Tender Frequency and Market Concentration in the Balancing Power Market – The Case of Germany

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Overview

In balancing markets balancing power is procured by Transmission System Operators (TSOs) in order to be able to balance short term deviation of demand and supply. All prequalified generators can participate in this market. The balancing power market is furthermore divided into products depending on the urgency and the direction of power provision. In Germany the markets are divided into primary, secondary and tertiary balancing power provision.

There is an ongoing debate between scientists, electricity market actors, politics and regulators about shortening provision periods of balancing power in Germany. The Federal Ministry for Economic Affairs and Energy (2015) names “Shorten time between contract and delivery and/or reduce size of products” as a proposal to further develop balancing power markets. As was shown by Müsgens et al. (2015), shortening provision periods increases the efficiency of the markets.

We explore the effects of a shortened provision period on the system costs and the market concentration of market participants. We consider a daily and hourly provision of primary and secondary balancing power instead of the current weekly provision. We find that a shortened provision period can increase the market concentration in some hours and thus may increase the danger of market power abuse. This effect may counteract the potential gains of reduced provision times.

Methods

We use a unit commitment model of the German electricity market which is extended to model balancing power markets. Two typical weeks in 2014 are in the focus of our analysis, a winter and a summer week. Power plants are modelled with a high technical detail depending on the fuel type and age of the plant accounting for e. g. state-dependent efficiencies, and start-up restrictions and ramping speeds. We map the information about the ownership to each power plant considering the German power plant operators E.ON, RWE, EnBW, Vattenfall and STEAG. All other plants are mapped to a competitive fringe.

We assume that all running plants are able to provide a certain share of their capacity as balancing power. E.ON, RWE, EnBW, Vattenfall and STEAG can furthermore shift balancing power provision within their portfolio over a time period, e. g. they can offer a certain volume of balancing power during the provision period and use different power plants within their pool to fulfil their commitment. The fringe is not allowed to pool meaning that each power plant of the fringe has to provide the balancing power during the whole provision duration.

Outputs of the model include the dispatch of power plants, power plant specific balancing power provision and balancing power provision of operators. We use the outputs in order to calculate market concentration measures like the Herfindahl-Hirschman Index (HHI), concentration ratio (CR) and Residual Supply Index (RSI).

Results

Comparing the system costs of the simulation with the current balancing power market design to a simulation without provision of balancing power provides us with a measure for the total costs of balancing power provision. We find that those costs are 1.328 million EUR in the winter week, and 0.677 million EUR in the summer week. Furthermore, we find that the maximum efficiency gain by shortening provision periods (difference between system costs of a weekly and hourly provision) is 222k EUR in the winter week, and 96k EUR in the summer week. We structurally explain those efficiency gains by analysing which power plants provide balancing power in the different setups.

Besides system costs, the second focus of our analysis is on market concentration. We find that the HHI, CR and RSI indicate market concentration in all considered provision periods. Our analysis shows that the market concentrations

fluctuate from hour to hour of the analysed weeks if we consider an hourly balancing power provision. Usually, the shorter provision duration sets an upper and lower boundary for the longer provision duration. Besides hours with small market concentration, there are hours in which the market concentration is significantly higher than the market concentration in the case of a weekly provision. This implies that certain power plants in the balancing power market have cost advantages in certain hours. We explore which power plants those are.

Conclusions

We quantify the efficiency gains of shortened balancing power provision durations using system costs as a measure for efficiency. An important implication of changing the market design of balancing power markets is the effect on market concentration. Our analysis shows that shortened provision durations can lead to increased market concentration in certain hours. We make a contribution to the ongoing debate about shortening provision durations and focus on the effects that potentially counteract the efficiency gains that are expected from shortening provision durations. With a daily provision duration, efficiency can be increased while high market concentrations can be avoided.

References

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Müsgens, Ockenfels, Peek (2012). Balancing power markets in Germany: Timing matters. Zeitschrift für Energiewirtschaft 36 (1), 1–7.