Abstract

Demand Response (DR) is one of the most effective ways to reduce the building's operating cost. This research work develops an optimal coordinated Building Energy Management System (BEMS) framework to study the control algorithms and demand responses in the building. The proposed framework provides a systematical construction of the BEMS which is adaptive to both the heuristic and deterministic approaches for solving complex optimization problems in the building. Moreover, the proposed smart combined ice storage strategy in cooperation with other DR programs in the building shows a better tradeoff between the energy consumption and building's operating cost. Furthermore, the proposed hybrid cooling-and-ventilation control algorithm is developed and validated in the framework. The results show that the proposed BEMS framework not only can be used to validate the developed control algorithms in the system but also provides optimal coordinated controls of the building facilities.

Publication List

Journal Paper

1. H. Zhang, P. L. So, and A. Ukil, "Smart building energy management with multi-storage systems for demand reesponse" IEEE Transactions on Sustainable Energy, 2019. (under revision)

Conference Paper

1. H. Zhang and A. Ukil, "Model predictive control of induction machine for energy efficient HVAC operation," in 2018 IEEE Innovative Smart Grid Technologies - Asia (ISGT Asia), 2018, pp. 1068-1073.

2. H. Zhang, A. Ukil, and Y. Li, "Analyzing refrigerant contaminants and reclamation service to prolong chiller lifespan and improving chiller energy efficiency," in IECON 2017 - 43rd Annual Conference of the IEEE Industrial Electronics Society, 2017, pp. 7085-7090.

3. H. Zhang and A. Ukil, "Analysis of ambient temperature effects and airflow rate for energy efficient HVAC in buildings," in 2016 IEEE Region 10 Conference (TENCON), 2016, pp. 441-446.

4. H. Zhang and A. Ukil, "Framework for multipoint sensing simulation for energy efficient HVAC operation in buildings," in IECON 2015 - 41st Annual Conference of the IEEE Industrial Electronics Society, 2015, pp. 000398-000403.