

Comparative techno-economic analysis of market models for peer-to-peer energy trading on a distributed platform

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Abstract-

Since the emergence of distributed energy resources, local electricity markets have garnered interest for energy sharing on a community scale through both centralized and distributed models, including innovative distributed platforms. Numerous studies and initiatives have demonstrated that local markets and peer-to-peer transactions can be effective for electricity networks under specific conditions. Amidst the growing exploration of local market models, there is a noticeable gap in quantitative techno-economic analyses comparing different auction mechanisms. This paper aims at filling this gap by representing a comparative analysis of the most commonly implemented double-sided market models for peer-to-peer transactions based on a distributed ledger implementation. The comparison is based on quantitative key performance indicators designed to assess the economic and technical performance of these market models, including technical constraints within the power system through a network constraints management market. According to the selected metrics, the simulation results reveal that no single model outperforms all others. The authors conclude that, under the tested application and assumed conditions, the distributed market using distributed ledger technology faces several challenges that hinder its efficient application to local energy trading.

Index Terms- Peer-to-peer energy trading; Local electricity markets; Techno-economic analysis; Double auction models comparison

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