Aggregators, Pricing and Deferrable Demand Management

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Abstract

Distributed storage capacity at load centers (e.g., deferrable demand) can lower total system costs by lessening the differences between the peak and the lowest daily demand, thus reducing the conventional generating capacity needed for reliability purposes. These savings have impacts both on the operational and capital expenses of the peaking units used for generating adequacy, and therefore on the allocative efficiency of the supply side resources. Nevertheless, it is unrealistic to have system operators managing individual deferrable demand sources directly. A more viable route is to have some hierarchy within the system, with aggregators managing large numbers of customers and interacting with the system operator. We present a mechanism for profit-seeking aggregators using pricing signals provided by the system operator. In our model, both demand and wind inputs are stochastic inputs, affecting the optimal results from the stochastic scheduling program. We show how in our model the optimum strategy for an aggregator is to determine a high threshold price for discharging and a low threshold price for charging, providing both time arbitrage and ramping services . We illustrate our proposal using a probabilistic, security constrained, ambiguity robust optimization, on a reduction of the Northeast Power Coordinating Council (NPCC) for a summer peaking day. We finally contrast this model with a centralized control scheme and discuss the sensitivity to price forecasts.