THE CASH COW HAS STOPPED GIVING:

Are Germany's lignite plants now worthless?

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Executive summary

Following the recommendations of Germany's coal exit commission, the German Federal government has begun negotiations with operators for the early closure of 3GW lignite plants by 2022. Understanding the current lignite profitability is critical to these negotiations: how quickly, how many, and for what cost (if any), can lignite units be retired?

This report gives evidence that lignite profits have collapsed very recently. It shows:

- **The gross profit of the German lignite fleet collapsed by 54% in the first half of 2019, according to our modelling using out-turn power prices.** Their gross profit – before any fixed costs are taken into consideration – fell to €513m, from €1109m in the first half of 2018. Old lignite units (pre-1990) fell the most aggressively – by 62% to €188m from €500m. This was not enough to cover their fixed costs.
- **As a result, the German lignite fleet lost €664 million so far this year, compared to a loss of €68m in the first half of 2018.** Old lignite units (pre-1990) lost €476m, against their assumed full six-monthly fixed costs, and new lignite (post-1990) units lost €188m. Not one lignite unit covered their full fixed costs.
- **The start of a new age: 24/7 lignite baseload is over.** Half of all hours from March to June this year were uneconomic for old lignite units.
- **Lignite will remain loss-making over the medium-term.** Current forward power and carbon prices indicate the old lignite units would lose €1.8 billion over 2020-2022. This compares to a loss of €0.4 billion in 2016-2018. Even new lignite plants barely make a profit against their full fixed costs, according to our modelling.

KEY RECOMMENDATIONS:

1. **Policymakers should accelerate lignite closures and push back on excessive compensation claims, knowing lignite profitability has collapsed.** The case for minimal compensation and maximum early closures is clear. The cash cow has stopped giving: lignite is currently unprofitable and is likely to remain so in the near term.
2. **The German government should agree a minimum carbon price.** This would end any arguments that lignite might return to profitability in the future.
3. **RWE and LEAG must publish their numbers and assumptions and positively engage in the negotiations.** We have published our full valuation model alongside this report. The truth is, only the lignite operators know the exact profitability and costs. Only by RWE and LEAG opening up, can there be an open and honest conversation about how quickly and how cheaply Germany's old lignite units can be closed.

Executive summary - DEUTSCH

Auf Empfehlung der Kohlekommission hat die Bundesregierung mit den Betreibern Verhandlungen über die vorzeitige Stilllegung von Braunkohlekraftwerken im Umfang von drei Gigawatt bis 2022 aufgenommen. Die Entwicklung der Wirtschaftlichkeit der Braunkohle ist entscheidend für diese Verhandlungen: Wie schnell, in welchem Umfang und zu welchen möglichen Kosten können Braunkohleblöcke stillgelegt werden?

Dieser Bericht liefert Belege dafür, dass die Braunkohleprofite in letzter Zeit eingebrochen sind. Er zeigt:

- **Im ersten Halbjahr 2019 sind laut unserer Modellierung unter Benutzung historischer Strompreise die Bruttogewinne der deutschen Braunkohlekraftwerke um 54 % gefallen.** Ihr Bruttogewinn – ohne Abzug der Fixkosten - fiel auf 513 Mio. Euro, im ersten Halbjahr 2018 waren es noch 1.109 Mio. Euro. Alte Kraftwerksblöcke (von vor 1990) verzeichnen im selben Zeitraum einen noch stärkeren Gewinnrückgang – um 62 % von 500 Mio. Euro auf 188 Mio. Euro. Das bedeutet, dass sie ihre Fixkosten nicht decken können.
- **In Folge machten die deutschen Braunkohlekraftwerke in diesem Jahr bislang einen Verlust von 664 Mio. Euro, im ersten Halbjahr 2018 war es ein Minus von 68 Mio. Euro.** Alte Kraftwerksblöcke (von vor 1990) verloren 476 Mio. Euro nach Abzug ihrer geschätzten vollen Fixkosten für sechs Monate, bei den neuen Einheiten (nach 1990) sind es 188 Mio. Euro. Kein einziges Braunkohlekraftwerk konnte seine gesamten Fixkosten decken.
- **Der Beginn eines neuen Zeitalters: die Zeiten von 24/7 Grundlastversorgung mit Braunkohlestrom sind vorbei.** Die Hälfte aller Stunden von März bis Juni dieses Jahres waren für alte Braunkohlekraftwerke unwirtschaftlich.
- **Braunkohle wird mittelfristig ein Verlustgeschäft bleiben.** Die aktuellen Terminpreise für Strom und der CO2-Preis weisen darauf hin, dass alte Braunkohlekraftwerksblöcke im Zeitraum 2020 bis 2022 einen Verlust von 1,8 Mrd. Euro zu erwarten haben. Im Zeitraum von 2016 bis 2018 waren es nur 0,4 Mrd. Euro. Auch neue Kraftwerksblöcke machen gemäß unserer Modellierung nach Abzug der Fixkosten kaum Gewinn.

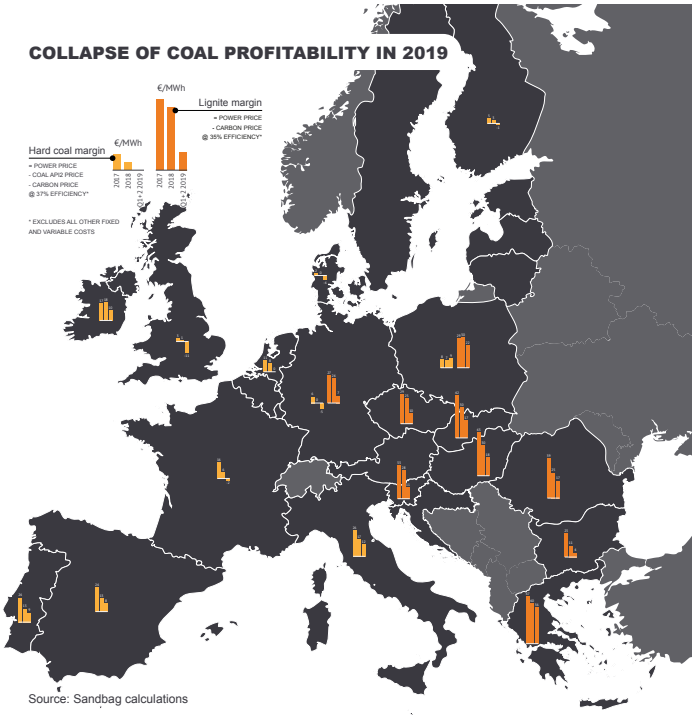
EMPFEHLUNGEN

1. **Politische Entscheidungsträger sollten die Schließung von Braunkohlekraftwerken beschleunigen und überzogene Entschädigungsforderungen ablehnen, da die Wirtschaftlichkeit von Braunkohle eingebrochen ist.** Die Berechnungen zeigen: zahlreiche Kraftwerke sollten bei nur geringer Entschädigung rasch vom Netz gehen. Die , Cash Cow' ist am Ende: Braunkohle ist derzeit unrentabel und wird es voraussichtlich vorerst auch bleiben.
2. **Die Bundesregierung sollte einen CO2-Mindestpreis beschließen.** Dies würde jegliche Diskussionen darüber beenden, ob Braunkohle jemals wieder profitabel werden könnte.
3. **RWE und LEAG müssen ihre Zahlen und zugrunde liegende Annahmen offenlegen und sich konstruktiv an den Verhandlungen beteiligen.** Wir legen unser komplettes Bewertungsmodell für diesen Bericht offen. Doch nur die Braunkohlebetreiber kennen die genaue Rentabilität und die Kosten. Nur wenn RWE und LEAG transparent sind, kann die Diskussion über Zeitplan und Kosten der Stilllegung alter Kohlekraftwerke in Deutschland offen und ehrlich geführt werden.

Introduction: Why did we write this paper?

Coal generation is not only collapsing in Germany – it fell by 19% across the whole of the EU in the first half of 2019. In July 2019, Sandbag released a report called "Europe's great coal collapse of 2019". We found that although Germany had the largest absolute fall in coal generation in the first half of this year, at 22%, it actually saw the smallest relative fall of any western European country. Ireland fell by 79%, France 75%, UK 65%, Spain 44%, Denmark 33%, Italy 28%, Netherlands 24% and Portugal 23%. However, coal falls in Poland, Czechia and other lignite countries were very small, due to near-zero deployment of wind and solar in 2018. Germany still was responsible for 35% of all the EU's coal generation in the first half of this year.

We also analysed the economics. *We found as carbon price rose, it not only led to coal-gas switching, but also the collapse of coal profitability, especially lignite profitability, and especially Germany lignite profitability. We produced the map below showing the changes.*



Therefore, we wanted to produce this analysis paper to further explore the recent changes in German lignite profitability.

2019 saw an unprecedented collapse in lignite profitability

We analysed the 29 lignite units operational in Germany, excluding those scheduled to close under the Lignite Reserve Agreement. That is split into 18 "old" units of 8.6GW and and 11 "new" units of 8.7GW, with 1990 build-age defining the split.

We used a simple and transparent methodology to calculate "Gross profit" (profit before fixed costs) by month by unit:

- Gross profit = Electricity revenues minus carbon cost minus variable cost, where:
  - *Electricity revenues* = [Hourly EPEX electricity price] x [actual unit hourly generation]
  - *Carbon cost* = [Carbon Price x Generation] x Carbon intensity by unit
  - *Variable cost* = 6.3€/MWh for old units and 5.6€/MWh for new units. This is split into €2/MWh for "raw materials and supplies", and the rest for "variable lignite fuel costs".
- The carbon intensity by unit and variable costs are sourced from Agora Energiewende's study on the German lignite industry "Die deutsche Braunkohlenwirtschaft" in tables A3-7 and 7-3 respectively.
- By definition, this excludes the profit or loss of all forward hedges. Utilities sell electricity and buy carbon permits in advance, so our methodology using day-ahead prices does not include the profit or loss of these forward hedge transactions.

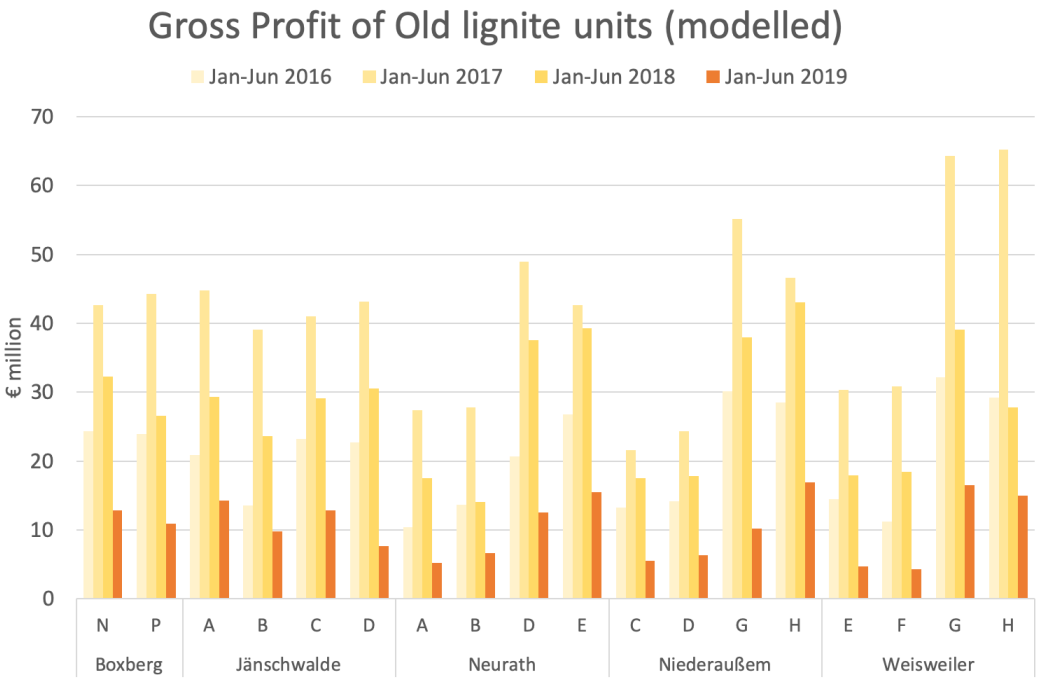
We then calculated "Net profit", which is "Gross profit" minus fixed costs. The fixed costs we use are also from Agora Energiewende's "Die deutsche Braunkohlenwirtschaft". In total they are €154/KW for old lignite plants and €118/KW for new lignite plants.

- *Fixed plant costs* = 60€/KW/year for old units, 40€/KW/year for new units (Tabelle 7-2), spread by month. These ignore all debt and depreciation costs of the cost of building the lignite unit in the first

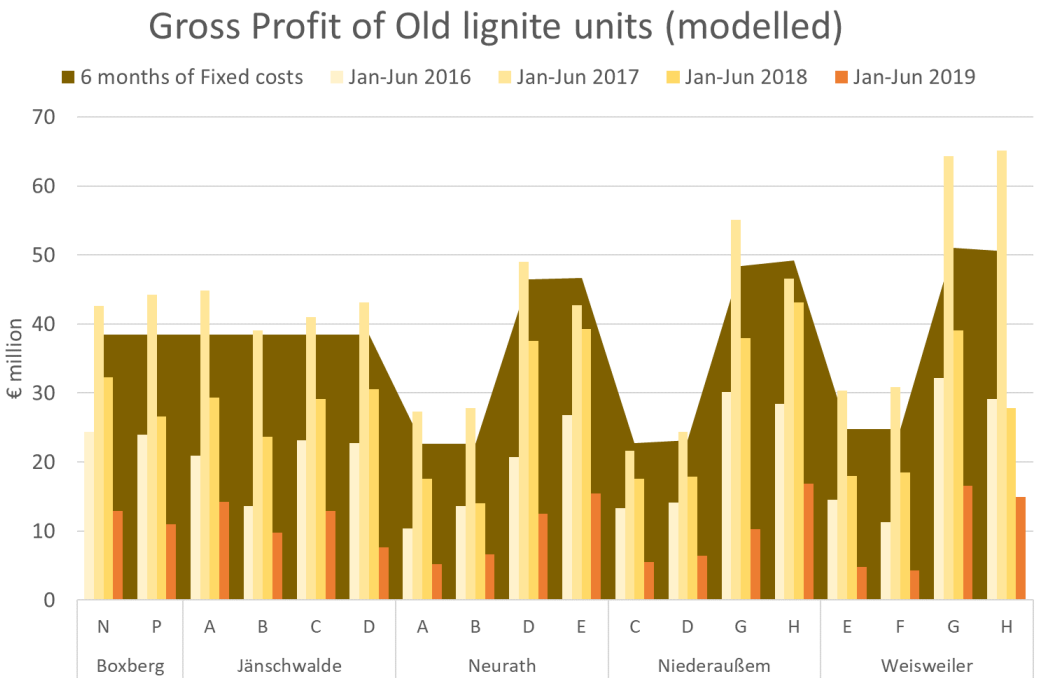
place, therefore all these costs should be avoidable. They only include standard maintenance, so there are even extra costs if the unit needs a refurbishment or emissions upgrades.

- *Fixed mine costs* = 94€/KW/year for old units, 78€/KW/year for new units (Tabelle 7-4), spread by month. The fixed mine costs includes some sunk costs, so not all these costs will be avoidable. They also vary more widely than fixed plant costs, so the uncertainty level is high.

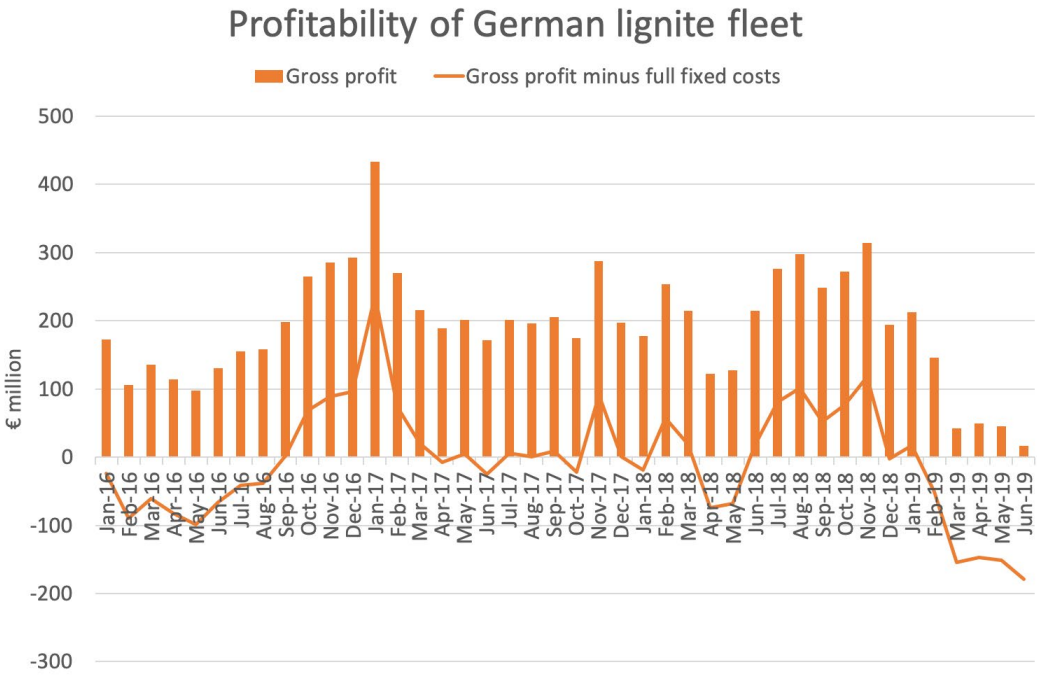
We found gross profit of old lignite units collapsed 62% in the first half of 2019 to €188 million, from €500m in the first half of 2018. This is before any fixed costs are included. RWE units fell to €119m from €328m, and LEAG units fell to €68m from €172m.



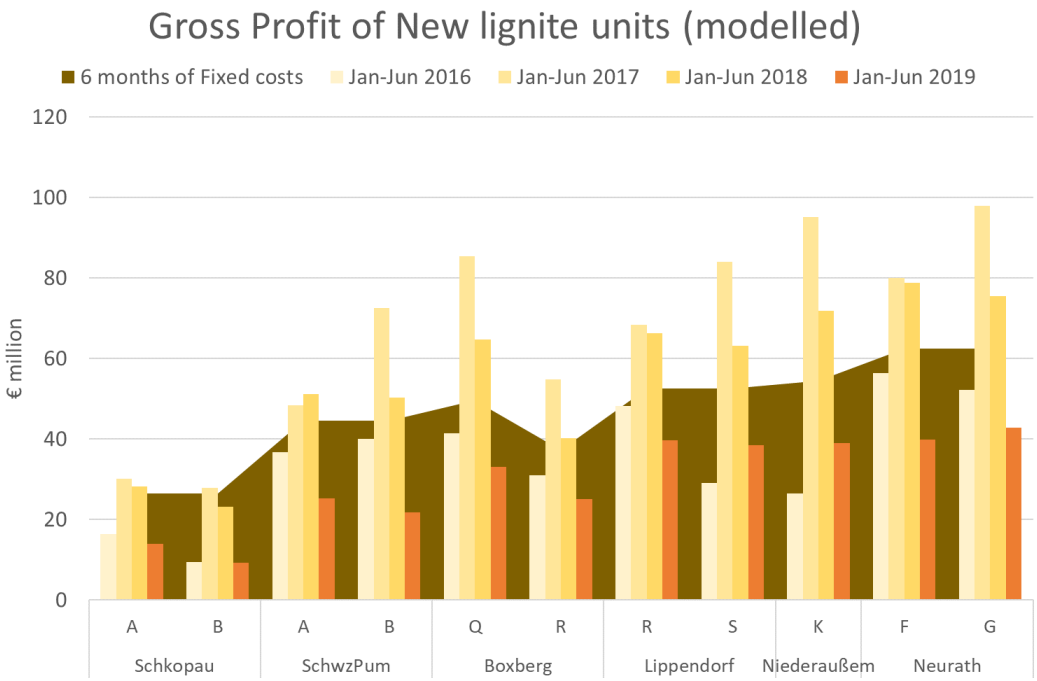
We found the old lignite units lost €476m in the first half of 2019, when you included full assumed fixed costs. Modelled gross profits were €188m in the first half of 2019, and when you include half of the full annual fixed costs of €1328m (using Agora's 154€/KW above), this leads to an overall loss of €476m. This was split as a €313 million loss for RWE and €163m for LEAG. This meant gross profit collapsed to cover only 28% of full fixed costs in 2019, compared to 92% in 2018 and 101% in 2017.



Since March, the gross profit for the German lignite fleet as a whole has collapsed, and has come nowhere close to covering its fixed costs. Even in the winter month of March, the lignite fleet gross profit this year fell to its lowest monthly level since at least January 2016, and carried on falling to reach a new low in June this year.

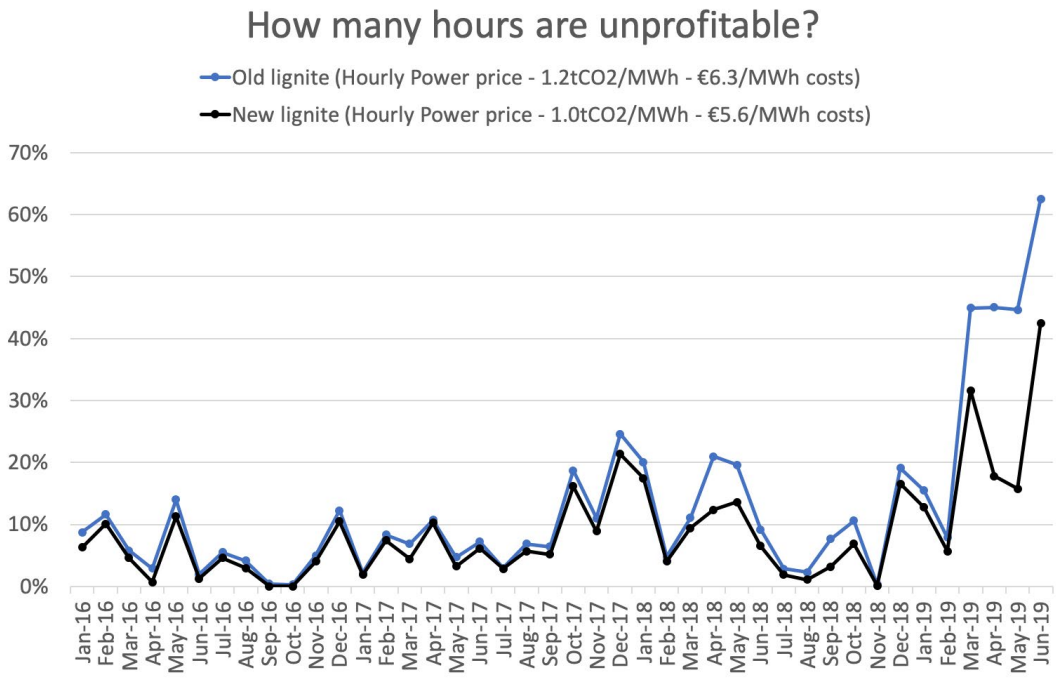


Every *new* lignite unit has also lost money so far in 2019. The lignite economics have collapsed so aggressively, that even more-efficient lignite plant with lower fixed costs would be losing money in 2019. We found their gross profits fell by 47% to €325 million, from €610m in the first half of 2018. Including assumed full six-monthly fixed costs, new lignite units lost €188m. ***This means the full lignite fleet lost €664 million in the first half of 2019. Not one lignite unit covered their full fixed costs.*** In total, the new lignite units covered only 63% of their fixed costs in 2019.

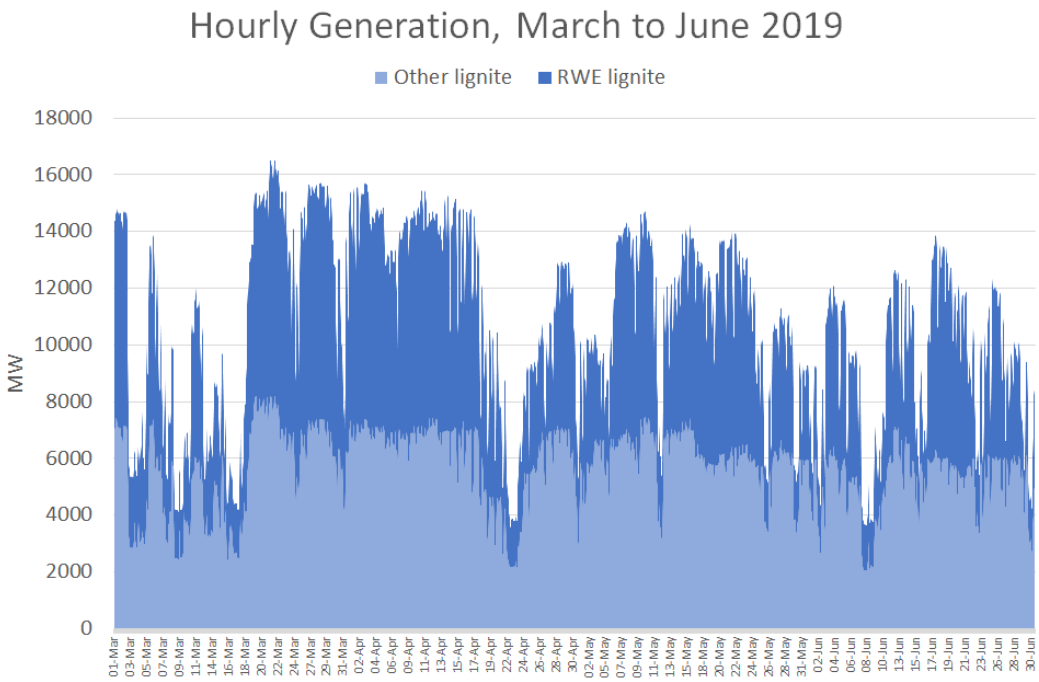


Start of a new age: 24/7 lignite is over

From March to June this year, 49% of hours have been uneconomic for old lignite plants. This is a new phenomenon : prior to March, 25% was the most number of uneconomic hours in a month. Even 27% of hours since March were uneconomic for new lignite plants as well.

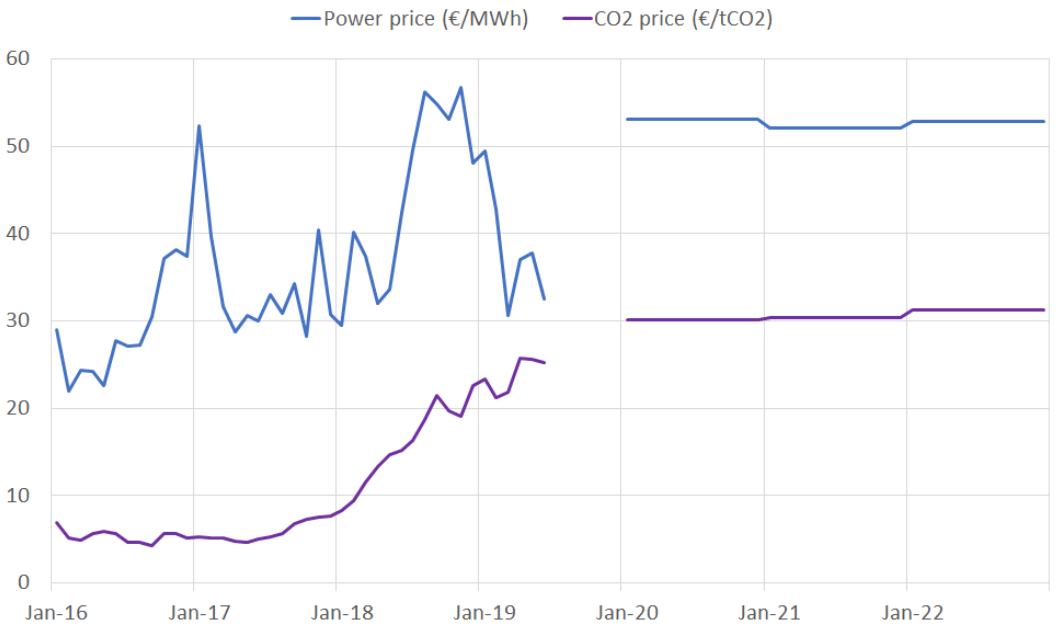


Lignite has responded to economics, and did not run baseload in the last four months. In particular, RWE's units have been running much less than other lignite units. The lignite generation was replaced with a combination of more wind and solar generation, more gas generation and less electricity exports.

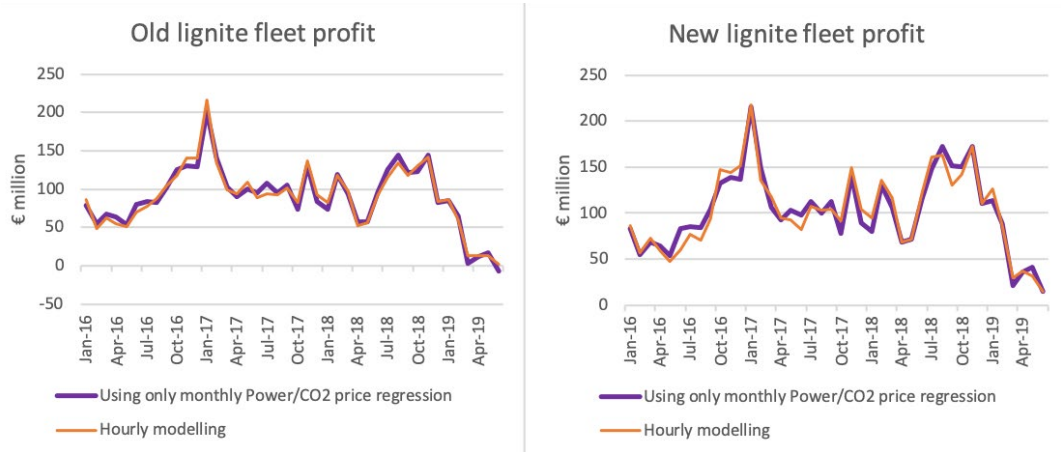


Current forward power and carbon prices indicate old lignite will remain loss-making over the medium-term

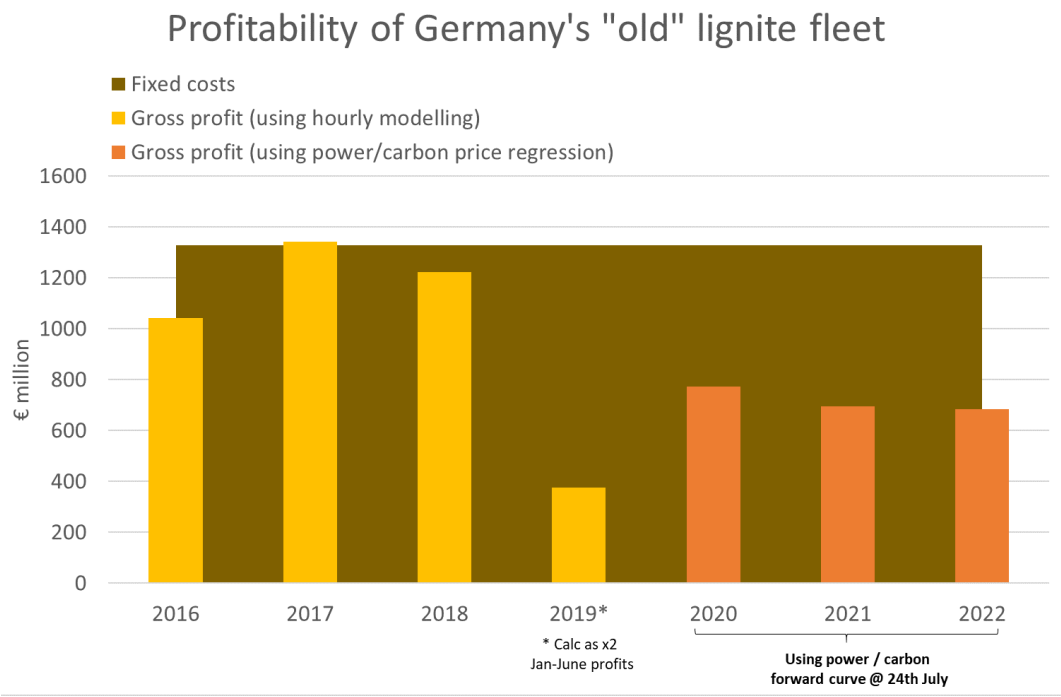
The latest forward curve shows profitability will be somewhat better from 2020-2022 than in 2019. The profitability of lignite was squeezed so hard in 2019, because the gap between power price and carbon price narrowed so aggressively.



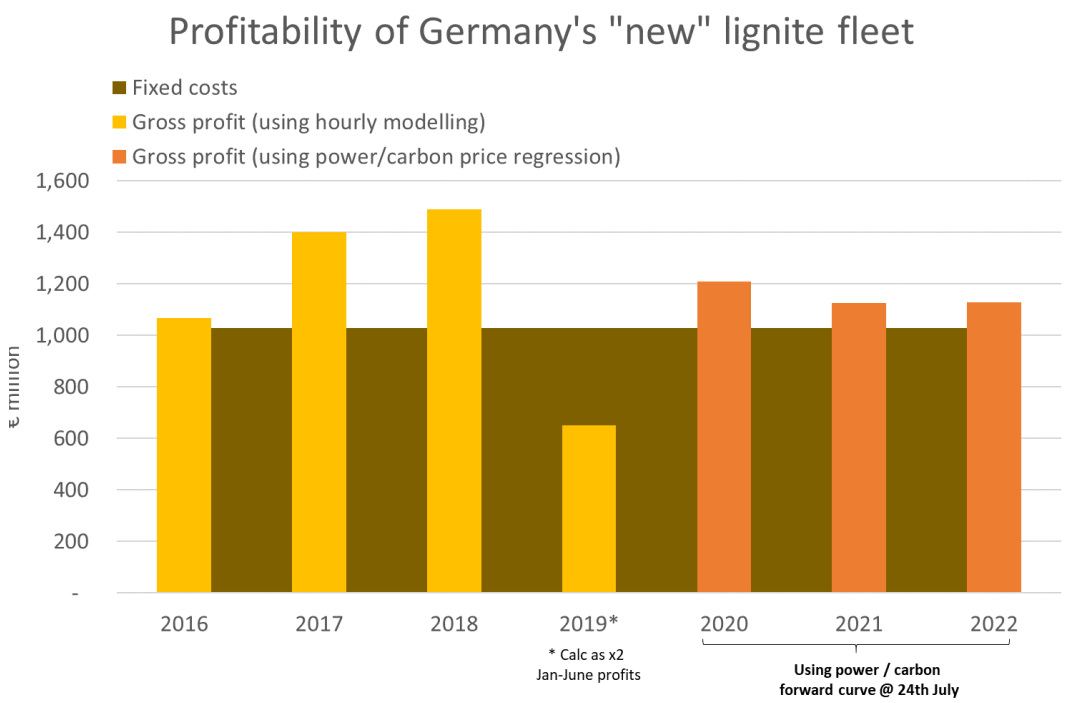
Since power price and carbon price are such critical drivers of gross profit, it's possible to estimate profit from power and carbon price alone. This can then be used to estimate future profitability, based on the forward curve for power and carbon.



The outlook for old lignite for 2020-2022 is substantially worse than 2016-2018. We model that the old lignite fleet would cover only 54% of full fixed costs in 2020-2022, compared to 91% in 2016-2018. This would mean making a loss of €1.8 billion in the period of 2020-2022, against full fixed costs.



The outlook for new lignite for 2020-2022 is to roughly breakeven against full fixed costs. We model that the new lignite fleet would cover 112% of full fixed costs in 2020-2022, compared to 128% in 2016-2018. Obviously the new lignite is less impacted by the higher carbon price than the old lignite is, so it is surprising that even the new lignite plants fail to make a significant profit.



Considerations for the negotiations

It is clear that the cash-cow days for German lignite plants are now over. With old lignite plants facing a €1.8 billion loss in the next three years, and new lignite plants barely turning a profit, the tables have truly turned.

Continued operation of lignite plants will incur additional costs that we haven't considered in this report. For example, RWE's Hambach and Garzweiler mines are facing problems, which might limit future lignite mining. And upcoming investment is needed for tighter EU pollution limits, which would make the units even more uneconomic.

The health externalities of lignite add further weight to the moral case for not paying compensation for early closures. In 2018, Sandbag modelled the health impacts of sulphur dioxide and nitrogen dioxide emissions of Europe's coal plants from 2016.[1] We found RWE and LEAG's parent, EPH, were the #1 and #2 biggest coal polluters in Europe. The health impacts from RWE and LEAG lignite units we modelled as around €6 billion. There are 46 million people living within 200km of RWE's four lignite plants, who face worsened air quality as a result of RWE's plants. Morally, paying public money to big polluters to close just seems wrong.

1. See Sandbag's Last Gasp report https://sandbag.org.uk/project/lastgasp/

The transition from lignite to renewable electricity depends on a lot of policies, but would arguably be faster and more efficient with a carbon price of at least €30/tonne. If the German government promised a minimum carbon price that is at around 30 or higher, then it would be hard to argue that lignite plants could ever be profitable into the future. This would make a phase-out of closer to 2030 more likely than the current 2038 date.

So what is a fair compensation? We have three reference points:

1. **The lignite reserve in 2015 paid €590m/GW.** €1.6 billion was paid to 2.7 gigawatts, which worked to €586 million per GW. This was calculated on generous historic profitability, rather than profitability based on the economics at the time which were already much worse. It's important this mistake it not made again.
2. **RWE CEO Rolf Martin Schmitz is requesting €1200-1500m/GW.**[2]
3. **Our projection for 2020-2022 shows gross profit of old lignite units of €250/KW, which is a loss of €213/KW against full fixed costs.**

Policymakers should accelerate lignite closures and push back on excessive compensation claims, knowing lignite profitability has collapsed.

The truth is, only the lignite operators know the exact profitability and costs to close. **We have published our full valuation model alongside this report. RWE and LEAG must publish their numbers and assumptions and positively engage in the negotiations.** Only by doing this can there be an open and honest conversation about how quickly and how cheaply Germany's old lignite units can be closed.

2. https://www.cleanenergywire.org/news/rwe-substantiates-claims-billion-euro-coal-plant-compensation

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Thanks for all the comments from the German experts that have helped shape this document.

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