

Preference Aggregation and Mechanism Design in the Smart Grid

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Abstract : Smart Grid is the vision of the future power system that combines advanced monitoring and communication technologies to provide energy in a smart, efficient, and user-friendly manner. This proposal considers a demand response model in the Smart Grid based on utility maximization. Given a set of consumers with conflicting preferences in terms of consumption and a utility company that aims to minimize the peak demand and match demand to supply, we study the problem of aggregating these preferences while modelling the problem as a game. We also investigate whether an equilibrium can be reached to maximize the social benefit. Based on such equilibrium, we propose a dynamic pricing heuristic that computes the equilibrium and sets the prices accordingly. The developed approach was analysed theoretically and evaluated experimentally using real appliances data. The results show that our proposed approach achieves a substantial reduction in the overall energy consumption.

Keywords : heuristics, smart grid, aggregation, mechanism design, equilibrium

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