

A Multi-Leader-Follower Game for Energy Demand-Side Management

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The energy domain currently faces multiple challenges. In particular, ensuring the supply-demand balance is essential to avoid blackouts. With the integration of renewable energies and the increasingly chaotic demand, this task has become more and more difficult, increasing the need for an efficient grid management. To this purpose, one approach consists in fitting the demand to the production: the so-called demand-side management (DSM). DSM relies on several techniques, including time-of-use pricing.

The model we present considers a set of energy suppliers competing to sell electricity to a set of clients. The suppliers offer prices, to which the clients react in an optimal manner by adapting their consumption. This setting gives rise to a multi-leader-follower game (MLFG), a mathematical object that is particularly complex to handle, since even simple bilevel problems are NP-hard. In this talk, we show how to take advantage of the problem's structure to guarantee the uniqueness of the equilibrium at the clients' level, and use this result to obtain points that are not only feasible, but sensible.

This is a joint work with Didier Aussel (University of Perpignan, France) and Sébastien Lepaul (EDF R&D, France).