

# The value of intraday electricity trading – Evaluating opportunity costs of units distributing on local flexibility markets

Timo Kern, Forschungsgesellschaft für Energiewirtschaft mbH, +49 89 158121-35, tkern@ffe.de  
Serafin von Roon, Forschungsgesellschaft für Energiewirtschaft mbH, +49 89 158121-0, sroon@ffe.de

## Overview

Keeping the energy transition in Europe in mind, there is a shift to decentralized volatile generation units resulting in more bottlenecks regarding the grid. An opportunity to decrease these congestions is the integration of local flexibility markets adapting the generation or consumption of flexible units [1]. In addition to local flexibility markets, these flexible units have the opportunity of distributing at short-term electricity markets [2]. Sufficient forecasting of revenues in all available markets is a crucial factor to a successful integration of these flexible units into the energy system. This paper develops an approach to analyze the opportunity costs of units distributing in local flexibility markets. Therefore, it focuses on the continuous intraday market for the country of Germany.

## Methods

Continuous intraday prices can be modelled as normally distributed values with a mathematical expectation value of the intraday auction price and a standard deviation [3]. Relating the deviation between continuous prices and expectations to day-ahead forecasts of wind generation, solar generation, load, prices and other influences results in a situative standard deviation. Comparing variable costs of generation units to the expected revenue at the intraday market leads to opportunity costs in the continuous intraday market. For a flexible standard unit, these revenues decide whether it acts on a local flexibility market or at the intraday market.

## Results

The standard deviation between continuous prices and expectations (price of intraday auction *ID\_Auction*) is evaluated by different statistical values of continuous intraday trading:

- *ID\_cont\_last*: Price of last transaction in continuous intraday trading
- *ID\_avg\_1ht*: Average price of all transactions in continuous intraday trading within 1 hour before delivery
- *ID\_avg\_3h*: Average price of all transactions in continuous intraday trading within 3 hours before delivery
- *ID\_avg*: Average price of all transactions in continuous intraday trading

**Figure 1** exemplarily shows the effect of wind power generation forecast. A higher wind power generation forecast leads to increased standard deviations between prices in continuous intraday trading and prices in intraday auction. There is a strongly situative standard deviation dependent on wind power generation. As a consequence as shown in [3], conventional generation units that have variable costs equal to the expectation value of continuous intraday trading expect higher revenues in situations characterized by a high wind power generation forecast.

## Conclusions

The presented approach promotes the integration of flexible generation units by helping to maximize their profit in a future market design with local flexibility markets. There is a situative expected revenue at the intraday market that should be taken into account before dispatching generation units on local flexibility markets.

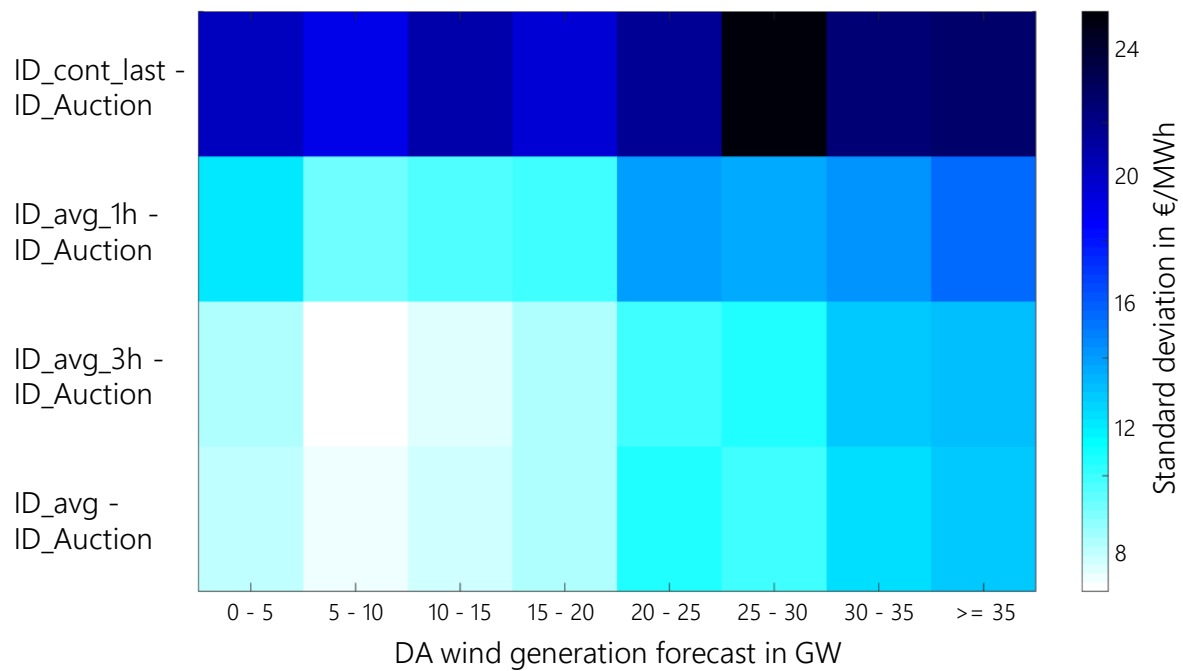


Figure 1: Influence of Day-Ahead (DA) wind power generation forecast on standard deviation between prices in continuous trading and intraday auctions

## References

- [1] Estermann, Thomas et al.: Approach to determine the effect of local flexibility options within the framework of a smart market platform in: 8th Solar Integration Workshop. Stockholm: Energynautics GmbH, 2018.
- [2] Timo Kern et al.: Rückwirkungen von Batterie-Vermarktungsoptionen auf den Strommarkt. Wien: 11. Internationale Energiewirtschaftstagung an der TU Wien, 2019
- [3] Prof. Dr. Christoph Weber: Berücksichtigung von Intraday-Optionalitäten im Rahmen der Redispatch-Vergütung. Gutachten im Auftrag der EnBW, 2015