

Mohammad Jadidbonab, Behnam Mohammadi-ivatloo, Mousa Marzband, Pierluigi Siano, 2020, Short-term Self-Scheduling of Virtual Energy Hub Plant within Thermal Energy Market, *IEEE Transactions on Industrial Electronics*, to appear.

Abstract Multi-carrier energy systems create new challenges as well as opportunities in future energy systems. One of these challenges is the interaction among multiple energy systems and energy hubs on different energy markets. By the advent of the local thermal energy market in many countries, energy hubs' scheduling becomes more prominent. In this paper, a new approach to energy hubs scheduling is offered, called virtual energy hub (VEH). The proposed concept of the energy hub, which is named as the VEH in this paper, is referred to an architecture based on the energy hub beside the proposed self-scheduling approach. The VEH is operated, based on the different energy carriers and facilities as well as maximization its revenue by participation on the various local energy markets. The proposed virtual energy hub (VEH) optimizes its revenue from participating in the electrical and thermal energy markets by examining both local markets. Participation a player in the energy markets by using the integrated point of view can be reached to a higher benefit and optimal operation of the facilities in comparison with independent energy systems. In a competitive energy market, a VEH optimizes its self-scheduling problem in order to maximize its benefit considering uncertainties related to renewable resources. To handle the problem under uncertainty, a non-probabilistic information gap method is implemented in this study. The proposed model enables the VEH to pursue two different strategies concerning uncertainties, namely risk-averse strategy and risk-seeker strategy. For effective participation of the renewablebased VEH plant in the local energy market, compressed air energy storage (CAES) unit is used as a solution for the volatility of the wind power generation. Finally, the proposed model is applied to a test case and the numerical results validate the proposed approach.

Keywords Virtual energy hub, local thermal energy market, information gap decision theory, wind power generation, compressed air energy storage.