

Interaction of Consumers and Power Supply Company for Demand-side Management

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The research proposes a methodology for the formation of tariffs in the retail electricity market. The methodology takes into account several factors that affect the demand-side management, namely: the presence of various types of consumers; the possibility of selecting a tariff type from several tariffs proposed by power supply company; the need to stimulate consumers to optimize their load during a day, in particular, to smooth peak load by shifting it to off-peak time; and the elimination of shortage risks. In our research the shortage is considered as a deviation of the actual consumption from the planned load, and, hence the emergence of the need to purchase the deficient electricity at higher prices. Interaction of consumers and power supply company is presented as a non-cooperative game [1].

A distinguishing feature of our research is the differential approach to stimulation of different consumers to optimize their load during a day. The problem of active consumer is solved by dividing all consumers into fully rational (their actions may be described by a financial result only) and boundedly rational (less motivated to save, whose strategy of behavior includes the notion "convenience"). Consideration of boundedly rational consumers is an important step in the research of such kind. We describe the behavior of these participants in the interaction through the utility function of a special form [2]. In our research the problem is maximization of the power supply company's profit with constraints which describe the utility maximization for several types of consumers in a simplified form. The existence and uniqueness of separating equilibrium for the two types of consumers with different utility functions are proved.

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References

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