Stochastic Multi-objective Economic/Emission Energy Management of a Microgrid in Presence of Combined Heat and Power Systems

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Abstract— Microgrids are structures that improve the reliability, efficiency, cost and emission in power systems. This paper presents the multi-objective economic/emission energy management of a microgrid including wind turbine, photovoltaic (PV) modules, combined heat and power (CHP) systems, power-only units, fuel cells, plug-in electric vehicles (PEV), heat-only unit and responsive loads. A price-based demand response program (DRP) is implemented to achieve a better management on demand-side. Also, the uncertainties of renewable generations, market price and load are modeled and two-stage stochastic programming is employed for modeling the optimization problem. The proposed model is evaluated in three case studies: single-objective energy management to minimize cost, single-objective energy management to minimize emission and multi-objective economic/emission energy management of the microgrid. The -constraint method is used to generate the Pareto optimal solutions in the third case. The results demonstrate how the microgrid resources are scheduled to reduce the cost and emission. Moreover, the emission and cost are decreased by about 10% and 6% respectively. Therefore, the multi-objective approach is presented for the selection of a compromise solution.

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