

# HOW (NOT) TO AUCTION THE PHASE-OUT OF COAL

New insights on the results of the German coal  
phase-out auctions

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# CONTENTS

|   |   |
|---|---|
| The results of the first six rounds are in                            | 4 |
| Does the German auction design really deliver against its objectives? | 6 |
| A more flexible auction design  | 8 |

Germany is gradually phasing out coal-fired electricity generation. Since 2020, the German government has conducted six auction rounds for more than 10,000 Megawatt of capacity to determine the order in which stations will close and the compensation that plants will receive for early closure.

In a first [bulletin](#) from 2020, we already identified several design flaws. An awkward award rule with a CO<sub>2</sub> adjustment and decreasing bid caps led to efficient modern plants being selected among the first plants for early decommissioning while older less efficient plant continued operation – such an outcome is clearly inefficient.

The current energy crisis has revealed further weaknesses in the auction design. Too low bid caps and rigid, short lead times for closures have made participation in these auctions unattractive at a time when power prices are sky-rocketing. And security-of-supply concerns have led the German government to allow plants that were earmarked for closure to temporarily return to the market. Other more flexible approaches, such as tradeable coal-firing allowances, similar to the EU Emissions Trading System (ETS) for carbon emissions, would have been better suited.

## The results of the first six rounds are in

The German Coal Phase-out Act adopted on 3<sup>rd</sup> July 2020 provides for the gradual phase-out of coal-fired electricity generation in Germany by 2038 at the latest. Closure payments for hard coal-fired power stations are determined in a series of tenders which are organised as pay-as-bid sealed-bid auctions.

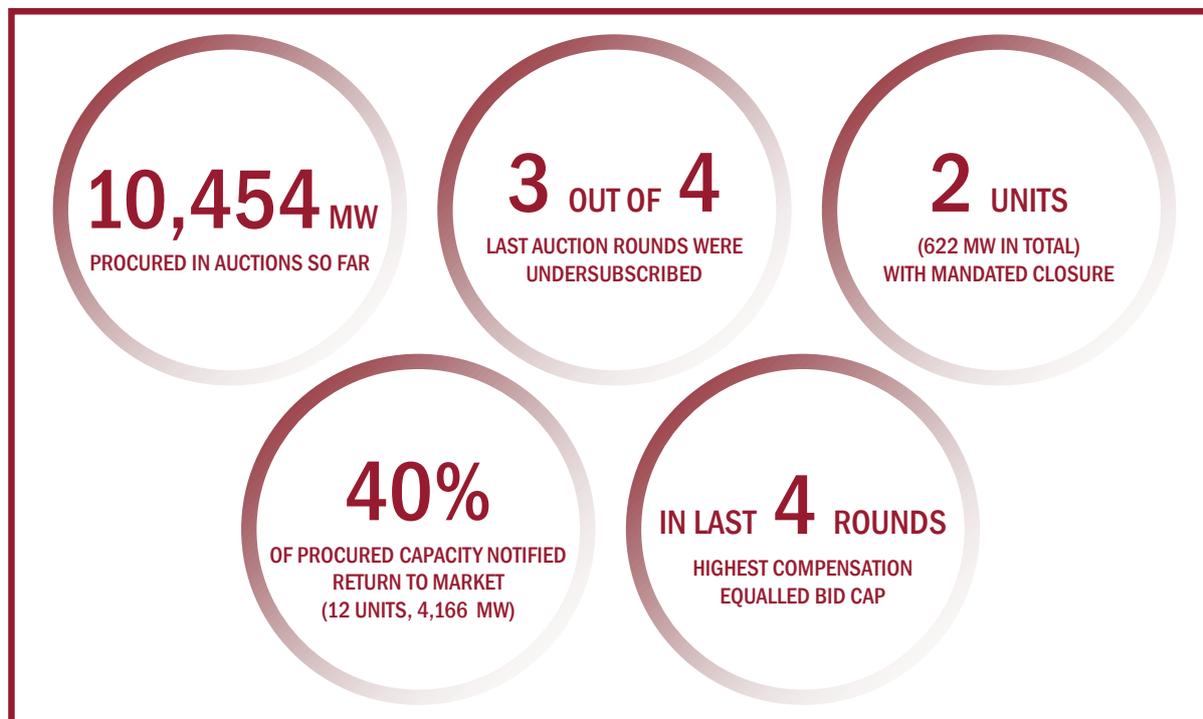
Results of the first six auction rounds are in – three out of the four last auctions were undersubscribed and several plants had to return to the market to secure supply:

- Since 2020, the German regulator BNetzA has tendered a total of 10,454 megawatt (MW) of hard coal-fired capacity in six auction rounds – the awarded plants have been either decommissioned already or must be taken off the grid within the next few years.
- Three out of the last four auction rounds were undersubscribed, i.e. BNetzA could not procure the full tendered capacity in the auction. This has created a gap of approx. 700 MW compared to the closure targets in the Coal Phase-out Act.
- The Coal Phase-out Act contains a provision to ensure closure targets are met: The capacity gap is filled up by mandatory decommissioning of plants, starting with the [oldest unit](#) still in operation. Plants that are subject to mandatory closure do not receive any compensation.
- However, the German government – through a new law – has allowed plants to re-enter the market as a result of recent security of supply concerns. As of 9<sup>th</sup> January 2023, there are already 12 units, with a total capacity of 4,166 MW (40% of total procured capacity), that have declared their [temporary return to the market](#).<sup>1</sup>
- The reduced competition in the last undersubscribed auction rounds meant that the tender awarded during the auction was equal to the bid cap. This resulted in the government potentially having to pay more than in a more competitive situation.

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<sup>1</sup> The Substitute Powerplant Maintenance Act ('Ersatzkraftwerkereithaltungsgesetz') and subsequent ordinances allow coal-fired power plants which were awarded bids in the phase-out auctions for decommissioning in 2022 and 2023 to temporarily return to the market (until spring of 2024 and only as long as there remains an official emergency situation for gas supply)..

Figure 1



The phenomenon of **undersubscriptions** in recent auction rounds is presumably linked to the surge in power prices due to higher gas prices and the unavailability of nuclear power plants in France over the course of 2022. This has increased foregone revenues for plants (i.e. their opportunity costs), and has made participation in recent auctions rounds at given bid price caps [unattractive](#).

This significant change in energy markets, which could not have been anticipated when the German Coal Phase-out Act was adopted in 2020, was met with an inflexible auction design with fixed closure dates and declining bid caps. The design forces plants to close within a short lead time of around two years when power prices are still expected to remain high. The declining (and recently binding) bid cap does not allow plants to reflect higher foregone revenues through higher bids due to the bid cap. We had already pointed out some of these flaws – which were apparent to critical economic thinkers even before the first auction – in our previous [bulletin](#) from 2020.

## Does the German auction design really deliver against its objectives?

The German Coal Phase-out Act aims to steadily reduce coal-fired power generation while ensuring a secure, affordable, efficient and climate-friendly supply of electricity.<sup>2</sup> However, the present results raise doubts that the German auction design is delivering on these objectives:

- **Inefficient selection of plants due to low bid caps and mandatory closures:** An efficient auction design first selects those power plants with the lowest CO<sub>2</sub> abatement costs. However, there are several reasons why the current German design cannot produce [efficient decommissioning decisions](#).<sup>3</sup>

The low bid caps, fixed (in € per MW) by law in 2020, at a time when energy prices were much lower, prevent bidders from signalling their true opportunity costs which are today much higher than previously anticipated. This either leads to crowding at the bid cap, i.e. multiple operators with presumably different opportunity costs bidding the same amount around the level of the bid cap, or bidders not participating at all – which results in undersubscriptions.

Undersubscriptions prevent the auction mechanism from selecting efficient plants in two ways: First, expected undersubscription implies that there is little competition. Low competitive pressure gives participants incentives to submit bids which do not reflect their true opportunity costs – this means that the bidding process does not reveal the information (i.e. opportunity costs) needed for an efficient selection. Second, mandatory closures which are a consequence of undersubscription are only done according to an age of the unit. This approach clearly cannot produce efficient closures since foregone revenues are driven by a wide range of additional drivers (heat output and operational performance, among other things). If it was simply about closing the oldest plant first, no auction mechanism would have been needed.

- **Missing security-of-supply incentives:** The phase-out auctions themselves do not include a security-of-supply criterion.<sup>4</sup> Scarcities are signalled through high prices on power wholesale markets. However, the bid caps prevent these signals from being reflected in higher bids in the phase-out auctions. This leads to potentially less or later coal closures at a time when there is less scarcity in the electricity wholesale market. This has led to subsequent legal adjustments to the phase-out design that allow plants to remain or return to the market, first until spring 2023 and then until 2024. To date, 40% of coal capacity earmarked for soon-to-be closure had to stay available or temporarily

<sup>2</sup> See Coal Phase-out Act, Article 2.

<sup>3</sup> In our previous [bulletin](#), we outlined that in the first auction round, efficient modern plants were selected among the first plants for early decommissioning while older less efficient plant continued operation. This is clearly not efficient. However, this trend has not continued in later auction rounds.

<sup>4</sup> Apart from a 'network factor' which serves as a surcharge on bids from plants that are required for the stability of the grid.

returned to the market. Such administrative ad-hoc adjustments often come too late and are driven by public opinion, not market information, and rarely generate efficient levels of supply security.

- **(At least temporarily) ineffective CO<sub>2</sub> emission reductions:** The German government is committed to removing from the traded CO<sub>2</sub> market certificates corresponding in volume to those that may have otherwise been omitted by the closing plants. This measure is intended to help avoid the 'waterbed effect' of CO<sub>2</sub> emissions<sup>5</sup>. The German government annually determines CO<sub>2</sub> emissions avoided by coal closures for the previous year and reduces the auction volumes of ETS by the amount of surplus certificates that have not been taken out of the market by the Market Stability Reserve.<sup>6</sup>

However, the re-entering of several plants into the market which were supposed to be decommissioned has at least increased CO<sub>2</sub> emissions temporarily. This could be avoided by still taking out the originally intended CO<sub>2</sub> certificates from the market while allowing some German coal plant back in. CO<sub>2</sub> abatement would then be achieved by other plants (German non-coal or foreign plant).

The inefficiency of the whole process is also bad news for climate change: less CO<sub>2</sub> is avoided for a given budget (or more could have been saved for the same amount).

So, are there better alternatives?

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<sup>5</sup> Large coal-fired power plants are part of the EU ETS which caps the total CO<sub>2</sub> emissions across all included sectors and countries. The closure of German plants would reduce demand for CO<sub>2</sub> certificates which lowers the market price for CO<sub>2</sub> certificates. This in turn increases emissions in other sectors until the initial CO<sub>2</sub> balance is reached (unless the price for CO<sub>2</sub> certificates reaches zero, i.e. they would be abundant). This is called the 'waterbed effect': Emissions removed by closing German coal plant would re-emerge in other countries or sectors, so that overall no emissions would be saved.

<sup>6</sup> See German Greenhouse Gas Emissions Trade Act ('Treibhausgas-Emissionshandelsgesetz'), Article 8(1).

## A more flexible auction design

From a purely economic perspective, the best solution would be a holistic approach to CO<sub>2</sub> reductions with a single price on carbon, irrespective of the location or sector (as in the EU ETS). However, such an approach does not seem politically feasible in practice, with governments setting national, sector-specific CO<sub>2</sub> reduction targets.

So, what is the second-best option to facilitate CO<sub>2</sub> reductions via the targeted decommissioning of national coal plants? The German government has taken a step in the right direction by using a market-based mechanism (auctions) to phase-out coal. However, the auction design itself is flawed and moreover unsuitable for the rapid changes we have seen in energy markets.

The **key is to avoid a rigid design**. Rather than using fixed, short lead times for the closure of plants, an auction process with “menu bids”<sup>7</sup> would have enabled operators to signal individual decommissioning costs for different decommissioning dates through their bids. This ensures that the targets are met at minimal need to provide pay-out for closure. A second, central issue is too low bid caps, which were set in 2020 and are not compatible with the current market situation and high power prices. Any market mechanism which prevents scarcity signals from being reflected in higher bids (for coal closure) will fail to deliver efficient closure decisions. While we could have projected the price increase in 2020 when the Coal Phase-out Act was adopted, a system with bids caps would need to be reviewed regularly or possibly linked to future power prices (as traded on the power exchanges).

A **more flexible approach, such as tradeable coal-firing allowances**, would have been better suited. The basic idea would be similar to the EU ETS for carbon emissions, but targeting specifically the phase-out of coal. The government would first define the remaining tonnage of coal to be burnt (and possibly define an expiration date which should be far enough in the future). These allowances could be tendered by the government or allocated pro-rata in accordance with historical emissions by plant (similar to grandfathering in the ETS). If tradeable, market participants can figure out between themselves which plants can use these allowances most efficiently and when to use them.

This approach would be much more resilient to sudden changes in the market environment since in times with scarcity and high prices, more allowances would be used and less in future when alternative power sources are available. It also provides a direct link to the main objective to save CO<sub>2</sub> emissions – each tonne of burnt coal is directly related to CO<sub>2</sub> while closing a certain megawatt of capacity has only an indirect and unclear impact on the CO<sub>2</sub>

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<sup>7</sup> In this case, the auctioneer would invite bids for different decommissioning dates (‘menu’) for a certain deadline (possibly every year or every two years), aligned with the target path in the Phase-out Act. Bidders can signal their individual decommissioning costs for different decommissioning dates through their bids. This ensures that the targets are met at minimal compensation cost.

balance.<sup>8</sup> In the light of the issues we have raised regarding the design of the auctions, the German phase-out auctions certainly provide an interesting experiment for other countries that plan to phase-out fossil fuels and we will continue to monitor how this takes shape across Europe.

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<sup>8</sup> CO<sub>2</sub> emissions for a megawatt of capacity will vary with utilisation (how many hours it is operated) and technical efficiency (how much coal is needed). The German design seeks to overcome this by converting the initially submitted bids from € per megawatt into €/tonne of CO<sub>2</sub> based on the average annual CO<sub>2</sub> emissions for each plant over the previous three years. However, as discussed in the 2020 bulletin, this has led to the early decommissioning of modern, more efficient plants in the first round.

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