

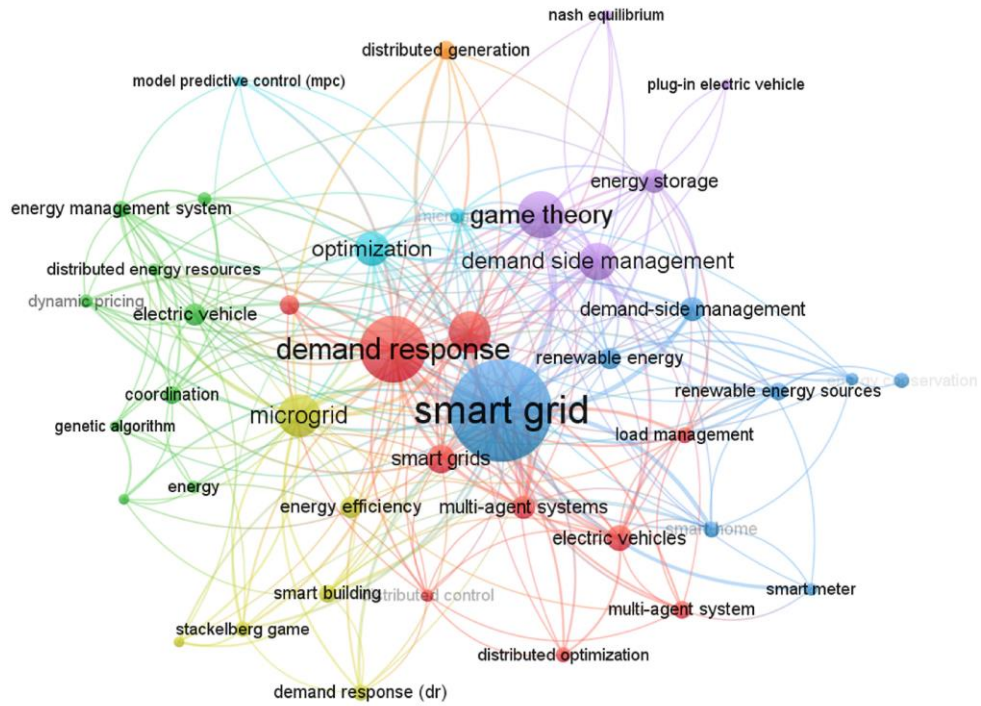
News Article for RISUD Strategic Focus Area (SFA) Scheme

	Name	Department
1. Principal Investigator:	<u>Prof. Shengwei WANG</u>	<u>BSE/PolyU</u>
2. Name of SFA:	<u>Smart Energy Efficient and Grid-Responsive Buildings</u>	
3. Project Title:	<u>Optimized Design and Optimal Control of Smart Buildings of Enhanced Grid Friendliness and Responsiveness</u>	

4. **Third Year Progress/Achievement**

The challenges faced by the power grid have increased in line with the growing demand of end-users and the growing penetration of the renewable energy generation. To address the inefficient operation and the reliability problem which may occur in the power system, optimizing the design and control of smart buildings has been proven to be an effective approach in our research. With the grant support under RISUD Strategic Focus Area (SFA) Scheme, we have achieved fruitful outcomes that 27 papers have been published in the journals with high impacts and received numerous citations. Our research works played a vanguard role in this research area, which achieved considerable progress in enhancing the friendliness and responsiveness of the smart buildings to the power grid. We have investigated the benefits and feasibility, and developed the methodology and technologies for enhancing energy flexibility of buildings and facilitating buildings to contribute to the flexibility services in today's and future electricity markets, and for enhancing the overall energy efficiency of buildings-grid ecosystems. Main original and significant contributions of this project include:

- ✓ Quantitative analysis of building demand side energy flexibility (e.g., flexibility index and assessment, uncertainty in the aggregate energy flexibility)
- ✓ Development of big-data analysis methods and optimal control methods of building energy systems for enhancing the power flexibility of buildings in operation (e.g., Identification of simplified energy performance models, hierarchical optimal control strategy for continuous building demand response)
- ✓ Development of smart power demand management and building demand response control method commonly applicable to smart buildings (e.g., neighborhood-level coordination and negotiation techniques)
- ✓ Development of frequency-response control methods (e.g., investigation on the dynamics, quality and impacts of the grid responsive strategies)
- ✓ Development of methods to optimize the multiple flexibility resources in electricity markets of multiple flexibility services.



Connections of building demand response and smart grid with other important research topics