

FLEXIBILITY IN COMPETITIVE ELECTRICITY MARKETS

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Abstract

The continuous expansion of electricity generation from intermittent renewable energy sources (RES) is changing the present generation structure considerably. In order to utilize a high share of supply-dependent RES, the future energy system needs to become more flexible than it is today. This presentation aims to contribute to the discussion about the adequate design of future electricity markets that ensures competition between different flexibility measures.

Methods

The first part briefly outlines the flexibility requirements of RES dominated electricity system. By examples of different coincidences of volatile demand and stochastic RES generation, the impact of the dissimilar characteristics of photovoltaic and wind power generation is stressed in particular. Thereafter, the various types of flexibility measures to balance RES deficits or surpluses are shortly introduced. Next to measures on the generation and demand side this also includes storage technologies and grid modifications. To evaluate the suitability of these alternatives, their major characteristics and limitations are examined afterwards. By showing how these restrictions lead to partly contrary cost structures for the individual balancing measures, the shortcoming of the present electricity market design to attain competition between these different flexibility alternatives are finally emphasized.

Results

To balance RES deficits and surpluses, a mix of different flexibility measures is required to integrate an increasing share of intermittent RES that causes higher load gradients. The individual flexibility alternatives affect different parts of the energy systems. Therefore restrictions and specialities of each flexibility measure vary quite considerably, e.g. in terms of availability, potential, efficiency as well as shares of fixed and variable costs. Hence, the suitability of a certain flexibility alternative not only depends on the specific RES surplus or deficit situation but also on the frequency of usage that determines the average costs for each measure.

To meet the required level of flexibility at lowest costs an appropriate market design that enables competition between all balancing alternatives is essential. Therefore, future electricity markets are supposed to reflect the time-dependent value of flexibility, i.e. the ability to balance different load gradients in the short- and in the long-run.

Conclusions

In many European countries spot and balancing markets are already competitively organized to incentivize an efficient short-term dispatch of existing flexibility. But, today's market design is also a construct of different market segments and regulations that is characterized by interdependences between partly opposing political energy targets on national and European level. Hence, to ensure a high level of completion between different flexibility measures, the further development of the electricity market design needs to find a trade-off between the following two approaches:

- Introduction of additional markets and regulations that go beyond the present discussion of capacity mechanisms to enable long-term competition of different flexibility measures
- Merger of existing markets and regulations on national and European level to increase today's market efficiency by further reduction of market entry barriers and avoidance of permanent market distortion

References

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