Journal papers</b>	<p>[1] <b>Sheng Wang</b>, Junyi Zhai, Hongxun Hui. Optimal Energy Flow in Integrated Electricity and Gas Systems With Injection of Alternative Gas[J]. <i>IEEE Transactions on Sustainable Energy</i>, 2023.</p> <p>[2] <b>Sheng Wang</b>, Junyi Zhai, Hongxun Hui, Yi Ding, Operational Reliability of Integrated Energy Systems Considering Gas Flow Dynamics and Demand-Side Flexibilities[J]. <i>IEEE Transaction on Industrial Informatics</i>, 2023</p> <p>[3] <b>Sheng Wang</b>, Hongxun Hui, Yi Ding, Chenjin Ye, Menglian Zhen. Operational Reliability Evaluation of Urban Multi-Energy Systems With Equivalent Energy Storage[J]. <i>IEEE Transactions on Industry Applications</i>, 2023.</p> <p>[4] <b>Sheng Wang</b>, Hongxun Hui, Pierluigi Siano, Resilience of Gas Interchangeability in Hydrogen-Blended Integrated Electricity and Gas Systems: A Transient Approach With Dynamic Gas Composition Tracking. <i>iEnergy</i>, 2023. (Accepted)</p> <p>[5] <b>Sheng Wang</b>, Yi Ding, Xiaoqing Han, Peng Wang, Lalit Goel, Jien Ma. Short-term reliability evaluation of integrated electricity and gas systems considering dynamics of gas flow[J]. <i>IET Generation, Transmission &amp; Distribution</i>, 2021, 15(20): 2857-2871.</p> <p>[6] <b>Sheng Wang</b>, Changzheng Shao, Yi Ding, Jinyue Yan. Operational reliability of multi-energy customers considering service-based self-scheduling[J]. <i>Applied Energy</i>, 2019, 254: 113531.</p>
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- [7] **Sheng Wang**, Yi Ding, Chengjin Ye, Can Wan, Yuchang Mo. Reliability evaluation of integrated electricity–gas system utilizing network equivalent and integrated optimal power flow techniques[J]. *Journal of Modern Power Systems and Clean Energy*, 2019, 7(6): 1523-1535.
- [8] Junyi Zhai, **Sheng Wang**, Lei Guo, Yuning Jiang, Zhongjian Kang, Colin N Jones. Data-driven distributionally robust joint chance-constrained energy management for multi-energy microgrid[J]. *Applied Energy*, 2022, 326: 119939.
- [9] Xiao Chen, Junyi Zhai, Yuning Jiang, Chenyixuan Ni, **Sheng Wang\***, Philippe. Decentralized coordination between active distribution network and multi-microgrids through a fast decentralized adjustable robust operation framework[J]. *Sustainable Energy, Grids and Networks*. 2023. (In Press)
- [10] Minglei Bao, Xiaocong Sun, Yi Ding, Chengjin Ye, Changzheng Shao, **Sheng Wang**, Yonghua Song. Multifactor-influenced reliability-constrained reserve expansion of integrated electricity-gas systems considering failure propagation[J]. *CSEE Journal of Power and Energy Systems*, 2022.
- [11] Xiaoming Zhou, Maosheng Sang, Minglei Bao, **Sheng Wang**, Wenqi Cui, Chengjin Ye, Yi Ding. Exploiting Integrated Demand Response for Operating Reserve Provision Considering Rebound Effects[J]. *IEEE Access*, 2022, 10: 15151-15162.
- Books**
- [12] **Sheng Wang**, Lalit Goel, Yi Ding, System Risk Assessment Under Higher Penetrations of Renewable Generations. Renewable Energy Integration to the Grid: A Probabilistic Perspective[M], Taylor&Francis Group; 2020 (Book chapter)
- [13] Yonghua Song, Yi Ding, Minglei Bao, **Sheng Wang**, Changzheng Shao. Risk modeling, analysis and control of multi-energy systems[M]. Springer Nature; 2023. (Book, ready to be published)
- Under-reviews**
- [14] **Sheng Wang**, Hongxun Hui, Junyi Zhai, Short-Term Reliability Assessment of Integrated Power-Gas Systems With Alternative Gas Injections Using Universal Generating Function. (Under the 2nd round review of *IEEE Transactions on Industry Applications*)
- [15] **Sheng Wang**, Hongxun Hui, Yi Ding, Junyi Zhai, Decentralized Demand Response for Energy Hubs in Integrated Electricity and Gas Systems Considering Linepack Flexibility. (Under review of *IEEE Internet of Things Journal*)
- [16] **Sheng Wang**, Hongxun Hui, Yi Ding, Yonghua Song, Long-Term Reliability of Integrated Electricity and Gas Systems With Alternative Gas Injection. (Under review of *IEEE Transaction on Power System*)
- [17] **Sheng Wang**, Hongxun Hui, Tao Chen, Multi-Period Optimal Energy Flow in Integrated Electricity and Gas Systems With Alternative Gas Injection Considering Gas Composition Dynamics. (Under review of *IEEE Transactions on Smart Grid*)
- Chinese journal papers**
- [18] **Sheng Wang**, Jian Tan, Wenbo Shi, Fenghua Zou, Guang Chen, Linyu Wang, Hongxun Hui and Lei Guo, Practices of the new power system in the UK and inspiration for the development of provincial power systems in China. Integrated Intelligent Energy, vol. 44, no. 7, pp. 19-32, Jul. 2022. (Best Paper)
- [19] **Sheng Wang**, Jian Tan, Yahui Ma, Fenghua Zou, Impact Factor Analysis and Forecasting of the Carbon Emission of Industrial Sectors Based on LMDI Method Under Multiple Uncertainties: The Case of Suzhou. Integrated Intelligent Energy, vol. 2, pp. 1-7, Feb. 2022 (Cover paper).
- [20] **Sheng Wang**, Yi Ding, Optimal Sizing and Asset Utilization Efficiency

**Conference papers  
(with oral or poster)**

- Analysis of the Distributed Multi-Energy System Considering the Energy Substitution and Load Uncertainty. *Journal of Global Energy Interconnection*, vol. 2, no. 5, pp. 426-432, Sep. 2019. (Best Paper)
- [21] Yintu Mao, **Sheng Wang**, Changzheng Shao, Yang Xu, Yi Ding, Bi-level Joint Optimization Model of Integrated Electricity and Gas System for Multi-energy Demand Response. *Smart Energy*, vol. 10, pp. 18-25, Oct. 2018.
- [22] Xin Wang, Fenghua Zou, Jing Shi, **Sheng Wang**, Hao Chen, LEAP-based scenario analysis in carbon emission of Jiangsu Province. *Advances in Applied Chemistry and Industrial Catalysis*, Sep. 2022.
- [23] **Sheng Wang**, Linggang Zhou, Lei Zhong, Xinyu Wang, Wenbo Shi, Fenghua Zou, Yahui Ma, Steady-State Optimal Power Flow in Integrated Electricity and Gas Transmission Systems with Hydrogen Injections. 2022 IEEE/IAS Industrial and Commercial Power System Asia (I&CPS Asia), pp. 2025-2030, Jul. 2022.
- [24] Bingjie Li, Xiaoyan Hu, Hu Li, **Sheng Wang**, Hao Chen, Yahui Ma, Fenghua Zou, Feasible Region Evaluation of Urban Industry Development for Achieving the Carbon Peak and Neutrality. *Journal of Physics: Conference Series*, pp. 012045, 2022.
- [25] **Sheng Wang**, Jian Tan, Yahui Ma, Haiyan Jiang, Aikang Chen, Fenghua Zou, Study on Carbon Emission and Impact Factor based on LMDI method: the Case of Jiangsu. 2021 International Conference on Power System Technology (POWERCON), pp. 145-150, Dec, 2021.
- [26] **Sheng Wang**, Yi Ding, Menglian Zheng, Chengjin Ye, Operational reliability evaluation of distributed multi-energy systems considering optimal control of energy storages. 2021 IEEE/IAS Industrial and Commercial Power System Asia (I&CPS Asia), pp. 182-187, Jul, 2021.
- [27] **Sheng Wang**, Yingchun Feng, Xuesong Li, Yishuang Hu, Yi Ding, Bidding and Offering Models in Generation-Grid-Load-Storage Transactions Based on Flexible Order Types. 2021 6th Asia Conference on Power and Electrical Engineering (ACPEE), pp. 676-681, Apr, 2021.
- [28] Xueyong Tang, Xiaocong Sun, Xia Yan, **Sheng Wang**, Yu Zhang, Changzheng Shao, Yi Ding, Linearized Modeling of Integrated Electricity and District Heating Systems with VF-VT Strategy Based on McCormick Envelopes. 2020 IEEE Sustainable Power and Energy Conference (iSPEC), pp. 1254-1260, Nov, 2020.
- [29] Xueyong Tang, **Sheng Wang**, Bin Sun, Qingsheng Li, Yi Ding, Contingency Management in Integrated Electricity and Gas Systems Considering Gas Flow Dynamics. *enerarxiv*, Oct, 2020.
- [30] Shuiquan Ye, Wenjun Ruan, **Sheng Wang**, Chong Zhang, A bi-Level equivalent model of scheduling an energy hub to provide operating reserve for power systems. 2020 Tsinghua-HUST-IET Electrical Engineering Academic Forum, pp. 1-7, May, 2020.
- [31] **Sheng Wang**, Yi Ding, Changzheng Shao, Generalized Modeling of Self-scheduling Demand Resource in Multi-Energy System. 2018 IEEE International Conference on Communications, Control, and Computing Technologies for Smart Grids (SmartGridComm), pp. 1-6, Oct, 2019.
- [32] Xiaoyan Yu, Guorong Zhu, **Sheng Wang**, Yi Ding, Economic impact of power to gas in integrated electricity and gas system with high wind penetration. 2018 IEEE Innovative Smart Grid Technologies-Asia (ISGT Asia), pp. 640-645, May, 2018.

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- [33] **Sheng Wang**, Hongxun Hui, Yi Ding, Chengzhi Zhu, Cooperation of demand response and traditional power generations for providing spinning reserve. Energy Procedia, pp. 2035-2041, Sep, 2017.

## **PROJECT EXPERIENCES**

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- [1] Operational reliability evaluation of multi-source and heterogeneous urban multi-energy systems (0.2m RMB). Natural Science Foundation of Jiangsu Province. 2022.6-2025.6. **Principal Investigator**.
- [2] Research on key technologies of new power system construction in typical countries such as the United Kingdom and Germany. (0.3m RMB). Consulting Project of State Grid Jiangsu. **Principal Investigator**.
- [3] Research on Operational Reliability of Integrated Energy System Considering Demand Side Flexibility and Energy Flow Dynamics. (20k RMB). Zhejiang University R&D project. 2018.6-2021.6. **Principal Investigator**.
- [4] Research on key technologies for regulating flexible resources considering the deep integration of power-communication networks. (1.53 m MOP). R&D project in Macao. 2023.1-2025.12. **Co-Principal Investigator**.
- [5] Demonstration of the distributed energy system with multi-energy complementary integration and optimization (20.31m RMB). National Key R&D Program of China. 2017.6-2021.9. Student project director of a sub-task.
- [6] Research on key technologies of regional multi-energy system planning and operation based on digital twin technology. (1.88m RMB) Science and technology project of China Southern Power Grid. 2020.6-now. Student project director of a sub-task.
- [7] Research on Energy Ecological Intelligent Interactive System with Bilateral Interaction of Supply and Demand in Electricity Market Environment. (0.60m RMB). Science and technology project of State Grid Zhejiang. 2017.6-2018.12. Student project director.
- [8] Multi-energy complementarity, coordination, optimization, planning and design, key technologies, and perfect services, (1.96m RMB). Science and technology project of State Grid Jiangsu. 2017.9-2018.12. Student project director.
- [9] Research and application of key technologies for interactive trading of clean energy, electricity load, and energy storage, (3.77m RMB). Science and technology project of State Grid Corporation of China. 2020.1-2021.12. Student project director of a sub-task.
- [10] Research and application of key technologies of regional multi-energy supply systems based on an all-energy flow model. (0.45m RMB) Science and technology project of State Grid Corporation of China. 2017.1-2019.12. Student project director of a sub-task.
- [11] Data-driven multivariate power experiment simulation platform. (1.5m RMB). 2016.8-2018.6. Zhejiang University. Student project director of a sub-task.

## **SELECTED HONORS**

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2022	Outstanding paper of conference of 2022 Integrated Intelligent Energy
2021	Zhejiang Electric Power Science and Technology Progress Award (provincial award by Zhejiang Society for Electric Power)
2020	Award of Honor for graduate (university-level honor)
2019	First Prize for Outstanding Papers at the Academic Annual Meeting of the Energy

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2019	Internet Special Committee of the Society of Electrical Engineering (the first prize out of hundreds of papers) Academic Rising Star of Zhejiang University Doctoral Student (three out of about 70 candidates)
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## **CHINESE PATENTS**

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- [1] A reliability evaluation method of integrated electricity and gas systems based on integrated optimal power flow. CN201910033159.6. Granted.
- [2] An improving method for the operational reliability of the multi-energy device. CN201910621448.8. Granted.
- [3] A demand response method for the multi-energy device. CN201811202661.7. Granted.
- [4] A handling approach for integrated electricity-heat power flow. CN201811639858.7. Granted.
- [5] A reliability evaluation method of the energy system containing multiple combined heat and power plants. CN201811582654.4. Granted.
- [6] A planning method of storage devices in integrated electricity and gas systems considering reliability constraints. CN202011115587.2. Granted.
- [7] An analytical operational reliability evaluation method for integrated electricity and gas systems. CN202011115733.1. Granted.
- [8] A configuration method of combined heat and power plants considering electricity-heat demand response. CN201910401970.5. Granted.
- [9] A multi-energy load prediction method based on energy consumption state transitions. CN202110461232.7. Granted.

## **PROFESSIONAL ACTIVITIES**

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- Guest editors of Special issues in *Engineering Report* and *Integrated Intelligent Energy*
  - Reviewer of IEEE Transactions on Reliability, IEEE Transactions on Power System, IEEE Transactions on Smart Grid, Applied Energy, IET Generation, Transmission & Distribution, Journal of Modern Power Systems, CSEE Journal of Power and Energy Systems, Electric Power Systems Research, etc.
  - Director of “IEEE PES Electric Vehicle Satellite Committee-China” “EV Participating Electricity Market Trading Subcommittee”
  - Session Chair of 2022 IEEE ICPS Asia
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