

Abstract

Distributed energy sources are becoming more and more important in the German electricity network. One solution to manage this growing number of distributed assets lies in the Virtual Power Plant concept. A Virtual Power Plant aggregates decentralized generators and loads to behave like a large power plant. Based on new technologies, it uses advanced communication technologies to provide different services (generation of energy, steering of power systems, balancing services ...). This thesis proposes a mixed-integer stochastic model of a Virtual Power Plant. The participation to different products is being studied: selling power on day-ahead basis on the spot market, providing flexibility to the secondary and tertiary reserve market. The particularity of this model is to consider the revenue generated by the stochastic activation of the reserve market. An operational tool named AlocaBid is implemented in Python, based on the developed mathematical model. The performance of the model is being evaluated using four study cases, representing typical market situations. The results demonstrate the advantage of the proposed model over state-of-the-art method for bids' allocation.

Keywords: Virtual Power Plant, Reserve Market, Spot Market, Optimization