

Analysing Market Movements from Day-Ahead- to Intraday-Market to Improve Capacity Validation Processes

Themenbereich: (2) Energieerzeugung/-infrastruktur und Netze

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Motivation and Central Research Question

To facilitate electricity markets, Transmission System Operators (TSOs) determine available capacities between bidding zones. This is done in accordance with the relevant regulations, e.g., EU Regulation 2019/943 (“CEP”), including the minimum capacity requirements [1]. TSOs have the right to validate these capacities, which requires an estimation of most likely power exchanges [2]. In Europe, the increasingly fluctuating power flows from Renewable Energy Sources (RES) lead to greater complexity in estimation of exchanges [3, 4]. Therefore, we ask the following research question: Are there patterns in cross-zonal Intraday-market trading, depending on the results of the Day-Ahead-market? Knowing such patterns could improve Intraday capacity validation processes.

Methodological Approach

In general, the objective of validation is to ensure that the determined capacities do not allow exchanges which violate operational security limits [2]. In our case, we could ideally examine all possible combinations (i.e., direction and magnitude) of Intraday-market movements. Due to finite calculation resources only discrete market directions can be analysed. For the Core-region², even this approach would lead to more than half a million combinations which is practically not feasible. Therefore, we analyse Intraday-market movements to reduce the number of combinations that need to be validated.

For this purpose, we use scheduled commercial exchanges, i.e., the quantities of energy traded between neighbouring bidding zones on Day-Ahead- and Intraday-market. This data is published on the ENTSO-E transparency platform [5]. Based on the scheduled commercial exchanges resulting from the Day-Ahead-market (that need to respect the Day-Ahead-capacity constraints), we investigate in which market direction and to which magnitude energy is traded on the Intraday-market, i.e., the market movement. We analyse the market movement in absolute and in relative means. For the relative analysis, we take the Intraday Available Transfer Capacity (ID ATC) into account. For illustrating and interpreting the results, we use descriptive statistics like scatterplots, frequency distributions, and heatmaps.

Results and Conclusion

Figure 1 illustrates the absolute and relative (starting from 09th June) market movement for Germany/Luxembourg and Austria from 01st January to 29th October 2022. The scatterplots as well as the frequency distribution plots reveal that there are a lot of hours with no further movement on the Intraday-market. Moreover, the plots reveal the pattern that the higher the exchange on the Day-Ahead-market, the more likely it is that the Intraday-market “moved back”. This can be conducted by the relative scatterplot since the capacity in the corresponding direction has often already been fully exploited on the Day-Ahead-market. Figure 2 illustrates the Day-Ahead- and Intraday-market trading over the course of the year as a heatmap which allows to derive daily and seasonal patterns.

Using only most likely market movements in capacity validation avoids that capacities are reduced due to very unlikely, respectively unrealistic exchanges. Hence, this article contributes to foster the efficient usage of grid capacities and, therefore, the power exchange between bidding zones in times of increasing RES shares in the coupled European grid. Further research should take more input data – e.g., the share of RES – and sophisticated methods into account to gain additional insights into most likely market movements.

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² Core-region refers to the capacity calculation region of central Europe.

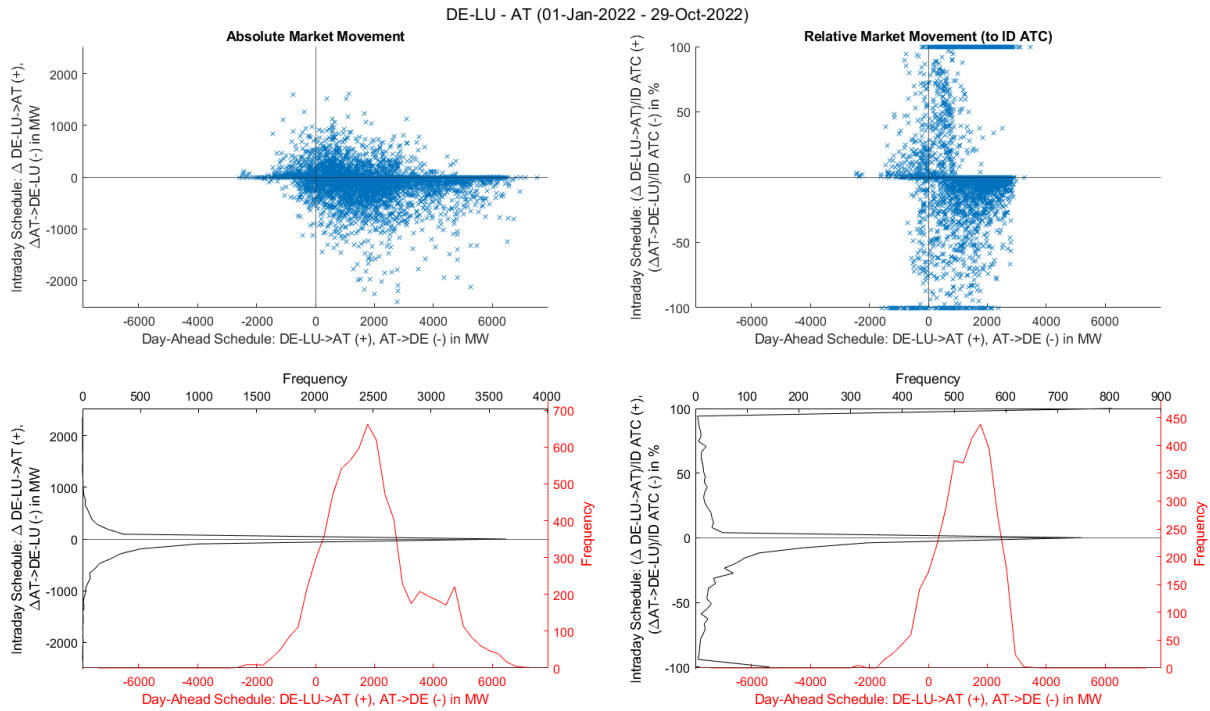


Figure 1: Absolute and relative market movement for Germany/Luxembourg and Austria.

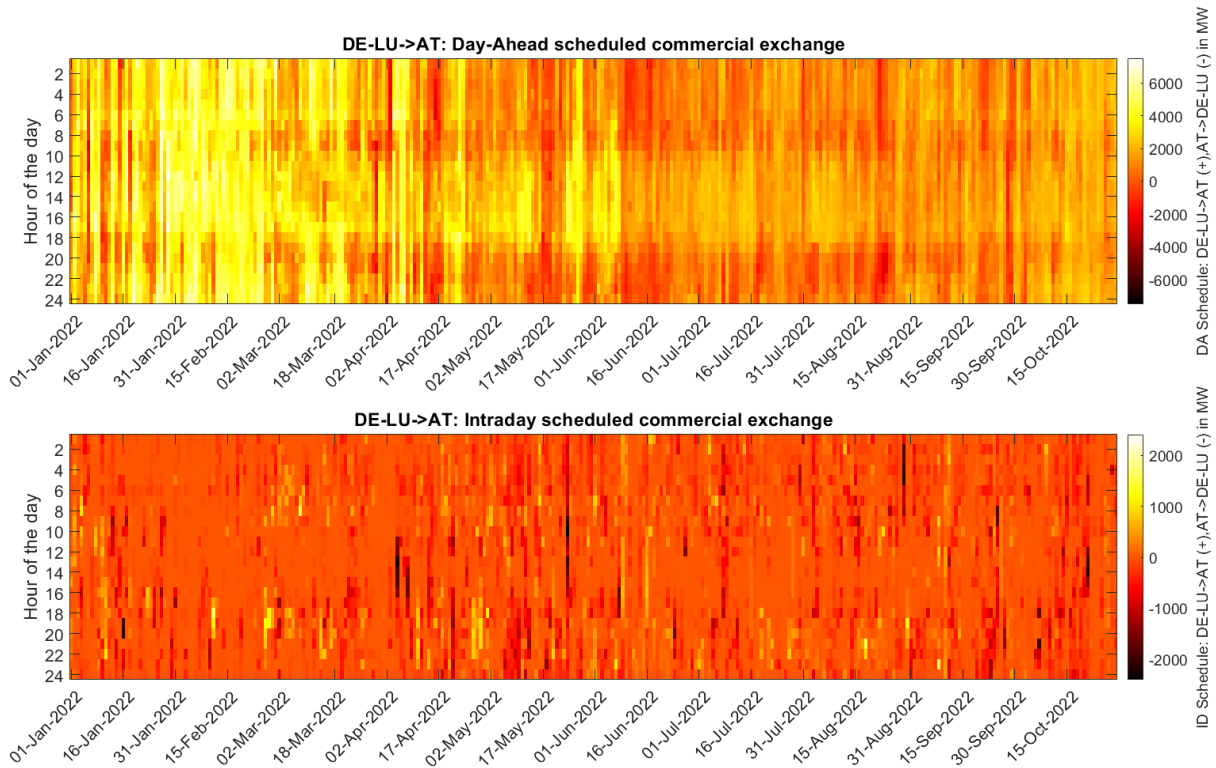


Figure 2: Absolute market movement on the Day-Ahead- and Intraday-market for Germany/Luxembourg and Austria over the course of the year.

Literature

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