Hongxun Hui

Ph.D. Candidate
Smart Grid Operation and Optimization Laboratory
College of Electrical Engineering
Zhejiang University

No.38 Zheda Road, Hangzhou, Zhejiang, China
Tel: +86-18143465355; +1-202-460-4566
E-mail: huihongxun@zju.edu.cn; hongxunhui@vt.edu.cn
Personal website: https://huihongxun.github.io

Research Interests

- Modeling, optimization and control of flexible loads (especially HVACs) for providing frequency regulation, operating reserve and peak-shaving services in smart grid.
- Electricity market and incentive mechanism design for motivating consumers to participate in demand response.
- Reliability analysis of power systems considering multiple uncertainties of flexible loads and renewable energies.

Education

Ph.D., College of Electrical Engineering, Zhejiang University — Hangzhou, China
Supervisor: Prof. Yonghua Song & Prof. Yi Ding — 09/2015 – 06/2020

Visiting Student Researcher, Advanced Research Institute, Virginia Tech — Arlington, USA
Supervisor: Prof. Saifur Rahman — 10/2018 – 10/2019

Short-term Exchange, CURENT Engineering Research Center, University of Tennessee — Knoxville, USA
Supervisor: Prof. Fangxing (Fran) Li — 06/2019 – 07/2019

B.S., College of Electrical Engineering, Zhejiang University — Hangzhou, China
Outstanding Graduates, Overall GPA: 3.88/4.0 (**top 3%**) — 09/2011 – 06/2015

Publications

Books

1. Yi Ding, Yonghua Song, **Hongxun Hui** and Changzheng Shao. Integration of Air Conditioning and Heating into Modern Power Systems. Springer; 2019. (**All eight chapters**)

Journal Publications

1. **Hongxun Hui**, Yi Ding, Qingxin Shi, Fangxing Li, Yonghua Song and Jinyue Yan, "5G Network-based Internet of Things for Demand Response in Smart Grid: A Survey on Application Potential," *Applied Energy*, Oct. 2019.
2. **Hongxun Hui**, Yi Ding, Zhenzhi Lin, Pierluigi Siano and Yonghua Song, "Capacity Allocation and Optimal Control of Inverter Air Conditioners Considering Area Control Error in Multi-area Power Systems," *IEEE Transactions on Power Systems*, Early Access, Jun. 2019.
3. **Hongxun Hui**, Yi Ding, Yonghua Song and Saifur Rahman, "Modeling and Control of Flexible Loads for Frequency Regulation Services Considering Compensation of Communication Latency and Detection Error," *Applied Energy*, vol. 250, pp. 161-74, Sep. 2019.
4. **Hongxun Hui**, Yi Ding and Menglian Zheng, "Equivalent Modeling of Inverter Air Conditioners for Providing Frequency Regulation Service", *IEEE Transactions on Industrial Electronics*, vol. 66, no. 2, pp. 1413-23, Feb. 2019.
5. **Hongxun Hui**, Yi Ding, Weidong Liu, You Lin and Yonghua Song, "Operating Reserve Evaluation of Aggregated Air Conditioners", *Applied Energy*, vol. 196, pp. 218-228, Jun. 2017.
6. Yi Ding, **Hongxun Hui** (Corresponding Author), Zhenzhi Lin, Menglian Zheng, Xinyao Qu and Wenqi Cui, "Design of Business Model and Market Framework Oriented to Active Demand Response of Power Demand Side," *Automation of Electric Power Systems*, vol. 41, no. 14, Jul. 2017. (in Chinese)
7. Dunjian Xie, **Hongxun Hui**, Yi Ding and Zhenzhi Lin, "Operating Reserve Capacity Evaluation of Aggregated Heterogeneous TCLs with Price Signals," *Applied Energy*, vol. 216, pp. 338-47, Apr. 2018.
8. Kang Xie, **Hongxun Hui** and Yi Ding, "Review of Modeling and Control Strategy of Thermostatically Controlled Loads for Virtual Energy Storage System," *Protection and Control of Modern Power Systems*, Oct. 2019.
9. Wenqi Cui, Yi Ding, **Hongxun Hui**, Zhenzhi Lin, Pengwei Du, Yonghua Song and Changzheng Shao, "Evaluation and Sequential Dispatch of Operating Reserve Provided by Air Conditioners Considering Lead–Lag Rebound Effect," *IEEE Transactions on Power Systems*, vol. 33,no. 6, pp. 6935-50, Nov. 2018.
10. Yi Ding, Wenqi Cui, Shujun Zhang, **Hongxun Hui**, Yiwei Qiu and Yonghua Song, "Multi-state Operating Reserve Model of Aggregate Thermostatically-Controlled-Loads for Power System Short-term Reliability Evaluation," *Applied Energy*, vol. 241, pp. 46-58, May 2019.
11. Yi Ding, Kaining Luan and **Hongxun Hui** (Corresponding Author), "Energy Saving and Emission Reduction

From the Glowworm Project—Coupon-based Demand Response Demonstration in Flat Rate Market," *IEEE Spectrum*, vol. 78, pp. 76-78, Jan. 2019. (in Chinese)

12. Xinran Zhuang, Chengjin Ye, Yi Ding and **Hongxun Hui**, "Data-driven Reserve Allocation with Frequency Security Constraint Considering Inverter Air Conditioners," *IEEE Access*, Aug. 2019.
13. Weidong Liu, **Hongxun Hui** (Corresponding Author), Lijun Zhang, Chenbo Xu, Yikai Sun, Yi Ding, "Analysis on Peak Load Regulation Potential and Evaluation Model of Residential Loads," *Southern Power System Technology*, vol. 10, suppl. 1, pp. 256-263, Dec. 2016. (in Chinese)
14. Yi Ding, Huahua Wu, **Hongxun Hui** (Corresponding Author) and Jun Zhang, "Analysis and Related Suggestions on Power Market Mechanism of Demand Side Response in China," *Southern Power System Technology*, vol. 10, no. 3, pp. 24-31, Mar. 2016. (in Chinese)
15. Kang Xie, Kaijie Zhang, Kaining Luan, **Hongxun Hui**, Yishuang Hu and Yi Ding, "Exploration of Demand Response Score Scheme Under the Background of Electric Power System Reform," *Power Demand Side Management*, vol. 21, no. 3, May 2019. (in Chinese)
16. Zuofeng Li, Wenqi Cui, Zhenyu Chen, **Hongxun Hui**, Kaining Luan, Bin Yang and Yi Ding, "Research and Practice of Interruptible Load in the Market Environment (I)," *Power Demand Side Management*, vol. 18, no. 6, Nov. 2016. (in Chinese)
17. Zhenyu Chen, Wenqi Cui, **Hongxun Hui**, Bin Yang, Kaining Luan and Yi Ding, "Research and Practice of Interruptible Load in the Market Environment (II)," *Power Demand Side Management*, vol. 19, no. 1, Jan. 2017. (in Chinese)

Submitted Journal Papers (Under Review)

1. **Hongxun Hui**, Yi Ding, Tao Chen, Saifur Rahman and Yonghua Song, "Dynamic and Stability Analysis of the Power System With the Control Loop of Inverter Air Conditioners," *IEEE Transactions on Industrial Electronics*. (First round revision, submitted)
2. **Hongxun Hui**, Yi Ding, Kaining Luan, Tao Chen, Saifur Rahman and Yonghua Song, "Coupon-Based Demand Response for Consumers Facing the Flat-Rate Retail Pricing," *IEEE Transactions on Smart Grid*.
3. **Hongxun Hui**, Qingxin Shi, Yi Ding, Saifur Rahman and Yonghua Song, "Inertia Support and Frequency Regulation of Virtual Synchronous Generator by IACs," *IEEE Power Engineering Letters*.
4. Qiangqiang Xie, **Hongxun Hui**, Yi Ding, Chengjin Ye, Zhenzhi Lin, Jiadong Cui and Peng Wang, "Utilization of Flexible Residential Loads for Voltage Control and Demand Response," *IEEE Transactions on Sustainable Energy*. (First round revision, submitted)
5. Yi Ding, Dunjian Xie, **Hongxun Hui** and Yan Xu, "Game-Theoretic-Based Demand Side Management of Thermostatically Controlled Loads for Smoothing the Tie-line Power of Microgrid," *IEEE Transactions on Industrial Electronics*.
6. Xinran Zhuang, Yi Ding, Changzheng Shao and **Hongxun Hui**, "Reliability Evaluation of Interconnected Power Systems with VSC-HVDC Links Considering the Frequency Dynamics," *IET Generation, Transmission & Distribution*.
7. Xingying Chen, Shuyang Xu, Jun Xie, Saifur Rahman, Jixiang Wang, **Hongxun Hui** and Tao Chen, "Agent-based Modelling and Simulation of Electricity Market with Residential Demand Response," *CSEE Journal of Power and Energy Systems*. (First round revision, submitted)

Peer-Reviewed Conference Publications

1. **Hongxun Hui**, Yi Ding, Yonghua Song and Saifur Rahman, "Modelling and Dynamic Performance Analysis of the Power System Under Unit Contingency Shutdown Accidents Considering Demand Response," *International Conference on Applied Energy*, Sweden, Aug. 2019.
2. **Hongxun Hui**, Yi Ding and Shihai Yang, "Modeling and Analysis of Inverter Air Conditioners for Primary Frequency Control Considering Signal Delays and Detection Errors," *Energy Procedia*, vol. 158, pp. 4003-10, Hong Kong, China, 2019.
3. **Hongxun Hui**, Yi Ding, Kaining Luan and Daoqiang Xu, "Analysis of 815 Blackout in Taiwan and the Improvement Method of Contingency Reserve Capacity Through Direct Load Control", *IEEE PES General Meeting*, Portland, USA, 2018.
4. **Hongxun Hui**, Xing Jiang, Yi Ding, Yonghua Song and Li Guo, "Demonstration of Friendly Interactive Grid Under the Background of Electricity Market Reform in China", *In Env. & Electr. Eng. and 2017 IEEE Industrial & Comm. Power Syst. Europe (EEEIC/I&CPS Europe)*, pp. 1-5. IEEE, Milan, Italy, 2017.
5. **Hongxun Hui**, Weidong Liu and Yi Ding, "Quantitative Analysis of Air Conditioner Aggregation for Providing Operating Reserve", *Energy Procedia*, vol. 104, pp. 50-55, Jinan, China, 2016.
6. Sheng Wang, **Hongxun Hui**, Yi Ding and Chengzhi Zhu, "Cooperation of Demand Response and Traditional

Power Generations for Providing Spinning Reserve", *Energy Procedia*, vol. 421, pp. 2035-41, Cardiff, UK, 2017.

7. Xinyao Qu, **Hongxun Hui**, Shengchun Yang, Yaping Li and Yi Ding, "Price Elasticity Matrix of Demand in Power System Considering Demand Response Programs", *International Conference on Energy Engineering and Environmental Protection*, Sanya, China, 2017.
8. Xinyao Qu, **Hongxun Hui**, Yi Ding and Kaining Luan, "Optimal Control of Intelligent Electricity Consumption for Residential Customers Considering Demand Response", *Applied Energy Symposium and Forum*, Tianjin, China, 2017.
9. Wenqi Cui, Yi Ding, **Hongxun Hui** and Maozhen Li, "Two-stage Payback Model for the Assessment of Curtailment Services Provided by Air Conditioners," Energy Procedia, vol. 142, pp. 2050-6, Cardiff, UK, 2017.

Invited Talks

1. Modelling and Dynamic Performance Analysis of the Power System Under Unit Contingency Shutdown Accidents Considering Demand Response, *International Conference on Applied Energy*, Västerås, Sweden, Aug. 2019.
2. Modeling and Analysis of Inverter Air Conditioners for Primary Frequency Control Considering Signal Delays and Detection Errors, *International Conference on Applied Energy*, Hong Kong, China, Aug. 2018.
3. Demonstration of Friendly Interactive Grid Under the Background of Electricity Market Reform in China, *IEEE EEEIC17 and I&CPS Europe*, Milan, Italy, Jun. 2017.
4. Electricity Distribution Pricing Mechanism in China. *IEEE PES General Meeting*, Boston, USA, Jul. 2016.
5. Quantitative Analysis of Air Conditioner Aggregation for Providing Operating Reserve, *Low-carbon Cities & Urban Energy*, Jinan, China, Jun. 2016.

Issued Invention Patents

1. Yi Ding, **Hongxun Hui** and Yonghua Song, "An Intelligent Meter with Multi-time Scale Electricity Prices," No. CN201610543375.1, May 2019.
2. **Hongxun Hui**, Yi Ding, Weidong Liu, Lijun Zhang, Yikai Sun and Chenbo Xu, "A Calculation Method of Aggregated Air Conditioners for Providing Regulation Services for Power Systems," No. CN201610821647.X, Dec. 2018.
3. **Hongxun Hui** and Chuangxin Guo, "A Self-powered Pinch Meter Based on Micro-generator and SCM," No. CN201410009920.X, Jul. 2016.
4. **Hongxun Hui** and Chuangxin Guo, "A Dismantling Equipment for Electronic Devices Based on SCM," No. CN201410010721.0, May 2016.
5. **Hongxun Hui**, Yibai Lu, Lequan Yu, Litong Lv and Hui Sun, "An Electrocardiogram Detection Device Based on Bluetooth Communication," No. CN201410094326.5, Mar. 2016.

Computer Skills and Software Copyrights

Computer Skills

- Programming languages: Matlab, C, C++, Java, Python
- Professional software: LabVIEW, Altium Designer, OrCAD, Altera Quartus, AutoCAD

Software Copyrights

- **Hongxun Hui**, Yi Ding and Wenqi Cui, "Software for Coupon Computing and Settlement in Friendly Interactive Smart Grid," No. 2018SR449433, May 2018.
- Yi Ding, Dunjian Xie and **Hongxun Hui**, "Software for Game Theory-Based Collaborative Optimization Control of Thermostatically Controlled Loads," No. 2019SR0481590, Mar. 2019.
- Dunjian Xie, Yi Ding and **Hongxun Hui**, "Simulation Software for Optimal Coordination of Thermostatically Controlled Loads for Demand Response," No. 2019SR0450852, Mar. 2019.

Research Projects

Friendly Interactive Smart Grid Between Supply- and Demand-Sides, $1100K Nanjing, China
Supported by Ministry of Science and Technology of China (No. 2016YFB0901100) 07/2016 – 06/2020
Research Assistant (Principal Student Investigator)

- Cooperative control strategies of supply-side (generating units) and demand-side (flexible loads).
- Business model design for flexible loads participating in demand response, including electricity prices, transaction method, and settlement method.
- Field demonstration in Suzhou and Changzhou Cities, around 110,000 customers are equipped with smart devices to participate in this project. It is one of the largest demand response projects in the world.

Reliability Analysis and Optimization of Smart Grid Considering the Coordinated Operation of Flexible Resources and Wind Power, $130K Hangzhou, China
Supported by National Natural Science Foundation of China (No. 51577167) 01/2016 – 12/2019
Research Assistant

- Multiple uncertainties' analysis of various flexible resources, especially HVACs.
- Reliability models and optimization of power systems, considering wind power and flexible resources.

Control Method and Peak-shaving Capacity Evaluation of Flexible Loads, $160K Hangzhou, China
Supported by State Grid Zhejiang Electric Power Company (No. 5211JY15001S) 01/2016 – 12/2017
Research Assistant (Principal Student Investigator)

- Control method of flexible loads, especially air conditioners, considering user's behavior and comfort.
- Quantitative evaluation of peak-shaving capacities provided by flexible loads, considering multiple uncertainties.
- Comparison of reliability and economy of the power system before and after integrating demand response.

Research and Application of Consumer Demand Response, $120K Nanjing, China
Supported by State Grid Jiangsu Electric Power Company (No. KH20161699) 03/2016 – 11/2016
Research Assistant (Principal Student Investigator)

- Market mechanism and implementation plan of demand response for the existing electricity market in China.
- The new spike price policy is proposed and implemented for the first time in China.
- According to the energy efficiency evaluation report by State Grid Jiangsu Electric Power Company, the construction investments in power plants and transmission lines are postponed around 16.78 billion Chinese Yuan.

Modeling and Regulation Potential Evaluation of Air Conditioners, EVs, and Batteries, $50K Nanjing, China
Supported by China Electric Power Research Institute (No. DZ71-15-004) 09/2015 – 06/2016
Research Assistant (Principal Student Investigator)

- Mathematical and physical model of typical flexible loads, including air conditionings, EVs and batteries.
- The operation performance and regulation potential of flexible loads with dynamic electricity prices.
- The proposed models and methods were tested and implemented in State Grid Jiangsu Electric Power Company.

Additional Information

Professional Services

- **Vice President**, IEEE Industry Applications Society Student Branch Chapter in Zhejiang University
- **Journal Reviewer** of *IEEE Transactions on Sustainable Energy* (Since 2019), *Applied Energy* (Since 2018), *Journal of Modern Power Systems and Clean Energy* (Since 2018), *International Journal of Electrical Power & Energy Systems* (Since 2017), *IEEE Transactions on Industrial Electronics* (Since 2017)
- **Conference Reviewer** of *IEEE PES General Meeting*, *International Conference on Applied Energy*, *IEEE Sustainable Power & Energy Conference*, *International Conference on Smart Energy Systems and Technologies*, *IEEE International Conference on Environment and Electrical Engineering and IEEE Industrial and Commercial Power Systems Europe.*

Teaching

- **Teaching Fellow**, *Power System Operation and Control* (Instructor: Prof. Yi Ding and Prof. Pierluigi Siano), College of Electrical Engineering, Zhejiang University, 2016.

Selected Honors & Rewards

- First Batch of the Academic Rising Star Program, Zhejiang University, 2018. (Three winners among 180 Ph.D. students in College of Electrical Engineering, Zhejiang University)
- Tang Lixin Scholarship, 2017.
- Award of Honor for Graduate, 2017, 2016.
- Graduate of Merit/Triple A graduate, 2016.
- Outstanding Graduates of Zhejiang University, 2015.
- Excellent Honor in Edison Class, Zhejiang University, 2015.
- Scholarship for Excellence in Research and Innovation, 2015.
- Meritorious Winner, Interdisciplinary Contest in Modeling (ICM), Consortium for Mathematics and Its Application, 2014.
- First Price, 7th University Student Science Contest on Energy Saving & Emission Reduction, 2014.
- Fifth (5/149), 9th University Student Robot Contest (My Super Personal Shopper), 2014.
- Best Design Award, 9th University Student Robot Contest (My Super Personal Shopper), 2014.
- Third Price, 7th Intelligent Car Competition of Zhejiang University, 2014.
- Bosch Scholarship, 2015.
- Excellent Student Awards, 2014.
- Outstanding Student Leader Awards, 2014, 2012.
- Excellent Student Awards, 2013, 2012.
- First-Class Scholarship for Outstanding Merits, 2012.
- First-Class Scholarship for Outstanding Students, 2012.