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A coordinated energy management framework for industrial, residential and commercial energy hubs considering demand response programs

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Abstract-

This paper proposes an energy hub management model for residential, commercial, and industrial hubs, considering AC optimal power flow (ACOPF) constraints have been applied to the model to prevent any unreal power transaction in the system. The cost due to environmental emissions has also been taken into account and the problem is modeled as a dynamic optimization problem, solved using the CPLEX solver in the GAMS software, interfaced with MATLAB/MATPOWER for the power flow analysis. Besides, the problem is studied in two cases as coordinated and uncoordinated operation modes to investigate their impacts on the operating cost, emission, and power losses. The obtained results show that the coordinated operation would lead to reducing the operating cost, power losses, and emission. Moreover, the impacts of the coordinated and uncoordinated operation modes on the load demand–supply under contingent events and disconnection from the upstream grid are assessed. The results derived from the simulation verify the superior performance of the coordinated operation. It is also noted that the DRP leads to mitigating the operating costs.

Index Terms- Energy hub; Energy management; Demand response programs; Renewable energy resources; Electric vehicles; AC optimal power flow

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