

Investments and Market Outcomes under Regulatory Uncertainty: A Case Study of German Electricity Bidding Zones

Johannes Spies, Lukas Maximilian Lang, Jonas Egerer, Veronika Grimm
University of Technology Nuremberg (UTN), Nürnberg, Germany

Extended Abstract

[Download file](#)

Abstract Summary

The German electricity market currently operates under a uniform bidding zone, which conceals structural north–south transmission bottlenecks and prevents regionally differentiated price signals. This leads to inefficient short-term market outcomes and distorted mid-term investment incentives for generation, storage and large consumers. While previous research shows that multiple bidding zones can improve system efficiency, the ongoing political debate in Germany creates regulatory uncertainty for market participants. This study extends the literature on regulatory uncertainty regarding the potential implementation of different bidding zone configurations in Germany by analysing their impact on investment decisions, market rents of various actors, redispatch costs, overall system efficiency, with a particular focus on regional investments and the operation of flexibility.

To analyse these effects, the paper applies a stochastic two-level electricity market model for the year 2030 within an integrated European electricity market. The model captures investment and operational decisions under uncertainty about whether Germany will maintain one bidding zone or transition to two or five zones. At the first level, firms decide on (dis)investments in generation, storage and electrolyzers amid uncertainty regarding the bidding zone configuration. After a configuration has been implemented, operational decisions are made which are adjusted at the second level by a TSO using cost-based redispatch to ensure feasibility with grid restrictions.

The analysis indicates that even low probabilities of future market splitting lead to adjustments in the location and scale of investments, particularly in flexible technologies. These anticipatory responses improve overall system welfare compared to a fixed uniform bidding zone, despite potential increases in redispatch costs under certain realisations. The findings emphasize that expectations about future market design shape investment behavior and system outcomes. While regulatory uncertainty can induce welfare-enhancing adjustments, clear and credible policy signals for multiple bidding zones are required to guide investments efficiently and achieve welfare gains.

Presenting Author Biography

Johannes Spies completed his Master of Science in Industrial Engineering with a focus on Electrical Engineering at Friedrich-Alexander-University Erlangen-Nuremberg (FAU) in July 2025. Since July 2025 he is part of the Energy Systems and Market Design Lab at the University of Technology Nuremberg (UTN). His research focuses on topics related to the electricity market, including market design, energy market modelling, regulatory frameworks and decentralized energy supply.