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Optimal participation of heterogeneous, RES-based virtual power plants in energy markets

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Abstract-

In this work, the optimal participation of heterogeneous, Renewable Energy Source (RES)-based Virtual Power Plant (VPP) in Day-Ahead Market (DAM) and Intra-Day Market (IDM) is studied. For this purpose, a detailed model of the RES-based VPP and of the market operation is needed. The VPP includes both dispatchable and non-dispatchable RESs and flexible demand assets. This paper presents an improved, linear solar thermal plant model to consider its non-linear efficiency curve. A novel demand model with two flexibility levels that are associated with the different market sessions is also proposed. The market operation allows for updates of energy offers and this is used by the VPP to submit DAM auctions and to participate subsequently in IDM to correct for deviations. Finally, the optimal participation of the VPP in energy markets is assessed under different weather conditions.

Index Terms- day-ahead market; flexible load; intra-day market; renewable energy sources; solar thermal plants; virtual power plant

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