Adaptive Portfolio Optimization for Multiple Electricity Markets Participation - DTU Orbit (25/12/2018)

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The increase of distributed energy resources, mainly based on renewable sources, requires new solutions that are able to deal with this type of resources' particular characteristics (namely, the renewable energy sources intermittent nature). The smart grid concept is increasing its consensus as the most suitable solution to facilitate the small players' participation in electric power negotiations while improving energy efficiency. The opportunity for players' participation in multiple energy negotiation environments (smart grid negotiation in addition to the already implemented market types, such as day-ahead spot markets, balancing markets, intraday negotiations, bilateral contracts, forward and futures negotiations, and among other) requires players to take suitable decisions on whether to, and how to participate in each market type. This paper proposes a portfolio optimization methodology, which provides the best investment profile for a market player, considering different market opportunities. The amount of power that each supported player should negotiate in each available market type in order to maximize its profits, considers the prices that are expected to be achieved in each market, in different contexts. The price forecasts are performed using artificial neural networks, providing a specific database with the expected prices in the different market types, at each time. This database is then used as input by an evolutionary particle swarm optimization process, which originates the most advantage participation portfolio for the market player. The proposed approach is tested and validated with simulations performed in multiagent simulator of competitive electricity markets, using real electricity markets data from the Iberian operator-MIBEL.

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