

Local flexibility markets based on grid segmentation

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Abstract-

Local flexibility markets are a promising solution to aid system operators in managing the network as it faces the growth of distributed resources and the resulting impacts on voltage control, among other factors. This paper presents and simulates a proposal for an intra-day local flexibility market based on grid segmentation. The design provides a market-based solution for distribution system operators (DSOs) to address near-real-time grid issues. The grid segmentation computes the virtual buses that represent each zone and the sensitivity indices that approximate the impact of activating active power flexibility in the buses within the zone. This approach allows DSOs to manage and publish their flexibility needs per zone and enables aggregators to offer flexibility by optimizing their resource portfolios per zone. The simulation outcomes allow for the assessment of market performance according to the number of zones computed and show that addressing overloading and voltage control through zonal approaches can be cost-effective and counterbalance minor errors compared to node-based approaches.

Index Terms- Active power flexibility; Distribution grid constraints; Grid segmentation; Linear optimization; Local flexibility markets

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