Economic Dispatch of Demand Response Balancing through Asymmetric Block Offers

This paper proposes a method of describing the load shifting ability of flexible electrical loads in a manner suitable for existing power system dispatch frameworks. The concept of an asymmetric block offer for flexible loads is introduced. This offer structure describes the ability of a flexible load to provide a response to the power system and the subsequent need to recover. The conventional system dispatch algorithm is altered to facilitate the dispatch of demand response units alongside generating units using the proposed offer structure. The value of demand response is assessed through case studies that dispatch flexible supermarket refrigeration loads for the provision of regulating power. The demand resource is described by a set of asymmetric blocks, and a set of four blocks offers is shown to offer cost savings for the procurement of regulating power in excess of 20%. For comparative purposes, the cost savings achievable with a fully observable and controllable demand response resource are evaluated, using a time series model of the refrigeration loads. The fully modeled resource offers greater savings; however the difference is small and potentially insufficient to justify the investment required to fully model and control individual flexible loads.

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