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Optimized Scheduling of Domestic Load Based on User Defined Constraints in a Real-Time Tariff Scenario

Authors : Madia Safdar, G. Amjad Hussain, Mashhood Ahmad

Abstract : One of the major challenges of today's era is peak demand which causes stress on the transmission lines and also raises the cost of energy generation and ultimately higher electricity bills to the end users, and it was used to be managed by the supply side management. However, nowadays this has been withdrawn because of existence of potential in the demand side management (DSM) having its economic and- environmental advantages. DSM in domestic load can play a vital role in reducing the peak load demand on the network provides a significant cost saving. In this paper the potential of demand response (DR) in reducing the peak load demands and electricity bills to the electric users is elaborated. For this purpose the domestic appliances are modeled in MATLAB Simulink and controlled by a module called energy management controller. The devices are categorized into controllable and uncontrollable loads and are operated according to real-time tariff pricing pattern instead of fixed time pricing or variable pricing. Energy management controller decides the switching instants of the controllable appliances based on the results from optimization algorithms. In GAMS software, the MILP (mixed integer linear programming) algorithm is used for optimization. In different cases, different constraints are used for optimization, considering the comforts, needs and priorities of the end users. Results are compared and the savings in electricity bills are discussed in this paper considering real time pricing and fixed tariff pricing, which exhibits the existence of potential to reduce electricity bills and peak loads in demand side management. It is seen that using real time pricing tariff instead of fixed tariff pricing helps to save in the electricity bills. Moreover the simulation results of the proposed energy management system show that the gained power savings lie in high range. It is anticipated that the result of this research will prove to be highly effective to the utility companies as well as in the improvement of domestic DR.

Keywords : controllable and uncontrollable domestic loads, demand response, demand side management, optimization, MILP (mixed integer linear programming)
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