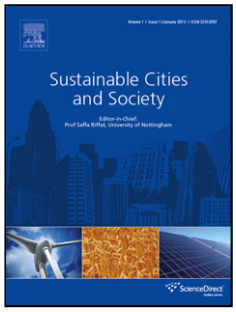

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A Two Stage Hierarchical Control Approach for the Optimal Energy Management in Commercial Building Microgrids Based on Local Wind Power and PEVs

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Highlights

This paper deals with a two stage hierarchical control for optimal energy management in commercial building microgrids. The main contributions of this paper are:

- Incorporates the uncertainty of electricity price in a model predictive control based plan for the optimization of energy management.
- The conditional value at risk is used to consider the uncertainty in the electricity price.
- The power balance is attained between power supply and load in the proposed microgrid building while the operational cost is minimized.

***Abstract*— The inclusion of plug-in electrical vehicles (PEVs) in microgrids not only could bring benefits by reducing the on-peak demand, but could also improve the economic efficiency and increase the environmental sustainability. Therefore, in this paper a two stage energy management strategy for the contribution of PEVs in demand response (DR) programs of commercial building microgrids is addressed. The main contribution of this work is the incorporation of the uncertainty of electricity prices in a model predictive control (MPC) based plan for energy management optimization. First, the optimization problem considers the operation of PEVs and wind power in order to optimize the energy management in the commercial building. Second, the total charged power reference which is computed for PEVs in this stage is sent to the PEVs control section so that it could be allocated to each PEV. Therefore, the power balance can be achieved between the power supply and the load in the proposed microgrid building while the operational cost is**