

Evaluation of risks for electricity generation companies through reconfiguration of bidding zones in extended Central Western Europe

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Executive summary

In Central Western Europe (CWE), a reconfiguration of bidding zones for electricity is frequently discussed as a way to improve congestion management due to increased redispatch costs and amounts. This is mainly a consequence of the increasing infeed from renewable energy sources in combination with the massive delays in grid expansion, but it also reflects changes in regulation, e.g. the nuclear phase-out in Germany. That is one reason why the current EU guideline on Capacity Allocation and Congestion Management envisages reviews of the bidding zone configuration (BZC) in regular intervals of three to five years. Such a change of BZCs gives rise to additional regulatory risk for generation companies. The expected net present value of their power plants depends on local prices, which are not only influenced by changes in primary energy and CO₂ certificate prices but also by the BZC.

Therefore, we develop a methodology to investigate and quantify the impact of this regulatory risk. We investigate optimized, endogenously determined BZCs and the risks for generation companies by computing and assessing the distribution of present values of the contribution margins obtained in future operations using a partly-meshed scenario tree. The risk factors reflected therein are uncertainties in grid developments, in combination with other risks such as changing coal and gas spreads, demand, or renewable infeed variations. Results are compared to the current BZC in Europe, where bidding zone borders usually align with national borders, and to a nodal setup. As key figures to evaluate the profitability and riskiness of power plants, the probability-weighted present value of contribution margins, the corresponding lower partial moments and standard deviations, are assessed and evaluated.

The riskiness is found to depend strongly on the location of the power plant and its type. Coal-fired power plants always expect positive contribution margins in contrast to gas-fired power plants, which is why we put the focus on the results of gas-fired plants. This reflects the current electricity market situation in CWE, with overcapacities and low CO₂ certificate prices, which according to our computations is likely to last even in future years. Moreover, the chosen regulatory scheme also influences the profitability of power plants, although the relationship between any regulatory scheme and the riskiness for generation companies turns out to be strongly nonlinear. The effect on power plants differs, depending on their location and their assignment to optimized (robust) bidding zones. Regarding the riskiness, the results are twofold: The lower partial moments (asymmetric risk measure, focus on downside risk) improves with reconfiguration of bidding zones, while the standard deviation (symmetric risk measure) deteriorates. This indicates that the possible downsides are reduced while potential upsides increase.

Keywords Electricity Market Design, Bidding Zone Configuration, Investment Decisions, Risks.

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