Getting contracts-for-difference right: Matching design to market needs

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Overview

In 2024, EU bodies brought an electricity market reform underway which, among other measures, mandates the use of two-way contracts-for-difference (CfDs) or equivalent contracts if member states implement a direct price support scheme for new non-fossil fuel power generation (EU, 2024). Although CfDs are a widely implemented support mechanism, this part of the reform has sparked a debate about the adverse effects of such contracts and how they should ideally be designed (Kitzing et al, 2024). However, this debate primarily focuses on bidding in the spot market during the operational phase of renewable energy projects (e.g., ENTSO-E, 2024). These arguments neglect the weather-dependence of renewable energy and do not consider that the potential adverse effects of CfDs (and thereby mitigation strategies) can depend on the market characteristics in which they are implemented.

We address this gap by evaluating the suitability of different CfD designs for offshore wind under various market conditions. The designs include generation-dependent CfDs with different kinds of averaging the reference price and generation-independent CfDs, such as yardstick and financial CfD, with different definitions of reference production. The markets differ regarding the technology mix and exhibit different pricing characteristics, trends, and correlations. The suitability of design options is evaluated in terms of their ability to reward high market value factors. In other words, CfDs are deemed suitable if they allow projects that are more complementary to the demands of the market to submit lower bids. Thereby, they enable price-based auctions to successfully select projects with better market integration.

Methods

It is argued in the scientific literature that CfDs do not support renewable energy investments through subsidisation, but rather through revenue stabilisation, which drives down financing costs (Beiter et al., 2024). Therefore, we employ a stochastic financial model, which is calibrated on empirical data, to derive the cost of capital for the different cases. This accounts for the CfD designs, market characteristics, and representative production profiles of offshore wind projects. The results are then used as input to discounted cash flow analysis to derive the lowest possible bid price. For each combination of electricity market design, we thereby obtain the most competitive bid for each representative project. Based on that, we determine the expected winner of a price-based auction. With the market value factor as the criterion, we then evaluate whether the expected winner is the one who complements market demands best.

Results

The results show that CfDs need to be adapted to market characteristics to yield desirable outcomes. CfD designs with greater basis risk allow for lower bids by installations with better market integration (i.e., higher market value factor). In the absence of basis risk (e.g., generation-dependent CfD with hourly reference price), the auction performance is independent of the potential for market integration. Basis risk can be introduced to generation-dependent CfDs through longer-term averaging of the reference price without technology-specific weighting. Generation-independent CfDs can achieve this through broader definitions of the reference production, which translates to a lower correlation with the actual production. This effect is dependent on long-term trends in the electricity market price. For example, in the case of annual averaging and a negative trend, the achieved market price relative to the reference price is lower than if there was a stable long-term price level. Since prices are usually driven down by renewable energy production, this effect is greater for projects whose production correlates more positively with the remaining fleet, thus having lower market value factors. Generally, we observe that the CfD design makes a greater difference in markets with a high share of wind energy.

Conclusions

The results show that the design of the CfD does not only affect bidding incentives in electricity markets during the operational phase but, together with price-based auctions, can also be used to incentivise offshore wind capacity expansion, which is suited for serving the demands of the respective electricity market. This is especially effective in markets with high wind penetration or a long-term perspective of declining prices.

References

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