Designing Contracts for Difference for the EU Power Market: Trade-off between Incentives and Risks

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1. Overview

At the end of 2021, electricity prices in Europe have reached unprecedented, and at that time unthinkable, high levels. The economic consequences of these prices are important for electricity consumers, facing bills way over the full costs of the power system. Several countries have put in place emergency measures to capture windfall profits and protect consumers from unbearable bills.

In a theoretical world, high prices would lead to massive investments in low-carbon technologies to capture inframarginal rents. Notably due to the absence of the free entry / exit conditions, fair inframarginal rents cannot be restored in the short run. In the long run, lack of information, coordination or missing markets highlight the need for long-term contracts under a hybrid regime, mixing public interventions and private investment to keep investment flow. The past year has emphasized more than ever the need to (i) protect consumers from high electricity prices and to (ii) derisk investment, both through long-term contracts (Abada et al., 2019; de Maere d'Aertrycke et al., 2017; Fabra, 2022; Joskow, 2022, 2020; Keppler et al., 2021; Lebeau et al., 2021; Newbery, 2016; Roques and Finon, 2017).

One way to answer both objectives is to rely on symmetric Contracts for Difference (CfD), that are financial contracts signed with a public counterparty (on behalf of consumers) and covering the fluctuation of prices. While addressing some of the market failures, these contracts stabilize revenue for private investors and protects consumers (Newbery, 2023). However, CfD as such cannot be generalized to all low-carbon technologies. Classic CfDs based on day-ahead prices and injected generation are known for causing distortions in the short term electricity markets (Meus et al., 2021). A permanent way to correct distortions and restore incentives is to adapt the contract design. Examples of adapted designs are yardsticks, capability-based or financial wind CfDs (ELIA and ENTSO-E, 2022; Newbery, 2023; Schlecht et al., 2022). However, addressing the incentives issues moves the allocation of risks between investors and the public counterparty. This paper focuses on the impact of new designs for the allocation of risks.

2. Methods

The *adapted CfDs* required further analysis for risk allocation that is realized in two steps. Firstly, CfDs designs are theoretically explored, to determine how the contract modifications can restore the right incentives in the short and medium term. It focuses on the modification of the contractual volume, by decomposing the financial settlement of several contract formulations. Incentives to produce any additional megawatt-hour is thus evaluated.

Secondly, the same contracts are explored for the allocation of risks, by using a pan-European modelling of the power system that includes weather and price risks. The power system modelling lies on a Monte Carlo approach uses for 200 climatic years and 60 power thermal availability series. After determining, for each contract and under the assumptions of pure and perfect competition, the contract price ensuring in average the economic viability of the investment, the revenues of assets for each contract design are evaluated. Each realized Monte Carlo year differs from the average approach, the combination of market revenues and CfD revenues is used to find total revenues. This approach enables the evaluation, *ex-post*, of the exposition to price and volume risks for each contract and each technology by analyzing the dispersion of revenues. This approach is decomposed for three low carbon technologies.

3. Results

The theoretical analysis of adapted CfDs contracts show that adapted CfDs can restore the right incentives by exposing, at least partially, the asset to the short term price. It thus disconnects the CfD's remuneration to the effective production that is only linked to the contractual volume. In this respect, there is no longer an incentive to produce at any time of the day independently of the power system state. In consequence, most of the *adapted CfDs* no longer distort short term offers. Concerning the risk allocation analysis laying on the modeling approach, the results highlight that strike prices are impacted by the CfD design. As the design modify the exposition of the profile to prices it changes the strike prices. On one hand, the analysis shows that the dispatchable technology (i.e. nuclear) is the most sensible technology to contract design and market revenues. By being a dispatchable asset, thus producing when it has the most value for the power system, any deviation to the reference scenario is reflected in the revenues dispersion increasing uncertainty for investors. Moreover, the contract providing the most incentives is also the one with the most important uncertainty in revenues. On the other hand, non-dispatchable technologies are less impacted, but remain highly impacted by the production profile.

In fine, any uncertainty on the investor's side will be reflected in the decision of investment and the cost of capital. It requires to provide enough short-term market exposure for incentives, while at the same time providing certainty on revenues to limit the cost of capital. It thus exists a trade-off to between restoring incentives and risks. The trade-off is not the same for each technology depending on their sensitivity to market prices and each contract.

4. Conclusions

The discussion about hybrid regimes lies on the development of long-term contracts. In this framework, long-term contracts derisk investment but wrong design can lead to distortive incentives. *Adapted CfDs* correct the short-term incentives by disconnecting effective production to the contractual production, enabling the extension of CfDs to low carbon technologies. Contracts analysed in this paper have shown that the restoration of incentives impacts the allocation of risks. For risks, the profile and dispatchable behavior is a key element for exposure. For a same contract design, dispatchable technologies are the most exposed. Maximizing the exposition to the market provides right incentives but comes at the cost of revenue certainty. Non dispatchable technologies are less exposed.

Policymakers must thus carefully choose the design for each technology and do not generalize a CfD design without any further analysis. Incentives must not justify an exposure to too many risks, as it could jeopardize a low cost and efficient decarbonization of the power system.

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