THE PRICE OF SHORT-TERM FLEXIBILITY IN EUROPE'S ELECTRICITY BALANCING MARKETS - A FORWARD-LOOKING PERSPECTIVE

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Overview

In Europe's electricity markets the transmission system operators (TSOs) maintain system stability through the market-based procurement and subsequent activation of reserve capacity. TSOs automatically and manually activate these capacities in a way to balance short-term deviations of actual generation and load from market schedules and load profiles. The corresponding procurements are typically organised as one-sided multi-dimensional auctions, whereas the actual auction design significantly varies across European countries. However, the European Network of Transmission System Operators for Electricity (ENTSO-E) recently drafted a network code on Electricity Balancing (GLEB) [ENTSO-E 2017] containing guidelines to which national electricity balancing markets across EU member states need to comply with. The GLEB is one out of eight network codes compiled in the course of ongoing electricity market reforms with the aim to realize the EU internal electricity market. The envisaged vision is to provide a credible real-time electricity price reflecting the real value of short-term flexibility provision across the EU. The European Commission (EC) emphasizes in their "Energy Union Winter Package" the importance that prices should "[] … reflect the real value of electricity in time and location (scarcity pricing) in order to drive investments towards the flexible assets most needed for the system, including demand-response and storage [EC 2017]." Against this background, the aim of this paper is to derive scenarios for the future development of electricity balancing markets in EU member states with the aim to assess their relevance by means of potential revenue streams from those markets under different framework conditions.

Methods

In this paper we apply the large-scale power system model HiREPS [EEG 2017a] covering all EU member states including Norway, Switzerland, the Western Balkan countries, North Africa and Turkey in order to derive electricity prices. In a first step, we identified relevant factors impacting the future development of electricity markets in the years 2020, 2030 and 2050. These factors are on the one hand related to electricity market design and regulatory trends currently observable in EU member states [Grave et.al. 2016] and on the other hand concern assumptions about developments of the supply side (e.g. future investments, RES ambition level), the demand side (e.g. peak load, forecast errors) and the future of the European transmission grid (e.g. congestion management, grid expansion). Concrete market design elements that have been included are whether and where capacity markets will implemented in addition to energy-only markets, whether demand response participation is incentivized and assumptions about the progress in international high-voltage grid expansion. In particular, we included the level of market integration between balancing markets in the assessment.

Different assumptions about these developments were grouped together with the intention to derive "possible future worlds" of framework conditions reflecting the most relevant and uncertain conditions impacting short-term electricity prices. The first relevant impact is the amount and type of (additional) RES that will be installed in the medium- to long-term within different countries. Second, the future evolvement of market design in wholesale as well as balancing markets and in particular, whether framework conditions across the EU converge more towards a nationalistic or an international approach will significantly impact (national) prices.

Assumptions on future RES deployment have been derived from results of the RES investment model Green-X [EEG 2017b]. Assumptions concerning market design evolvement, regulations and grid development are based on a comprehensive review of relevant literature and official documents from stakeholders like the EC, ENTSO-E and ACER. Assumptions concerning the future demand for balancing energy have been derived based on an empirical approach applying ARIMAX models and outage statistics of conventional power plants.

Results

The power system model HiREPS will be used to model the development of hourly wholesale electricity prices and real-time balancing prices (5min resolution) for each price zone in the covered region and for the years 2020, 2030 and 2050. Together with the modelled market quantities the results will enable us to assess the future monetary relevance of balancing markets across the EU under different assumptions of framework conditions. In that way, we will be able to assess the benefit of market integration (i.e. cross-border participation and imbalance netting) of balancing markets within the EU internal market and to quantify for different technologies the share of revenues from balancing markets on their total revenues.

Conclusions

The results of this study will contribute to the ongoing debate about interactions of RES policy and electricity market design, the efficiency gains of market integration and provide next to the impact assessment accompanying the EU winter package another estimate on the future value of flexibility and its importance for revenues of different supply technologies.

References

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