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Prosumer Community Portfolio Optimization via Aggregator: The case of the Iberian Electricity Market and Portuguese Retail Market

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Summary

The participation of household prosumers in wholesale electricity markets is very limited, considering the minimum participation limit imposed by most market participation rules. The generation capacity of households has been increasing since the installation of distributed generation from renewable sources in their facilities brings advantages for themselves and the system. Due to the growth of self-consumption, network operators have been putting aside the purchase of electricity from households, and there has been a reduction in the price of these transactions. This paper proposes an innovative model that uses the aggregation of households to reach the minimum limits of electricity volume needed to participate in the wholesale market. In this way, the Aggregator represents the community of households in market sales and purchases. An electricity transactions portfolio optimization model is proposed to enable the Aggregator reaching the decisions on which markets to participate to maximize the market negotiation outcomes, considering the day-ahead market, intra-day market, and retail market. A case study is presented, considering the Iberian wholesale electricity market and the Portuguese retail market.

Highlights

- An optimization model that jointly solves the minimization of the operating costs (energy usage) of an energy community and the optimal participation of an Aggregator in the Spot market and intraday sessions.
- A real scenario (prices and condition of participation) is modeled considering the Portuguese retail market and MIBEL wholesale electricity market.
- A cost reduction of 6–11% is achieved when the community of households buys and sells electricity in the wholesale market through the Aggregator.

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