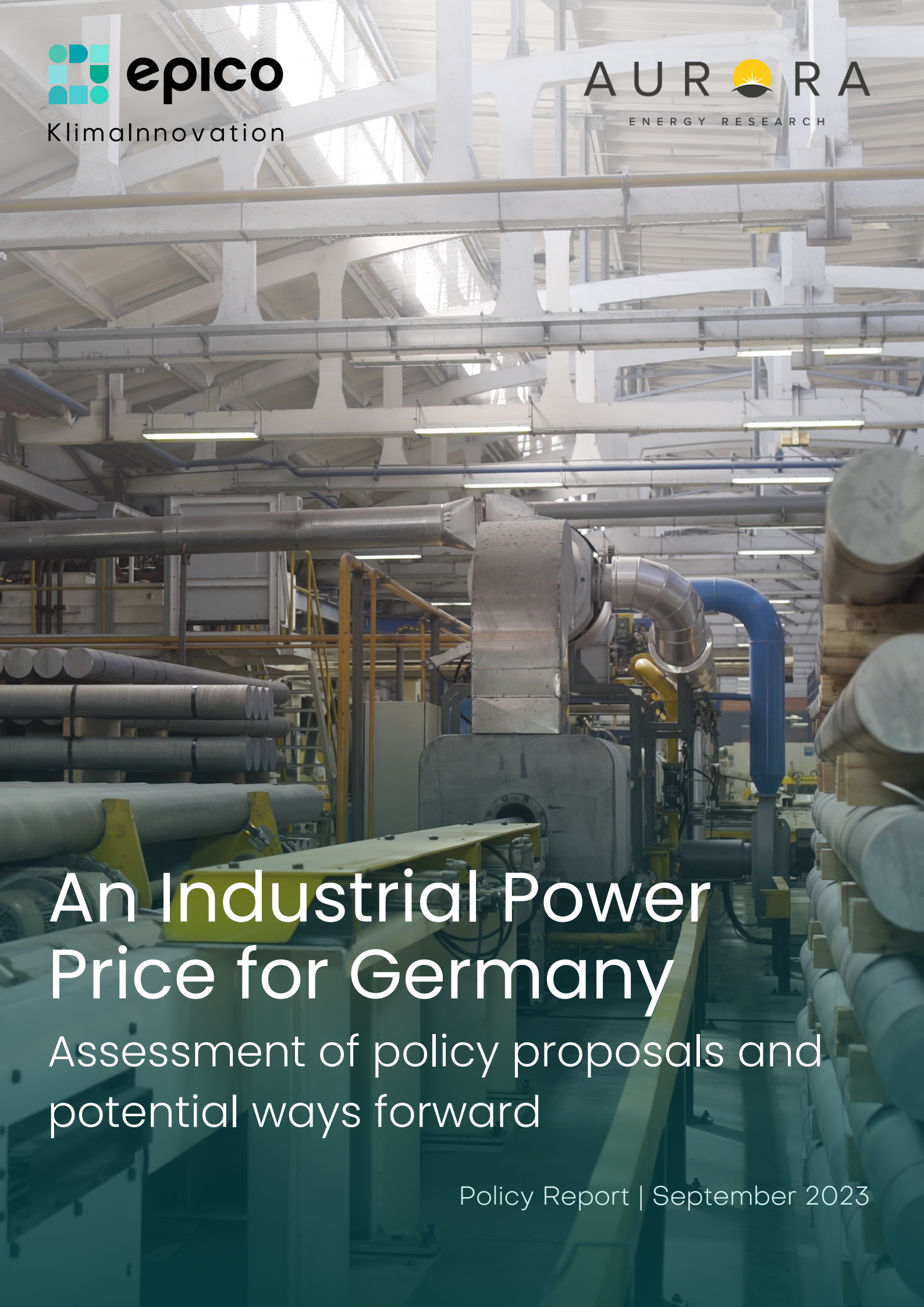
epico KlimaInnovation

AURORA ENERGY RESEARCH



An Industrial Power Price for Germany

Assessment of policy proposals and potential ways forward

Policy Report | September 2023

Imprint

An industrial power price for Germany – Assessment of policy proposals and potential ways forward

PUBLISHED BY

EPICO KlimaInnovation
(Energy and Climate Policy and Innovation Council e.V.)
Friedrichstraße 79
10117 Berlin (DE)

Aurora Energy Research GmbH
Kottbusser Damm 25-26
10967 Berlin

AUTHORS

Dr. Bernd Weber, Klaus-Dieter Borchardt, Hanns Koenig, Dr. Casimir Lorenz, Nicolas Leicht, Dr. Matthias Müller, Oskar Schickhofer, Sam Williams

CITE AS

Bernd Weber, Klaus-Dieter Borchardt, Hanns Koenig, Casimir Lorenz, Nicolas Leicht, Matthias Müller, Sam Williams (September 2023). *An industrial power price for Germany: Assessment of policy proposals and potential ways forward*. Policy Report. EPICO KlimaInnovation and Aurora Energy Research. Berlin and Brussels.

MORE FROM EPICO

epico.org

EPICO Klimainnovation

EPICO_Online

Table of Contents

Glossary

BDI	Bundesverband der Deutschen Industrie
BesAR	Besondere Ausgleichsregelung
BMWK	Bundesministerium für Wirtschaft und Klimaschutz
CAPEX	Capital expenditures
CEEAG	Guidelines on State aid for climate, environmental protection and energy
CfD	Contract for Difference
CHP	Combined heat and power plant
DIHK	Deutsche Industrie- und Handelskammer
DSR	Demand-Side Response
EEG	Erneuerbare-Energien-Gesetz
EnFG	Energiefinanzierungsgesetz
EnWG	Energiewirtschaftsgesetz
FDP	Freie Demokratische Partei
KfW	Kreditanstalt für Wiederaufbau
kWh / MWh / GWh	Kilowatt hour / Megawatt hour / Gigawatt hour
LCOE	Levelized Cost of Electricity
P2H / P2X	Power to heat, Power to X
PPA	Power Purchase Agreement
RES	Renewable energy source
SME	Small and medium-sized enterprises
SPD	Sozialdemokratische Partei Deutschlands
StromNEV	Stromnetzentgeltverordnung
TCTF	Temporary Crisis and Transition Framework
VCI	Verband der Chemischen Industrie
WACC	Weighted Average Cost of Capital

Executive summary

The idea of introducing a subsidized power price for industrial offtakers to preserve international competitiveness of energy-intensive industry is heavily discussed in Germany after the publication of a proposal by the German Federal Ministry for Economic Affairs and Climate Action (BMWK). Key actors, such as the German Green Party and parts of the German Social Democratic Party (SPD), argue for the introduction of the measure, while the Chancellor and the Minister of Finance oppose it.

In this policy note we examine the proposed industrial power price, consisting of the short-term 'bridge power price' and a long-term 'transformation power price'. Also, we compare them to other proposed alternatives, such as a recent "Eigenstrom PPA" suggestion by the Vice-Chairman of the FDP Parliamentary Group Lukas Köhler and a "StromPartnerschaft" (electricity partnership) proposal by the DIHK. This report assesses all proposed measures along three dimensions: (1) overall efficiency and governance, (2) policy impact on a well-functioning and efficient power market, and (3) effects on individual industrial offtakers.

In its current form, we expect the proposed BMWK bridge power price not to be compatible with EU energy law, most notably undermining the price-setting mechanism under the current electricity market design. It also reduces incentives for power savings and long-term hedging via Power Purchase Agreements (PPAs) and futures markets. Additionally, we do not expect wholesale power prices in 2030 to reach 5-6 ct/kWh, which puts into question whether there will be a clear end to the proposed bridge power price.

Generally, the analysis finds structural reinforcements focussing on the supply-side of the power market more beneficial. We find that Contracts for Difference (CfDs), as well as PPAs, are promising tools to encourage a well-functioning and efficient future power market with lower prices. CfDs offer price stability and reduced risk, but in their conventional form do not reward system-friendly renewable asset deployment, increasing overall system costs. Alternative designs, such as financial CfDs, however, can avoid that pitfall and are compatible with an efficient power system.

Yet, they have never been tested in a market environment so far. PPAs have a higher price risk but incentivize an optimal blend of capture price level, generation level, and expenditures for generators as well as demand flexibility on the offtaker side. Proposals to introduce government guarantees for PPA projects as well as to subsidize capital expenditure for PPA projects both can substantially decrease financing costs and accelerate the buildout of renewables, contributing to lower long-term power prices. Hence, we see such measures contributing to a strong PPA market as most favourable options on the supply side.

Beyond supporting the supply side structurally, possible short-term measures compatible with EU law could focus on taxes and levies. As energy-intensive companies are already exempt from most non-wholesale components, usually such measures would mostly be targeted at smaller or medium-sized companies. Examples of such measures would be the reduction of grid fees for PPAs, like mentioned in a recent "Eigenstrom-PPA" proposal by Lukas Köhler.

This, however, would require payment of higher grid fees by other offtakers or funding them through the public budget. An option to reduce grid fees in the long-term that the proposal does not pick up could be time-variant or locational grid fees, as they can lead to a better use of the grid and limit required buildout. A short-term measure for energy-intense companies would be extending the Spitzenausgleich (i.e., peak compensation) to avoid an increase of the electricity tax for these firms. This tool is already in place and grants energy-intensive businesses a waiver for electricity tax payments in exchange for improvements in energy efficiency. Extending the measure is also mentioned in the recent proposal by Lukas Köhler.

If there is a political consensus to provide further short-term support to energy-intensive companies apart from a reduction of, or exception from, taxes and levies, we need a political discussion on which industries are eligible for targeted support, and according to which criteria. We suggest that such a short-term support should be production-based, instead of price-based, as currently proposed by BMWK. Benefits of a production-based option would be that it is more likely to be compatible with EU market-rules, no interventions in the power market would be necessary, and incentives for flexibility and energy savings could be maintained in their current form. Also, a blueprint for such support already exists in CCfDs and support levels could be determined efficiently via auctions.

1. Introduction and context

Low energy costs are pivotal in shaping a country's attractiveness as an industrial hub. They allow businesses to achieve competitive pricing for their products on the international stage. For Germany, a production- and export- oriented economy, maintaining energy cost-competitiveness, is thus crucial to further advance growth. Low energy prices safeguard local supply chains and encourage renewed investments in energy-intensive sectors and domestic manufacturing. This diminishes the risk of industrial relocation, preserving employment, and specialized knowledge by preventing renewed dependence on a single, dominant supplier of strategically important goods. Given that energy-intensive processes often form the basis of local supply chains, domestic execution of these steps could catalyse higher value-added production.

Germany's industrial sector is the cornerstone of its economy, generating over 2.1 trillion in revenue, and employing 7.5 million individuals (Statistisches Bundesamt, 2023). A quarter of Germany's energy consumption is attributed to industry, with the chemical sector as the primary consumer. Energy-intensive industry accounts for three-quarters of the industrial energy demand.

The energy crisis has led to a substantial rise in power costs over the last two years, significantly impacting energy-intensive firms. The share of energy costs as a proportion of total expenses has surged by nearly half from 10% to an average share of 14% between 2021 and 2023, driven by spiking gas and power prices during the transition towards cleaner production methods (EPICO, 2023). This demonstrates the double burden that German energy-intensive businesses are facing: confronting substantially increased energy prices in the short-term and adopting costly climate-neutral production practices in the long-term.

The consequences of this challenge can already be observed: the German production index for energy-intensive businesses has fallen significantly below the industry average since May 2022. Additionally, companies such as BASF and VW have announced to relocate production sites (Tagesschau, 2023), prompting fears of a decline of Germany's status as industrial stronghold.

To address this challenge, the BMWK has suggested an 'industrial power price' consisting of a 'Brückenstrompreis' (bridge power price) and a 'Transformationsstrompreis' (transformation power price).

This policy report critically assesses the proposal as well as alternatives, along with their implications for Germany's power sector and economy. The structure is as follows:

1. **Analytical criteria:** Identifying key criteria to evaluate the impact of proposed measures.
2. **Proposal overview:** Delving into the BMWK proposal, along with suggested alternatives from other political and economic stakeholders.
3. **Comparative analysis:** Evaluating measures in proposals against defined criteria.
4. **Summary and outlook:** Summarizing the analysis and drawing conclusions for policymakers.

In this report we contribute to the public debate by highlighting the complexities, trade-offs, and potential outcomes of proposed policy options. While this paper focuses on a certain set of criteria outlined below to assess these proposals, it is

also important to keep in mind that the attractiveness of Germany as an industrial hub does not only depend on energy costs: in fact, industrial power prices have been significantly higher than those of competitors already in the past. Other factors such as infrastructure, the regulatory environment, and digitalization impact industry attractiveness too. Germany's robust performance in areas like research and development, supply chains, production clusters, and a skilled labour force contribute significantly to its competitive advantages (EPICO, 2023).

2. Goals and criteria for an industrial power price

This chapter outlines the assessment criteria that the analysis will rely upon. Before that, we briefly examine the question of who should qualify for support in the first place.

Support for whom?

A significant consideration when addressing the industrial power price is the question of its necessity and potential eligibility: Who should be entitled to an industrial power price and why? If industry were targeted entirely, this would be very costly. Reducing levies and charges making a larger part of the power cost being dependent on the wholesale prices would be more effective as broader measures. An additional measure addressing industrial power prices could thus support only those industries that have a high likelihood of leaving the country, i.e. those competing internationally. However, determining who might credibly exit is challenging, and could require a case-by-case assessment. Criteria could be as follows: the share of energy procured compared to the gross value added, the individual strategic relevance of the sector, importance for national security or substitutability of production. The diversification of supply, as well as imports and the need to keep local supply chains intact, will also play a pivotal role.

If there is target group of specific companies for a measure aiming to alter industrial power prices, it should not impose a significant financial strain or distortion on companies not eligible for such subsidies. As of now, the approach proposed by the BMWK is to rely on the definition of recipients' eligibility as established in Besondere Ausgleichsregelung (BesAR, part of Energiefinanzierungsgesetz EnFG), currently used to define beneficiaries eligible for exemptions from the offshore and CHP levy. Criteria for eligibility for this list include the need for businesses to have an overall yearly power demand of at least 1 GWh, and meeting certain energy management practices. In 2022, around 2,200 businesses were accepted and put on the BesAR list, constituting 111 TWh of electricity consumption (Bundesamt für Wirtschaft und Ausfuhrkontrolle, 2023). This list of beneficiaries of a potential subsidized industrial power price has led to ongoing discussions: Organisations such as the German Chamber of Industry and Trade (DIHK) and the German Federation of Industry (BDI) have demanded that all German industry should be able to access support to face high prices, the main argument being that limiting the measure to a small group of recipients would severely distort the market. The BMWK, on the other hand, maintains that this would make the measure too expensive Tagesschau (2023).

The SPD proposal additionally focuses on key industries for the transformation as addressed in the Net Zero Industry Act by the EU. This inter alia includes the production of solar devices, wind assets, heat pumps, energy storage facilities, electrolysers or fuel cells.

In this policy report we focus on assessing the proposals on the table, without conclusively determine the recipient group, which needs to be part of an inherently political discussion. Thus, our focus will be on the criteria discussed in the following.

Assessment criteria:

The criteria of this policy note are structured along three categories: overarching economy and governance, the power market, and effects for offtakers.

A. Overarching economy and governance:

Ease of implementation:

Any policy should be easily enforceable throughout its lifetime. Potential bureaucratic burden must be minimized and addressed quickly: For instance, the intricacies of the German power and gas price breaks just recently have shown that eligible entities often refrain from applying for subsidies due to overwhelming bureaucracy.

Fiscal affordability:

Secondly, it is vital to evaluate the total fiscal cost emanating from the adoption of the measure since any measure must be compatible with the current public budget.

Compatibility with EU regulatory framework:

Thirdly, given the fact that state aid in Europe nowadays must comply with common EU-wide requirements, compatibility with the EU legal framework constitutes an important third assessment criterium for this category. In that regard, the final retained measure must:

- Be compatible with Internal Electricity Market rules and Competition rules,
- Contribute to the integration of renewable energy sources, and
- Align with EU climate targets.

<u>Electricity Market issues</u>

The Electricity Directive (2019/944) sets specific provisions to ensure compliance with EU state aid rules, adoption of approaches that are market-based and compatible with the Internal Market. Specifically, Article 5 seeks to ensure that suppliers shall be free to determine the price at which they supply electricity to customers. Member States may apply public interventions in the price setting only for the supply of electricity to energy poor or vulnerable household customers. Public interventions in the price setting for the supply of electricity shall:

a) pursue a general economic interest and not go beyond what is necessary to achieve that general economic interest;
b) be clearly defined, transparent, non-discriminatory and verifiable;
c) guarantee equal access for Union electricity undertakings to customers;
d) be limited in time and proportionate as regards their beneficiaries;
e) not result in additional costs for market participants in a discriminatory way (Official Journal of the European Union, 2019a).

Additionally, the directive seeks to prevent selective advantages for specific companies or regions. Similarly, objectives of relevant measures must be clearly stated and be legitimate (Article 29(1), Official Journal of the European Union, 2019a).

The Electricity Regulation (2019/943) complements the Electricity Directive and provides additional rules for the operation of the electricity market, including guidelines related to market transparency and cross-border electricity exchanges. It requires Member States to ensure non-discriminatory access to spot markets for all market participants, including new entrants, smaller players, and renewable energy producers. This is to prevent market dominance, promote fair competition, and ensure that Member States' energy systems are accessible to all market participants in real-time. A very limited exemption to the principle of market-based free price formation is allowed solely for vulnerable consumers, such as

households and SMEs (Article 3 (a)(b), Official Journal of the European Union, 2019b).

The recent and much-debated proposal to reform the EU's Electricity Market Design, amending Regulation (EU) 2019/943 and Directive (EU) 2019/944, has three main pillars: (1) protecting consumers and providing safeguards against very high electricity prices, (2) enhancing the stability and predictability of prices, and (3) accelerating the development of renewables and their integration into the system (European Commission, 2023).

Under the second pillar, Member States would be obliged to implement guarantee schemes to promote PPAs, covering off-taker risk, especially when contracting with smaller (riskier) customers, such as Small and Medium Enterprises (SMEs). Should the Commission declare a regional or Union-wide electricity price crisis, article 66(4) allows Member States to set a temporary electricity supply price below market value (*Ibid.*). Members of the European Parliament suggested the inclusion of a new article, Article 66a. Inter alia, the measure would allow Member States "to apply temporary targeted public interventions in price setting for the supply of electricity to small and medium sized enterprises and energy-intensive industrial consumers" (European Parliament, 2023). Yet, such price-formation would still require the Commission to declare a regional or Union-wide electricity price crisis. The amendment would however have to be approved through interinstitutional negotiations and eventually at the plenary.

State aid issues

The Revised Guidelines on State aid for climate, environmental protection, and energy (CEEAG), as well as the Temporary Crisis and Transition Framework (TCTF), seek to speed up support to Member States' green transition whilst protecting competition rules in the Internal Market. The CEEAG and TCTF set a technology-neutral approach, focusing on reducing or removing greenhouse gases (GHG). Accordingly, the Communication enables state aid in areas that can help achieving the EU's climate targets. The guidelines also reiterate the need for state aid to cause the least distortion of trade and competition as possible, and should it be directed to beneficiaries of EU funding, it cannot lead to overcompensation.

B. A well-functioning and efficient power market:

A well-functioning and efficient power market with competitive power prices is necessary to provide efficient investment and dispatch incentives and foster the energy transition. The following points are vital to achieve this outcome:

Incentivising flexibility and innovation of industrial power demand:

Flexibilization of the power demand is a core matter to keep system costs low when an increasing share of intermittent renewable energy is present in the system. Demand which is adapting to renewable energy production profiles reduces systematic needs for storage in batteries or pumped hydro assets. Thus, incentivizing industry to adopt mechanisms to balance an increasingly volatile market is of great importance. Projections from Aurora's net zero scenario, which is in line with government buildout pathways, underline this need for flexibilization of the demand side: by 2030, the dispatchable generation capacity in the German power market is anticipated to total 100 GW, a modest 5% ascent from levels recorded in 2023. At the same time the electricity demand is forecasted to increase by 30%.

System friendly demand translates into savings for offtakers: Procurement of demand profiles close to RES profiles is significantly cheaper than baseload prices. Such price signals are imperative to ensure increasing flexibilization of industrial power demand and have to be considered when assessing policy measures.

Incentivising system-friendly deployment and operation of renewables:

Several support measures for the buildout of renewable generation capacity such as conventional CfDs and feed-in premiums incentivize output maximization rather than revenue maximization. However, a system-friendly deployment and operation of renewables, which targets times of scarcity, schedules timely maintenance, and regulates output during surpluses, can bring more systemic benefits. An optimal mix of capture price level, generation level as well as capital and operational expenditure for renewables assets should be strived for: setting up your installation in a way that allows you to sell electricity in precisely those moments where the price you get for your output is the highest. Fully merchant based revenue streams or those based on PPAs fall within this category. Renewables need to adapt to market price signals: the challenge and opportunity lies in ensuring that renewables respond to price signals and thereby minimise issues such as cannibalisation and curtailment. Deploying tracking solar panels, installing west-facing solar panels which produce towards high-demand periods like late afternoons, or investing in advanced turbines with enhanced design features could be strategies for this purpose. Policy measures should reward, rather than disincentivize, such decisions.

Maintaining market-driven buildout of renewables:

The deployment of renewables should not be a tightly controlled, state-driven effort. There is merit in industrials utilising on-site renewables and closing PPAs with developers. The benefit of secured revenues enables improved financing conditions and thereby accelerates market-driven buildout of renewables. Furthermore, it fosters economically optimised projects with increased private capital investments to achieve timely decarbonisation, which would be impossible with state-spendings alone.

Optimising financing for renewables assets:

With substantial upfront investment requirements, the financing aspect is often a make-or-break factor for many initiatives. By optimizing financing costs, projects can decrease their levelized cost of electricity, and thereby their needed revenues to achieve profitability. Hence, projects with lower financing costs can withstand stronger cannibalisation and therefore accelerate buildout of renewable capacity. This is not just a win for developers; consumers such as energy-intensive industry stand to benefit from reduced power prices, a direct consequence of the stronger cannibalisation. Weighted Average Cost of Capital (WACC) for renewable projects range from 3-4% for subsidized projects to 9% for fully merchant projects, PPAs lie in between. Measures that de-risk the buildout of renewables, make the energy transition more affordable.

Preventing market distortions:

Subsidies inherently alter the competitive situation between parties which benefit and these who do not. It is however the aim to keep changes to the level playing field to a minimum and prevent market distortions.

A measure decreasing the cost of power for one actor may in doing so unintentionally increase the cost for another actor outside the purview of the adopted measure. A good example would be introducing individual exemptions from grid charges for single actors, while being financed through a common levy to be paid for by every consumer. This might make it increasingly more difficult for this other actor to compete on prices in the domestic market. Ultimately, that can stifle innovation and competition, which are essential for a healthy market. It is integral that policy measures keep such effects to a minimum.

C. Offtaker-level effects:

Impact on power procurement costs:

Lowering power procurement costs for large industrial offtakers is the main driving factor of the discussed proposals. An assessment on whether the power costs will indeed decrease is therefore a vital rating parameter.

Preservation of energy saving incentives:

However, while keeping prices competitive is essential, it is equally vital to ensure that industries do not lose sight of the broader German objective to decarbonise its economy by 2045. Energy efficiency remains central to this effort. Every megawatt-hour (MWh) saved not only reduces costs, but also eases the burden on the energy system, making the path to decarbonization less challenging.

Clear price signals in the energy market play a pivotal role in this. When industries receive clear indications that energy savings and efficiency are economically beneficial, they are more likely to invest in energy-saving technologies and practices. This proactive approach to energy usage does not just reduce the industry's operational costs, but also diminishes the need for additional investment in generation capacity in the energy system.

3. Short description of BMWK proposal and alternatives

BMWK proposal

The BMWK published a proposal in May 2023 centring on measures that aim to reduce industrial power procurement prices. The proposal consists of two main measures: a so-called 'Brückemstrompreis' or bridge power price as well as a so-called 'Transformationsstrompreis' or transformation power price.

Bridge power price

The bridge power price is set to be a short-term measure with a price ceiling of 6 ct/kWh, before taxes, charges, or levies. Individual businesses will be eligible for reimbursements of the difference between average wholesale prices on the spot market and the proposed 6 ct/kWh. This measure will cover 80% of a reference power consumption. The initiative targets the energy-intensive industry competing on an international level using the existing 'BesAR' list. Funding for the measure shall come from the Economic Stabilization Fund, with the entire initiative estimated to cost between 25-30 billion.

The policy is scheduled to end by 2030 at the latest, where the ministry expects renewables to allow for low-cost power sourcing. There are mandatory conditions attached: Recipients are required to commit to net-zero emissions by 2045, as well as to continuing their operations within Germany, and adhere to stipulated tariffs. Furthermore, certain voluntary energy efficiency measures outlined in the EnFG will become obligatory for beneficiaries.

Transformation power price

The BMWK has suggested a transformation power price consisting of two main elements to promote long-term power price declines. Firstly, it is planned to enable pricing close to production cost or Levelized Cost of Electricity (LCOE). This will be enabled through publicly funded CfDs for offshore wind projects that will supply directly to industry, with plans to expand this to other renewable technologies in the future.

Secondly, government guarantees for developers entering PPAs with industrial offtakers will be provided. This is intended to mitigate risk premia of such contracts and reduce financing costs for renewable projects. Furthermore, reduced interest rates through the KfW, Germany's national development bank, shall be offered to the same target group.

Other measures include time-variable network charges, discounts for local P2H/P2X to minimize RES curtailment due to grid congestion, and a reduction of network charges for RES power acquired by industries located in close proximity to renewable assets through PPAs.

European dimension

Finally, the BMWK expressed its intention to advocate for an EU-wide agreement on subsidies for industrial power prices within the context of the market reform.

The aim is to use revenues from CfDs and other claw-back measures to support industry that operates on an international scale. Additionally, financial backing may be sourced from RENEW or potentially new loans, particularly for Member States with limited financial means. As these suggestions are kept quite short in the BMWK proposal, we do not discuss them further.

Alternative proposals

Sozialdemokratische Partei Deutschlands (SPD)

The SPD published an own concept which refines some measures of the BMWK proposal. This includes an even lower bridge power price of 5 ct/kWh which should be paid for 100% of the actual consumption and should be implemented for 5 years with intermediate reviews after 2 and 4 years. Furthermore, the long-term transformation price should rely on pooled CfDs which generate an average renewables profile which should be handed to offtakers.

Deutsche Industrie- und Handelskammer (DIHK)

The DIHK introduces a multi-faceted approach. Firstly, it proposes reducing taxes and levies for industry more generally, estimating this to have an annual fiscal impact of around €10 billion. Secondly, it introduces a concept it terms 'StromPartnerschaft', a scheme intended to increase the use of PPAs between industry and renewable asset developers. Within this scheme, developers are set to receive a 25% investment subsidy, a strategy reminiscent of the IRA practices in the US. This is projected to cost around €1.3 billion annually. Additionally, a specific reduction of network charges by 2 ct/kWh for industrial power procurement is suggested, with an estimated annual financial implication of €1.6 billion for the public budget. Through the StromPartnerschaft scheme, DIHK projects power prices for industry to reach price levels of around 4.4 ct/kWh for solar PV projects and 5.6 ct/kWh for wind projects in the long-term. Lastly, the DIHK has also demanded the introduction of additional measures targeting energy-intensive firms, though the no specific measures have been proposed in this regard.

Lukas Köhler, Freie Demokratische Partei (FDP)

The Vice-Chairman of the FDP Parliamentary Group suggests an alternative approach which focuses on a reduction of taxes, levies, and fees for PPAs: these should be treated like own consumption even if no direct connection between the asset and the offtaker exists. This includes waived grid fees as well as significantly lowered taxes and levies. New as well as existing assets (under EEG subsidies) should be eligible to this privilege and PPAs should also be made available for small and medium-sized businesses, e.g., by standardised products. This measure is accompanied by a few further proposals, e.g., easier permitting of direct wire connection, improved combination of PPA projects with EEG subsidies for risk mitigation and a reduction of the electricity tax (or at least a continuation of the Spitzenausgleich).

Bundesverband der Deutschen Industrie (BDI)

The BDI shares the DIHK's perspective and suggests a substantial reduction in grid fees and advocates for the removal of several levies, specifically the CHP levy, the offshore levy, and concession fees. In addition to these, it proposes a reduction of the German electricity tax to the European minimum.

Verband der Chemischen Industrie (VCI)

Lastly, the VCI puts forward the idea to subsidise 70% of historic reference consumption, which could be extended if power demand rises. Furthermore, it argues that the procurement price ceiling should be adjusted to align with prices from other competitive regions or countries, starting with 4–6 ct/kWh.

4. Assessment of BMWK proposal and alternatives

	Group	Core BMWK proposal		Proposals focusing on PPA market		
	Measure	Cap of 6 ct/kWh for 80% of consumption	State-backed CfDs for industry	Government guarantees	25% CAPEX subsidy for projects with PPAs	Reduction of taxes/ charges/ levies for PPAs
	Source Name of proposal	BMWK "Brücken-strompreis"	BMWK "Transformations-strompreis"	BMWK "Transformations-strompreis"	DIHK "Strom-Partnerschaft"	Lukas Köhler (FDP) "Eigenstrom PPAs"
Overarching economy and governance	Ease of implementation	Coupled to spot prices; pledges hard to monitor	Auction mechanism; high coordination effort	Proven concept in other markets (Norway, Spain)	No access requirements	Quick to implement on national level but exception could create overhead
	Fiscal affordability	Around €4 bn per year (in total €25-30 bn) according to BMWK estimations	Limited to market maker and cases of corporate default	Only in cases of corporate default	Around €3 bn per year	Missing revenues not yet clear but well below €10 bn per year
	Compatibility with EU law	No Member State empowerment for proposed price setting. Limited to crisis is given	Of national competence, but would require Commission approval	Of national competence, but would require Commission approval	Of national competence, but would require Commission approval	Own consumption not described in EU law
Power sector	Flexibility of industrial power demand	Incentives for flexible demand are kept and saved costs could be invested	Pay-as-produced: alignment of production with supply profile	Pay-as-produced: alignment of production with supply profile	Pay-as-produced: alignment of production with supply profile	Pay-as-produced: alignment of production with supply profile
	System-friendly renewable deployment	Less hedging demand could slow down system-friendly PPA buildout	Rewards output rather than system-friendly deployment	PPA prices depend on capture prices	PPA prices depend on capture prices	PPA prices depend on capture prices
	Market-driven renewables buildout	Less hedging demand could slow down buildout	Targets share of market that cannot be market-driven	PPA as market driven tools to ensure adequate supply	PPA as market driven tools to ensure adequate supply	PPA as market driven tools but lower impact than other proposals
	Financing cost for asset development	No direct impact on financing costs	Significantly lower commercial risk	Minimal counterparty risk	Lower leverage required	Developer likely to secure higher prices
	Prevention of market distortions	Already supported companies receive more, no change for others	Preferential market access for industry; increase in overall baseload prices	Accessible by everyone	Prefers those that can enter PPAs; does not widen access	Existing subsidies slightly extended to more companies
Offtaker	Power procurement costs	Floor to power procurement; for smart players strong reduction possible	Access to low-cost renewable power, but top-up for baseload consumers	Limited impact on cost per se; mainly widens PPA supply	Limited impact on cost per se; mainly widens PPA supply	Only little cost reductions for large offtakers possible
	Energy efficiency	Incentive to consume less: remaining amount procured at market price	Procurement costs may still be optimised (even though based on LCOE)	Procurement based on capture prices; incentive to consume less	Procurement based on capture prices; incentive to consume less	Procurement based on capture prices; incentive to consume less

Legend:
0 – does not fulfil / strongly disincentivizes criterium
1 – does not change status quo
2 – slightly fulfils / incentivizes criterium
3 – strongly fulfils / incentivizes criterium
4 – fully fulfils / incentivizes criterium

Cap of 6 ct/kWh for 80% of consumption

Overarching economy and governance

This short- to medium-term measure that purely focuses on the demand-side comes at a cost of around €25-30 billion over its six-year time span, according to BMWK estimates. This means it places a substantial strain on the public budget.

Tying the mechanism to average spot prices as a referencing benchmark for retroactive compensation avoids the potential pitfall of evaluating payback amounts for each eligible business on a case-by-case basis. This methodology makes the tool efficient, cost-effective, and faster than any individualized solutions. Bureaucratic hurdles might arise from monitoring transformation pledges and qualification criteria. Previous initiatives such as the power and gas price breaks have encountered such obstacles due to organizational overheads and ended up coming short of fulfilling their full potential.

As to compatibility with EU law, the application of the 'Brückenstrompreis' proposed by the BMWK to fix an industrial power price ceiling at 6ct/kWh can be ruled out by EU market-related rules, as it is not compliant on at least two accounts. First, Article 3 (a) and (b) of the Electricity Regulation (2019/943) and Article 5 of the Electricity Directive (2019/944) set clear principles for price formation. The text admits prices to be shaped on the basis of demand and supply; market rules must avoid introducing measures which prevent free price formation on this principle. Currently the only exception to this principle is the empowerment of Member States to set, under very strict conditions, regulated electricity prices for vulnerable consumers and SMEs (Article 5, Official Journal of the European Union, 2019a; Article 3 (a)(b), Official Journal of the European Union, 2019b).

Therefore, an industrial power price policy may only be implemented at the Member State-level if the EU empowers Member States to adopt such a measure. This is currently not the case. It remains unclear whether Germany has enough political capital in order to convince in the first place other Member States in the Council to support an empowerment for Member States to fix a regulated electricity price for energy intensive industries. Even if Germany would take this very challenging hurdle successfully, it remains to get the EP as the co-legislator (and implicitly the Commission, as being part of the legislative discussions in the trialogue) on board for such an empowerment.

Well-functioning and efficient power market

The power bridge price establishes a top-up based on two factors: (1) A reference consumption that has to be assigned from state site, and (2) the difference between the baseload price and 6 ct/kWh. Both effects are detached from offtaker decisions, therefore the price cap can be seen as a fixed revenue stream for consumers. The effects on a well-functioning power market can then be assigned to two main implications.

Possible financial upsides for offtakers can be kept. This means that offtakers have an unchanged incentive to optimise their energy procurement and consumption. Flexibilization to benefit more from low-cost hours, cheap procurement and general consumption reductions result in the same cost savings as without the measure.

At the same time, the price cap provides a safety net and plannability for offtakers, which is an original aim of the proposal. This means that there is less penalty if no dedicated procurement strategy is pursued. This will disincentivise hedging in

futures markets of energy-intensive industry, leading to less trading in these markets. Lower liquidity then increases the prices of hedging for those businesses, that do not benefit from the bridge power price but still have to protect themselves against future price risks. Overall market distortions increase.

Similar is true for the PPA market. The demand for PPAs as hedging instrument, especially if priced higher than 6 ct/kWh, will likely decrease with the given safety. Such a potential reduction in PPA engagement might impede market-driven renewables buildout, as it leaves only the riskier fully merchant route with higher financing costs. As a result, the overall and especially the system-friendly deployment of renewables could be slowed down.

Offtaker-level effects

The bridge power price would introduce a fixed demand-side procurement cap at 6 ct/kWh. This is considerably lower than current average German wholesale power prices which are around 10 ct/kWh (excluding taxes, levies, and charges).[1] Additionally, due to its connection to the average spot price as its reference, smart players might be able to reduce their procurement costs even more. Since the measure is meant to be in place until 2030, a look at price levels from there onwards is warranted: a sudden steep price increase at that point would invoke calls to prolong the measure, running against the explicitly stated target of making this a temporary measure according to the BMWK. Aurora's scenario forecasts expect prices of around 8-11 ct/kWh in 2030.[2] This calls the feasibility of introducing this measure as a temporal one in question: If energy-intensive firms will face an increase in industrial power prices of around 50% as soon as the measure ends, there will be resistance towards a clear cut-off. This harbours the risk of resulting in ongoing subsidization of industrial demand.

SPD additions

Most prominently the SPD proposal includes a price level of 5 ct/kWh. At a demand of about 100 TWh (BesAR subsidised 111 TWh in 2022) the additional fiscal burden compared to the 6 ct/kWh proposed by the BMWK calculates to € 1 billion per year. A 5 ct/kWh price cap is therefore less likely to be implemented than the 6 ct/kWh as proposed by the BMWK.

Reimbursements based on the actual power consumption instead of a reference demand reduce the needed effort to define reference demands and simplifies the inclusion of new businesses. On the other hand, this requires extensive reporting from the company side along throughout screening from the regulator side, which likely increases the overall bureaucratic effort. As in the BMWK proposal 80% of reference demand are subsidised, there is still an incentive for energy savings on the margin. As the SPD proposal targets 100% of consumption, this savings incentive is depressed.

The end of a bridge power price is addressed in more detail: A two-stage process is proposed. A first adjustment should be made after 2 years. This should include a re-evaluation of the 5ct price tag which should orient on long-term price levels

[1] Average wholesale power price Jan-Aug 2023
[2] Nominal prices in Aurora's Net Zero scenario (in line with governmental targets) and Aurora's Central scenario (most likely development with today's anticipated developments)

of renewable energy sources. Furthermore, the subsidy should then only be given for a certain profile oriented on renewables production.

This incentivises a flexibilization of electricity consumption in a system friendly manner or requires consumers to procure additional electricity at market prices. The second stage is the end of the bridge price after 5 years. Then companies should be able to cover their electricity demand based on, e.g., state-backed CfDs which are described below. The decision on this second stage should be confirmed after 4 years where a limited extension of the bridge price is possible as well. Overall, it is questionable whether German renewables capture prices will be internationally competitive for energy-intensive industry by 2030. Generally, we support the suggestions of a clearly defined and stepwise end of the bridge price as it softens the switch from a fixed price baseload guarantee towards market-based procurement. It provides plannability to industrial offtakers and avoids additional discussions at the end of the bridge price period.

Summary

The proposed bridge power price comes at a significant cost for the public budget. In its essence, the strategy represents a shift of rents from private to public stakeholders but does not inherently translate into lower total system costs, savings or higher market efficiency. Furthermore, compatibility with EU law is currently not assured and it is highly questionable whether during the negotiations on the electricity market design reform the empowerment of Member States to set industrial electricity prices will be open enough to cover a measure as envisaged by the BMWK, if such an empowerment will come at all.

State-backed CfDs for industry

Two-sided CfDs are an increasingly popular tool for the development and financing of renewable energy projects. CfDs are promoted by the currently discussed European electricity market design reform and will be one of the most important support instruments. However, the concrete measure would still need state aid approval by the Commission. The focus of the state aid scrutiny will be on the determination of the strike price and the necessity and proportionality of the aid. The main advantage of CfDs includes reduced system costs: state-backed guarantees reduce commercial risks for developers, which translates to reduced weighted average costs of capital (WACC) and thereby lower levelized costs of electricity (LCOE). The BMWK proposes to hand-over low LCOE-based prices to large industrial offtakers who then get to profit from low electricity costs compared to market prices.

The realisation of a win-win situation for developers, offtakers and accelerated renewables buildout depends on the CfD strike price. Offtakers will readily take CfDs if the strike price is below their expectation of the marked-driven procurement cost for an equivalent profile. Passing on LCOE-based prices, as proposed, fulfils this expectation and will incentivize offtakers to engage in such a scheme. Developers, on the other hand, will join such a scheme if the project profitability is secure and matches or exceeds that of other options (adjusted for respective risk). State-backing fulfils requirements for security to a larger extent than market-based business models like PPA- or fully merchant day-ahead marketing of power generation. Favourable profitability can be achieved when profits from participating in CfD auction are as high as or exceeding profits from PPA-based or merchant business models, adjusted for their respective WACCs:

Developers can identify their individual thresholds of CfD strike prices and bid into state-governed auctions.

State-backed CfDs for industry are rather burdensome to implement from a governmental point of view: Especially in the beginning there will not be enough CfD-based electricity to fulfil all industrial demand. The regulator has to become a matchmaker who distributes the limited supply fairly. The often-used concept of auctions will not be constructive here, as possible offtakers would bid close to the market value of the electricity and not the (lower) LCOE which should be handed over. A large burden of allocating the supply would lie with the state. Depending on the implementation it would also result in administrative hurdles for offtakers: It involves considerable coordination efforts for these to access these CfDs. In the end, however, for offtakers this might still be easier to implement than engaging in long PPA negotiations or employing a trading department as an alternative.

State-backed CfDs for industry would be based on a 'pay-as-produced' model that incentivizes alignment of industrial production processes with supply profiles. This would incentivize demand-side flexibility and in turn not just smooth but adapt the load curve of industrial power demand.

However, a challenge arises concerning system-friendly renewable deployment: given that CfDs compensate producers based on the difference between a pre-agreed strike price and the actual market price of their output, they inherently incentivize maximizing production. In contrast, system-friendly behaviour requires a price-driven approach in which price signals indicate periods of supply scarcity: this incentive will get lost with state-backed CfDs for industry.

To remedy these weaknesses, alterations to the design of conventional, two-sided CfDs have been proposed. One of the potential alternatives are 'financial CfDs' (Schlecht et al., 2023): Their main benefit is a decoupling of revenues from physical output of a specific renewable asset. This is achieved by mandating the generator to reimburse benchmarked spot market revenues rather than actual revenues. Relying on benchmarks rather than actual revenues preserves the incentive to maximize profits by targeting an optimal mix of capture price level, generation level as well as capital and operational expenditure. Nevertheless, state-backed CfDs for industry do not refer to this type, but rather to conventional, two-sided CfDs.

As a result, CfD-based renewables buildout will take away space for market driven buildout (i.e., PPA driven buildout) and make market integration for other renewables more challenging. Yet, passing on LCOE-based prices through state-backed CfDs would yield lower electricity prices, enabling industry with flexible demand to access low-cost renewable power. By efficiently allocating capital and reducing risk premiums, they can significantly reduce the total system cost. However, we believe that their potential administrative overhead and their effect of incentivizing output maximisation means that they should be used as a targeted tool for specific markets rather than a one-size-fits-all solution.

SPD additions

The proposal from the social democrats heavily relies on CfDs as a long-term measure as well. However, they emphasise another step before providing electricity to industrial offtakers. So called "pooling". Individual renewables profiles (from solar PV, offshore and onshore wind) should be combined into an aggregate which is given to offtakers. This significantly smoothens the profile which simplifies the requirements of flexible demand of individual offtakers. The initial BMWK proposal mentions an extension of CfDs towards solar PV and onshore wind as well to provide broader generation profiles but does not further elaborate on it.

Pooling requires that CfDs are rolled out at scale across renewables technologies. This poses the possibility of overpronounced administrative burden, e.g., due to CfD supply auctions in the rather fragmentated PV market. We believe that CfDs are mainly an option for offshore wind assets which itself provide rather smooth production profiles. For onshore wind and solar PV we believe that the downsides of bureaucracy and system-friendly deployment are more striking. PPAs, e.g., combined with government guarantees, could be the more viable option for these.

Government guarantees

PPAs offer an important pathway to enhance the financing conditions for renewable energy development and play a major role as instrument in the electricity market design reform.

The proposed introduction of government guarantees for PPAs by the BMWK aims to eliminate an inherent drawback of PPAs by addressing counterparty default risk in PPA agreements. This shall be achieved through the introduction of public guarantees for renewable projects with PPA agreements, culminating in substantially lower WACCs for new projects. This has the potential of widening market access for offtakers since their default risk is covered and consequently the potential of considerably expediting the rollout of renewable generation capacity. This concept is not novel. For example, in Norway and Spain the introduction of public guarantees to mitigate counterparty default risks in PPAs has been demonstrated before. The fiscal implications of this mechanism are quite manageable. Public funds would only be dispersed in the event of a corporate default, circumventing excessive drains on the state budget. Indeed, state guarantees are a classical instrument to further de-risk investments. However, the concrete setup of the state guarantee would still need state aid approval by the Commission. The state aid assessment will mainly focus on the necessity of such a guarantee, and on the conditions under which this guarantee is established.

The dynamics of PPAs lead to similar impacts on flexibility of industrial demand as the ones emanating from state-backed CfDs for industry. Here, too, the reliance on a 'pay-as-produced' model incentivizes alignment of industrial production processes with supply profiles, smoothing the load curve for industrial power demand. One of the big strengths of increased reliance on PPAs, however, is their effect on incentives for renewables deployment. Contrary to state-backed CfDs, the dependency of PPA prices on capture prices of renewable assets amplifies the motivation for system-friendly renewable deployment.

PPAs act as a buffer against price volatility for developers and, as long-term bilateral agreements, allow offtakers for future planning. For government-backed guarantees to be effective, the design of the eligibility criteria will be crucial.

Lastly, while the direct implications of government guarantees on procurement costs for offtakers might appear limited per se, the overall impact of widening the PPA supply pool is important. By driving down the LCOE, a larger array of PPA projects become financially viable. This increases the supply of PPAs, making overall electricity costs decline slightly due to additional cannibalisation.

To summarize, PPAs can optimize particularly renewable energy financing for renewable projects. This proposal promises to decrease total macroeconomic costs by mitigating counterparty default risks all the while constituting a minimal fiscal burden on the public budget.

25% CAPEX subsidy for projects with PPAs

The 25% CAPEX subsidy for projects with PPAs, while echoing some benefits and drawbacks of the proposed government guarantees for PPAs, differs in specific aspects. Its absence of rigorous, predefined access requirement results in a measure that is easy to implement, all the while being economically more viable than the aforementioned bridge power price with an anticipated annual cost hovering around €3 billion. As a typical investment aid, this measure would still need state aid approval by the Commission under the Guidelines for Investment Aid.

Nevertheless, its impact on financing conditions for asset development seems limited. With a reduced CAPEX, the need for leveraging decreases. It's important to note that the inherent risk structure and the associated risk premiums remain unchanged, resulting in only a slighter decrease in financing costs than for example the proposed government guarantees. Nevertheless, a decrease of 25% of CAPEX constitutes a considerable boost for the PPA market, making many projects viable by bringing LCOE below capture prices. Furthermore, a palpable market distortion emerges, as the measure appears to favour new projects while old PPA projects are put at a disadvantage.

From an overall economic perspective, this proposed measure may accelerate the PPA market buildout more directly than governmental guarantees as LCOEs decrease more. However, the CAPEX subsidy is aimed at the supplier side to reduce costs. State guarantees aim at the offtaker providing security. Which opportunity is driving market dynamics more is not fully clear.

"Eigenstrom PPAs"

When determining the effect of a reduction of various taxes, charges, or levies on our assessment criteria, it is important to note that the energy-intensive industry already enjoys a substantial variety of exemptions. These exemptions include 'BesAR' as part of the EnFG, a policy that is targeted at energy-intensive businesses that have to compete internationally and limits the CHP and offshore levy to only 15% (or for list 2 businesses to 25%) for power demand exceeding 1 GWh. The current BMWK proposal for a bridge power price is intended to benefit the same businesses that fall within the BesAR. This is followed by the 'Strompreiskompensation', a subsidy for indirect CO_2-related costs to prevent carbon leakage; the 'Netzentgeltebefreiung' (determined in §19(2) StromNEV) that exempts consumers with total demand over 10 GWh and 7000 load hours from network charges as such; and finally, the 'Spitzenausgleich' that grants energy-intensive businesses a waiver for electricity tax payments in exchange for improvements in energy efficiency.

This non-exhaustive list demonstrates that energy-intensive businesses receive significant support already. They can therefore only very limited benefit from the proposed Eigenstrom-PPAs. The aim of the proposal is, however, to extend these exemptions to small and medium-sized companies which are currently exposed to all non-wholesale power costs. These would therefore benefit. An important requirement to facilitate this is the eligibility to close PPAs which is currently limited to creditworthy companies, a problem for small to medium-sized companies. Lukas Köhler proposes to establish standardised products to facilitate accessibility. The proposed BMWK measure of government guarantees could also simplify the access for small to medium-sized companies.

The cost of such a measure is a significant question which is not addressed in the proposal. The DIHK estimates that ca. €10 billion annually are needed for general reductions of taxes and levies. If only PPAs are considered this number could be substantially lower. These costs have to be covered by some party: Either by the remaining electricity consumers which are mainly households, or by the state. Both may be a significant strain on available budgets. In the long-term, a measure for reducing grid fees could be time-variant or locational fees, as they can lead to a better use of the grid and limit required buildout. Although the Eigenstrom is not regulated at the EU-level, and as such would not raise issues with EU law, the state guarantees and the exemption from network costs are state-aid relevant and would therefore need approval by the European Commission.

Adding more possibilities to be exempt from taxes and levies adds bureaucratic burden to regulator and consumer side. More general cuts in, e.g., the electricity tax (as proposed by Lukas Köhler (FDP) and other players as well) is an easier to maintain option.

And finally, the effect on offtaker prices is questionable. The limited supply of cheap green electricity is one of the core reasons for high electricity prices. The same is true for PPA markets: the demand for PPAs largely exceeds the availability. A reduction of additional costs will not change this situation in the short- to medium-term. It could, however, alter the price finding of PPAs. In the setting of the industrial power price PPAs are a hedging instrument for offtakers. The reference costs are determined by futures prices and/or expected day-ahead prices. This means, that an offtaker will sign a PPA if the total cost (including taxes and levies) is below the total cost of another procurement strategy. If taxes and levies are reduced for PPAs only, offtakers will be willing to pay higher PPA prices as the total costs will still be lower than futures prices plus taxes and levies. Considering the market power of suppliers in an undersupplied market, this means that the offered PPA prices could increase by the amount of reduced taxes and levies. As a result, the power procurement costs for offtakers might not decrease, but suppliers can secure higher revenues which are effectively provided by government money.

As an upside, this could improve project economics, shield developers from intense cannibalisation and accelerate renewables buildout with long-term price declines. However, it might not achieve the short- to medium-term aim to reduce offtaker costs.

General reductions of taxes, charges, and levies (DIHK, BDI, VCI):

Multiple parties are advocating general reductions of taxes and levies. One of the benefits of such an approach is the ease with which measures might be implemented. Especially the approach of waiving levies also has the added benefit of reducing the administrative burden for concerned businesses considerably. However, such a measure can quickly become a considerable strain on the public budget. The DIHK estimates that a reduction of charges and taxes of around €10 billion annually is necessary to adequately support energy-intensive businesses. Member States enjoy an exclusive competence with regard to their taxation. However, the concrete taxation measures would still be subject to a state aid scrutiny by the Commission. An often expressed measure which is in line with EU regulation is the reduction of the electricity tax from currently 2.05 ct/kWh to the EU minimum of 0.05 ct/kWh.

Generally, such an approach of lowering non-time dependent levies and charges increases the relative volatility of total hourly power cost by making a larger part

of the cost being dependent on the wholesale price. In relative terms this, then, incentivizes flexibility of industrial power demand to reduce procurement costs. However, this approach does not incentivize a system-friendly deployment of renewables assets. The same applies in terms of financing: financing costs for renewable asset development would not decrease as a result of such reductions. Introducing additional exemptions for energy-intensive businesses will lead market distortions since those will most likely have to be financed by other actors not falling within this category. General reductions, on the other hand, preserve the status quo of competition in the market.

The effect on power procurement costs is undeniable: Reducing taxes, charges, and levies on electricity in general would decrease its price noticeably, consequently encouraging further electrification of industry and increasing industrial power demand. Without accompanying measures, this may have unintended effects on incentives to increase energy efficiency of industrial production processes: after all, increasing power procurement might be cheaper than investing in costly efficiency measures in already electrified processes. What could potentially address this is the introduction of time- and location-dependent network charges:[3] This would incentivize flexibility of industrial power demand by encouraging off-peak consumption as well as reduce network congestion and resultingly grid curtailment for renewable assets, leading to higher and more secure revenue streams for such.

Finally, current regulation on grid fees, particularly the exemption according to StromNEV §19 (2), do not provide the right incentives for system-friendly behaviour on the offtaker side. They grant fee reductions for industrials if they run baseload, an offtake profile which is not matching an increasingly renewable-dominated power market. While for some industrial processes there is limited room for flexibility, such incentives inhibit the provision of flexibility from all industrials and consequently increase the costs in the power system. In a reform of grid fees, this should be reflected.

Concludingly, reducing taxes and levies uniformly is an effective way to lower costs without distorting the market too strongly (albeit this gets rid of incentives to save energy). Abolishing the electricity tax, specifically, is a promising measure that might be reasonable once the share of clean energy makes up most of power supply.[4] Lastly, implementing tariffs that reflect time and locational aspects can benefit overall system costs considerably.

[3] This could be achieved by removing §36 EnWG.
[4] As proposed by the Scientific Advisory Board of the Federal Ministry of Finance (2023).

5. Summary and outlook

Any measure for an industrial power price must align with EU law, giving Germany limited room for manoeuvres. A policy also should be easy to implement, provide incentives for flexibility, system-friendly renewable buildout, support low financing conditions, incentivise energy efficiency and come with limited market distortions.

Generally, this paper suggests, measures are preferrable that focus on structural reinforcements of the supply side and help deploying renewables, which will eventually lead to lower power prices. Some of the proposed measures follow this logic: the BMWK's state-backed CfDs for industry, the BMWK's government guarantees for PPA projects and the DIHK's 25% CAPEX subsidy for PPA projects take such an approach. Our analysis finds that CfDs as well as PPAs are promising tools to encourage a well-functioning and efficient future German power market. CfDs offer the advantage of price stability and risk mitigation. This is a good approach for concentrated but complex technologies such as offshore wind. On the downside, however, conventional CfDs incentivize output maximization. That disregards system-friendly renewable deployment and increases overall system costs. Newer alterations to CfD design such as the concept of 'financial CfDs' avoid this pitfall (Schlecht et al. 2023) and merit further consideration. Nevertheless, the state's role as central planner introduces substantial administrative overhead, potentially leading to inefficiencies.

To ensure a successful transition to a clean and cheap energy system, a market-driven rather than publicly governed buildout of renewables is favourable. PPAs facilitate this goal: they expose developers directly to the market and enable bespoke agreements, thereby encouraging private sector participation. Their pricing that incentivizes an optimal mix of capture price level, generation level as well as capital and operational expenditure, coupled with an increased revenue security, promotes the system-friendly deployment of renewables. Furthermore, in combination with additional measures in place PPAs can cater to a broader spectrum of offtakers, whereas state-backed CfDs as envisioned by the transformation power price are predominantly directed towards high-demand offtakers.

This comes at a cost: PPAs carry a higher price risk than CfDs and might be challenging and expensive to negotiate. Given the anticipated increase in intermittent renewable generation capacity in Germany, however, flexibility becomes paramount for an efficient power system in the future: As concluded in our assessment, a future power system characterized by a strong PPA market addresses this issue. Specifically, the proposals to introduce government guarantees for PPA projects as well as to subsidize CAPEX for PPA projects both have the potential of substantially decreasing financing costs for asset development and make previously unviable projects profitable, while preventing major market distortions. Especially the government guarantees further improve the accessibility of PPAs for smaller or less creditworthy companies, currently struggling to conclude these contracts.

With measures in place to support the buildout of renewables, two major questions remain: First, how will price levels in a high-renewable system look like? And second, how could short-term support be structured?

Starting with the first of these questions: it is unlikely that baseload power prices in 2030 will reach 5-6 ct/kWh, Aurora's modelling suggests them to be in the range of 8-11 ct/kWh (nominal), even with strong buildout of low-cost renewables. This underlines the need for a clear phase-out strategy, for any measure taken in the

short-term, and raises doubt whether the proposed bridge power price could be easily ended, without sparking new discussions from offtakers.

Structuring short-term support for offtakers remains much more complex under these circumstances. The bridge power price as proposed by the BMWK, and the SPD proposal would implement a price ceiling of 5-6 ct/kWh. This is not compatible with EU market-related rules on at least two accounts. Firstly, there is currently no empowerment for Member States in EU legislation which would allow EU capitols to go forward with a selected price setting mechanism. Even if the amendment proposed by the European Parliament, foreseeing such an empowerment under a declared crisis, it would still limit the German measure to a European Commission-declared crisis timeframe. Also, incentives to enhance energy efficiency could be weakened by such a program and incentives for hedging via futures market or PPAs reduced. Nevertheless, the proposal keeps incentives for efficient procurement and industrial flexibility in place.

Lukas Köhler from the FDP proposes a separate approach focusing on the non-wholesale parts of the electricity costs. Treating PPAs as own consumption with strongly decreased grid fees is a viable idea that is compatible with EU market-rules. However, it also bears shortcomings. Energy intensive industries already benefit from many exemptions for grid fees, levies, and the electricity tax. For them, no significant benefit is expected. From cheaper PPAs through the Eigenstrom PPA, mainly SMEs could benefit. That is, if they can access the PPA market, which might require e.g. state guarantees on top of what the proposal suggests currently.

Even then, it is not clear that reduced fees will be handed over to offtakers as the PPA market is undersupplied with large market power on the generator side. Finally, when some companies are exempt from grid fees, others must pay the bill, as the cost for grid is given by the installed lines. An additional measure to reduce grid fees in the long-term could be time-variant or locational grid fees, as they can lead to a better use of the grid and limit required buildout. For energy-intensives, a continuation of the Spitzenausgleich or a general reduction of the electricity tax would however be beneficial to maintain current savings for these companies, an option that the liberal proposal mentions.

With limited room to support energy intense industry further via reduction of taxes and levies, policymakers could additionally consider temporary production-based support for these companies instead of subsidising power demand as proposed by the BMWK. Subsidies for manufactured goods hold the advantage that they support domestic production and added value with limited state interference in the power market itself. Support levels could be determined economically efficient via auctions, potentially even combined with the recently launched program of carbon contracts for difference (CCfDs). Resulting payments would for instance be per produced ton of steel or glass. Such support would keep incentives for economic power procurement, flexible demand and overall energy efficiency while providing security for local investments in industrial processes and decarbonisation.

The discussion of various measures illustrates that there is no silver bullet to address all requirements for an industrial power price. More likely a combination of measures will be needed to address rising power costs quickly and in the long-term. This could include targeted short-term support, for instance production-based, with a clear exit pathway and simplifications of the structures for taxes, levies, and fees. Measures to accelerate the buildout of renewables to provide more cheap electricity are favoured in the long-term, ideally using market-based instruments like PPAs.

Current public debate centres mainly on the bridge power price and its adequacy as an industrial policy measure. The discussion is inherently political as well as contested and will need to address first, if and which industries should receive targeted support according to clearly defined criteria. For now, Germany's chancellor as well as its finance minister have both publicly declared that they do not support the BMWK proposal as it stands today.

References

BDEW (2023a). BDEW-Strompreisanalyse Juli 2023. https://www.bdew.de/service/daten-und-grafiken/bdew-strompreisanalyse/ [accessed on 12 September 2023].

BDEW (2023b). Ein Industriestrompreis für die Energiewende? – Kurzanalyse des BMWK Vorschlags. https://www.bdew.de/media/documents/Awh_20230524_Diskussionspapier_IndustriestrompreisKurzanalyseBMWK-Vorschlag.pdf [accessed on 12 September 2023].

BDI (2023). Wettbewerbsfähigkeit der Industrie. https://bdi.eu/artikel/news/wettbewerbsfaehigkeit-der-industrie-debatte-um-industriestrompreis [accessed on 12 September 2023].

BMWK (2023a). "Wettbewerbsfähige Strompreise für die energieintensiven Unternehmen in Deutschland und Europa sicherstellen - Arbeitspapier des BMWK zum Industriestrompreis für das Treffen Bündnis Zukunft der Industrie. https://www.bmwk.de/Redaktion/DE/Downloads/W/wettbewerbsfaehige-strompreise-fuer-die-energieintensiven-unternehmen-in-deutschland-und-europa-sicherstellen.pdf?__blob=publicationFile&v=6 [accessed on 12 September 2023].

BMWK (2023b). Erneuerbare Energien https://www.bmwk.de/Redaktion/DE/Dossier/erneuerbare-energien.html#:~:text=Anhebung%20des%20Ausbauziels%20f%C3%BCr%202030%20auf%2080%20Prozent&text=Bis%20zu%20600%20TWh%20Strom,sind%20es%20etwa%20240%20TWh%20 [accessed on 12 September 2023].

BMWK (2023c). Merkblatt für stromkostenintensive Unternehmen 2023 zu den gesetzlichen Regelungen der Besonderen Ausgleichsregelung nach dem Energiefinanzierungsgesetz. https://www.bafa.de/SharedDocs/Downloads/DE/Energie/bar_merkblatt_unternehmen_2023.html [accessed on 12 September 2023].

DIHK (2023). StromPartnerschaft für wettbewerbsfähige Preise und schnelleren EE-Ausbau. https://www.dihk.de/de/aktuelles-und-presse/aktuelle-informationen/so-laesst-sich-das-energieangebot-schneller-und-nachhaltiger-steigern-98274 [accessed on 12 September 2023].

EPICO (2023). Standortvorteil Erneuerbare Energien?. https://epico.org/de/studie-standortvorteil [accessed on 12 September 2023].

European Commission (2023). Proposal for a Regulation of the European Parliament and of the Council Amending Regulations (EU) 2019/943 And (EU) 2019/942 As Well As Directives (EU) 2018/2001 and (EU) 2019/944 to improve the Union's electricity market design. https://eur-

lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52023PC0148 [accessed on 12 September 2023].

European Parliament (2023). Report on the proposal for a Regulation of the European Parliament and of the Council amending Regulations (EU) 2019/943 and (EU) 2019/942 as well as Directives (EU) 2018/2001 and (EU) 2019/944 to improve the Union's electricity market design. https://www.europarl.europa.eu/doceo/document/A-9-2023-0255_EN.html [accessed on 12 September 2023].

Iberdrola (2023). Alternative Ausgestaltung des Brückenstrompreises: PPA-Konzept

Official Journal of the European Union (2019a). Regulation (EU) 2019/943 of the European Parliament and of the Council on the Internal Market for Electricity (Recast). https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R0943 [accessed on 12 September 2023].

Official Journal of the European Union (2019b). Directive (EU) 2019/944 of the European Parliament and of the Council on Common Rules for the Internal Market for Electricity and Amending Directive 2012/27/EU (Recast). https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L0944 [accessed on 12 September 2023].

Schlecht, I; Maurer, C; S, L. (2023). "Financial Contracts for Differences". https://www.econstor.eu/bitstream/10419/268370/1/Financial_CfD.pdf [accessed on 12 September 2023].

Scientific Advisory Board of the Federal Ministry of Finance (2023). Ein Industriestromtarif für Deutschland?. https://www.bundesfinanzministerium.de/Content/DE/Downloads/Ministerium/Wissenschaftlicher-Beirat/Gutachten/industriestromtarif-fuer-deutschland.pdf?__blob=publicationFile&v=4 [accessed on 12 September 2023].

Statistisches Bundesamt 2023. Branchen und Unternehmen – Industrie, Verarbeitendes Gewerbe. https://www.destatis.de/DE/Themen/Branchen-Unternehmen/Industrie-Verarbeitendes-Gewerbe/_inhalt.html [accessed on 12 September 2023].

Tagesschau (2023). Immer mehr Stimmen gegen Industriestrom-Subvention. https://www.tagesschau.de/wirtschaft/unternehmen/industriestrompreis-reaktion-alternativen-100.html [accessed on 12 September 2023].

Tagesspiegel Background (2023). Grüne lehnen Steuer-Vorschlag der FDP ab. https://background.tagesspiegel.de/energie-klima/gruene-lehnen-steuer-vorschlag-der-fdp-ab [accessed on 12 September 2023].

epico.org

EPICO Klimainnovation

EPICO_Online

epico
KlimaInnovation

AURORA
ENERGY RESEARCH