

Energy management in microgrids including smart homes: a multi-objective approach

S.A. Mansouri; A. Ahmarinejad; E. Nematbakhsh; M.S. Javadi; A.R. Jordehi; J.P.S. Catalão

Abstract-

With the penetration of smart homes in distribution systems, and due to the effect of their schedulable load on reducing the peak load of the network as well as their comfort index, microgrid's scheduling in the presence of smart homes has become an important issue. In this regard, this paper presents a tri-objective optimization framework for energy management of microgrids in the presence of smart homes and demand response (DR) program. The model is implemented on an 83-bus distribution system with 11 microgrids. The uncertainties of renewable energy resources (RESs) output power and load demand have been taken into account and the objective function is modeled in the form of bi-objective and tri-objective models using the max-min fuzzy method. The objectives include the operating cost, emissions, and peak-to-average ratio (PAR). The results indicate that an increase in DR penetration reduces the PAR and operating costs and leads to a decrease in the customers' comfort. Besides, the simulation results show that the best results are obtained from the tri-objective model, and in this model, three goals, including the operating costs, emissions, and PAR index are close to their optimal values, while the customers' comfort index is also satisfactory. Finally, the results show that considering smart homes in the network reduces the operation cost and emission by about 16 % and 17 %, respectively.

Index Terms- Microgrids; Home energy management system; Multi-objective optimization; Demand response programs; Peak to average ratio

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