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MARKET EQUILIBRIA IN CROSS-BORDER BALANCING PLATFORMS

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Overview

The next phase of electricity market integration in Europe concerns balancing markets. It will see the introduction of balancing platforms for the trading of manual and automatic frequency restoration reserves. Balancing markets ensure the reliable operation of the grid by trading energy imbalances. These markets balance electricity consumption and generation in real-time. They are operated by transmission system operators which activate balancing energy bids submitted by flexibility suppliers to compensate the imbalances caused by electricity market agents. Balancing energy from flexibility suppliers is remunerated at the balancing energy price, and imbalances are settled at the imbalance price. The objectives of the platforms are to centralize the balancing energy bids across Europe and activate these bids at least cost to cover the system operators' demand for balancing energy. The platforms will generate common cross-border prices for uncongested zones.

Even though the volumes traded in balancing markets are much lower than those traded in real-time, the pricing of balancing markets should not be overlooked as the expectation of real-time prices drives the wholesale electricity price in the wholesale market [1]. Additionally, the potential synergies brought by the integration of European balancing markets are estimated to be considerably more significant than the ones from coupling day-ahead markets [2].

We investigate potential pricing asymmetries between European member states connected to the balancing platforms. The asymmetries are caused by balancing incentive components unilaterally implemented by a member state. These adders modify the balancing energy price paid to flexibility providers and/or the imbalance price charged to the imbalance creator.

Method

We characterize analytically the optimal bidding strategy of balancing energy suppliers for 3 different applications of adders: (i) the "adder on BRPs" design where an adder is applied on the imbalance price; (ii) the "adder on BSPs and BRPs" design where an adder is applied on both the balancing and imbalance prices; and (iii) the "RT market for reserve" design which proposes to introduce a market for balancing capacity imbalance and to uplift the balancing and imbalance prices by the balancing capacity imbalance price.

The equilibria resulting from these optimal strategies are then derived in a single zone setting and extended to the cross-border setting.

Results

Our analytical model highlights the potential inefficiencies caused by adders without a RT market for balancing capacity imbalances. Both the "adder on BRPs" and "adder on BRPs and BSPs" designs modify the order of activation and reduce the productive efficiency. The "adder on BRPs" design induces self-activation by the flexible suppliers, and the "adder on BRPs and BSPs" incentivizes them to internalize the value of the adder in their balancing energy bid instead of bidding at cost.

On top of the inefficiencies, cross-border distributional effects are also observed for those two designs. Consumers in the zone with an adder subsidize the consumption in the other zones, and flexible suppliers in a zone without an adder are discriminated against.

Conclusions

Only the "RT market for reserve" design can restore the productive efficiency. This design does not modify the bidding incentives for the flexible suppliers and does not generate cross-border distributional effects.

References

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[2] D. Newbery, G. Strbac, and I. Viehoff, "The benefits of integrating European electricity markets," Energy Policy, vol. 94, pp. 253–263, Jul. 2016. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0301421516301513