Environmental/Economic Power Dispatch of MicroGrid Using Multiobjective Optimization

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Abstract

The need for more flexible electric systems, changing regulatory and economic scenarios, energy savings and environmental impact are providing impetus to the development of MicroGrids (MG), which are predicted to play an increasing role in the electric power system of the near future. This paper proposes a generalized formulation to determine the optimal operating strategy and cost optimization scheme as well as the reduction of the emissions for a MicroGrid (MG). Multiobjective (MO) optimization is applied to the environmental/ecomomic problem of the MG. The proposed problem is formulated as a nonlinear constrained MO optimization problem. Prior to the optimization, models for system components from real data are constructed. The problem formulation takes into consideration the operation and maintenance costs as well as the emissions **NOx**, $\mathbf{SO_2}$, and $\mathbf{CO_2}$ reduction. The MG considered in this paper consists of a wind turbine, a micro turbine , a diesel generator, a photovoltaic array, a fuel cell, and a battery storage. The optimization is aimed at minimizing the cost function of the system while constraining it to meet the costumer demand and safety of the system. We also add a daily income and outgo from sale or purchased power. The results demonstrate the efficiency of the proposed approach to satisfy the load and to reduce the cost and the emissions. The comparison with other techniques demonstrates the superiority of the proposed approach and confirms its potential to solve the problem. The management of the MG units require accurate economic model to describe the operating cost taken in to account the output power produces.