

The '13k Mechanism' – Price Formation and its Impact on Hydrogen Production

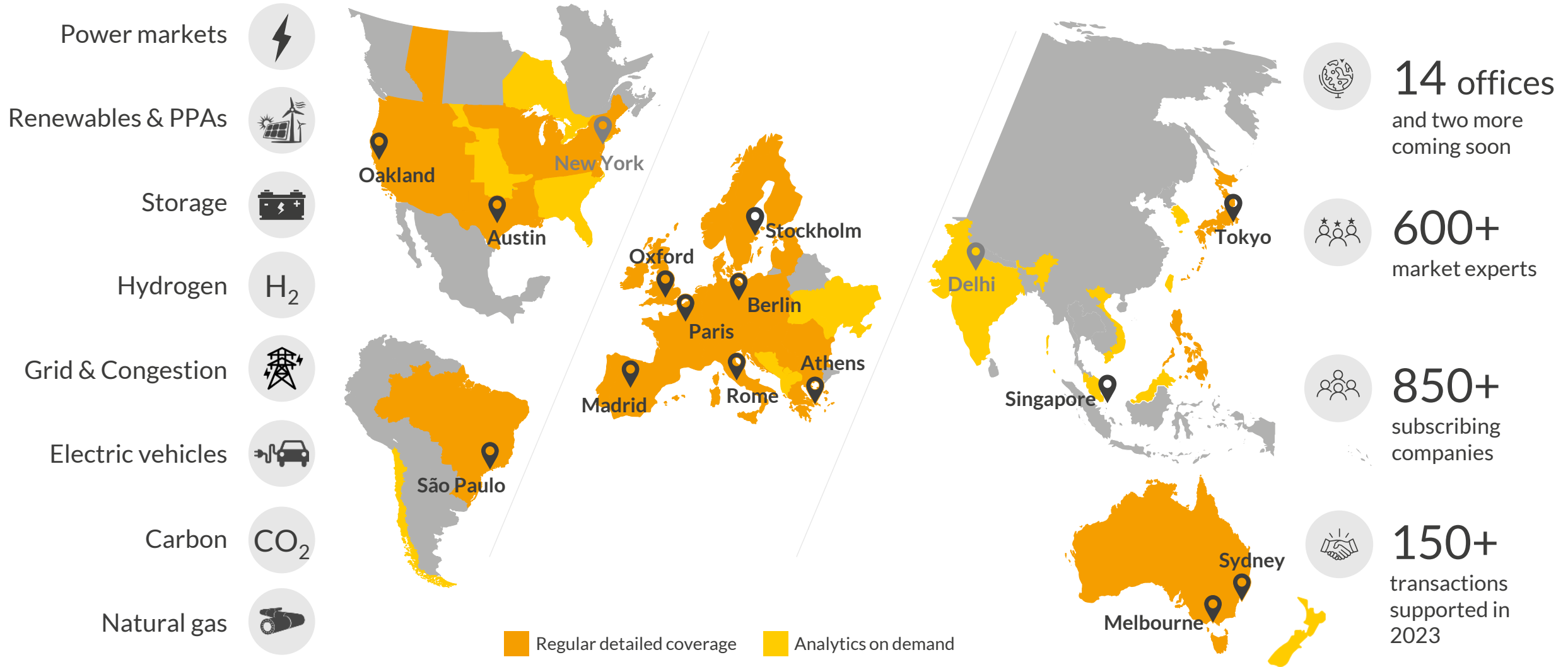
Public Report

17 September 2024



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- I. Introduction
- II. The Use-Instead-Of Curtail Mechanism (§13k EnWG)
- III. The Impact for Hydrogen Production
- IV. Key Takeaways

Looking to understand more about the changing dynamics
of the German energy market?

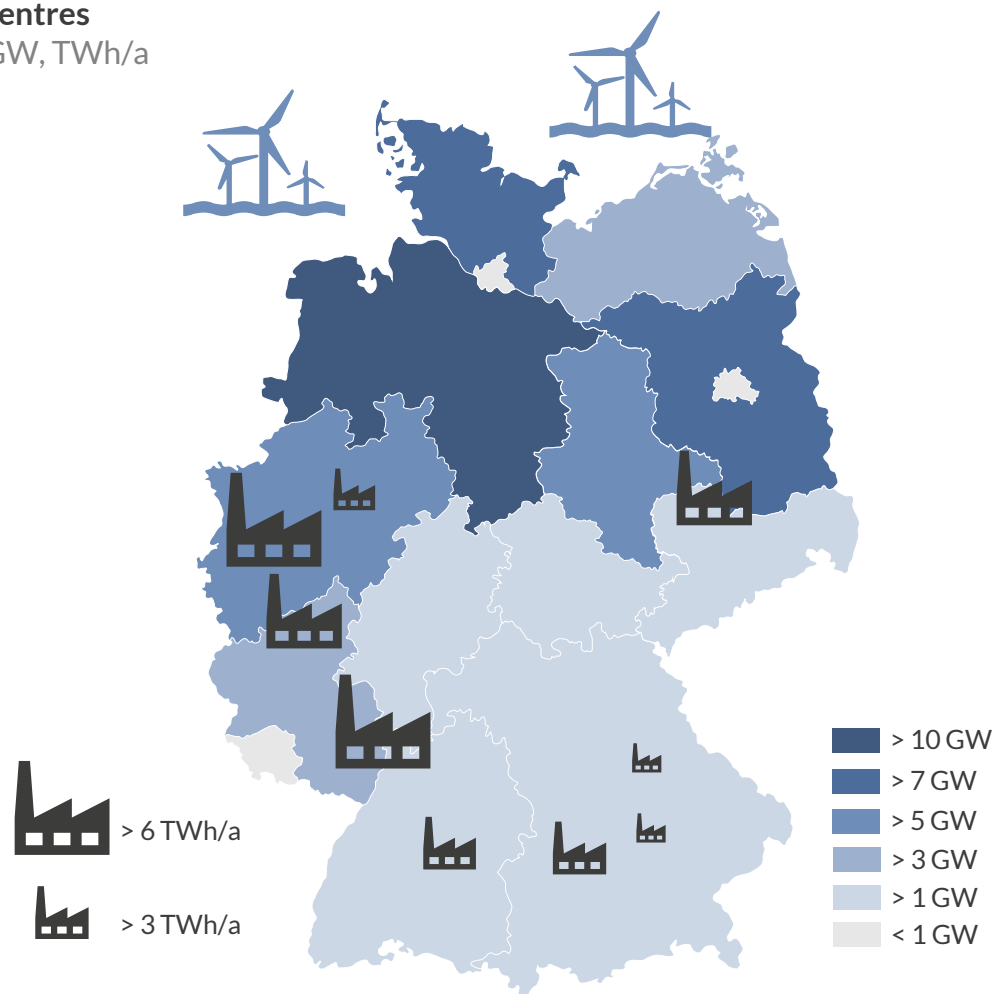
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[Marc Peitan](#), Commercial Associate

Germany faces a North-South system imbalance leading to increasing volumes of curtailed renewable electricity

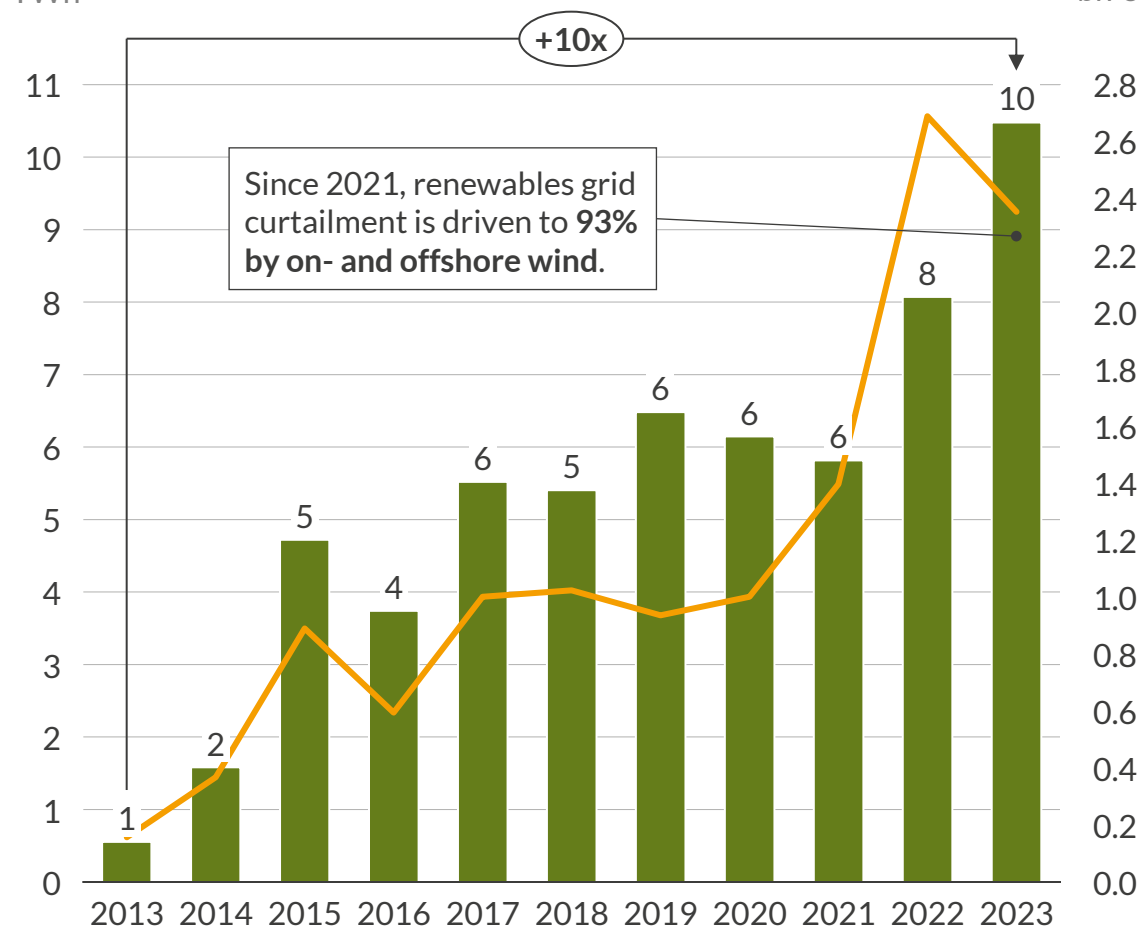
Installed wind power capacity by federal state¹ and industrial consumption centres

GW, TWh/a



Curtailed renewable generation
TWh

Annual curtailment and redispatch costs
bn €



■ Curtailed renewable generation² — Curtailment and redispatch cost

1) Includes onshore and offshore wind capacities (2021). 2) Volume of *Einspeisemanagement*, now *Redispatch 2.0*; for 2023 reflects redispatch down of renewables.

I. Introduction

II. The Use-Instead-Of Curtail Mechanism (\$13k EnWG)

1. Implementation
2. Price formation

III. The Impact for Hydrogen Production

IV. Key Takeaways

As of October 2024, heat loads and electrolyzers can procure previously curtailed renewable electricity at a discounted price under §13k of the EnWG¹



Aim and participants

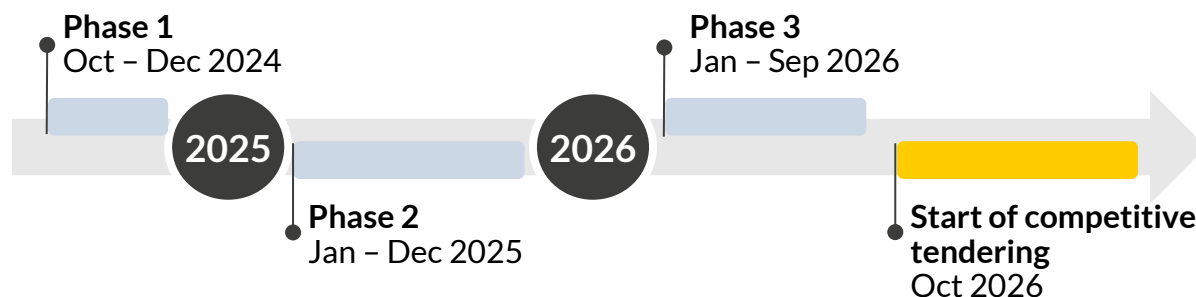
- **Aim:** Reduce grid-based renewables curtailment and incentivise additional flexible electricity offtake in Northern Germany.
- **Authorised participants:** (1) power-to-heat applications, (2) grid-connected storage systems, (3) electrolyzers and heat pumps.
- Participation conditional on **additionality criteria** defined by the BNetzA².



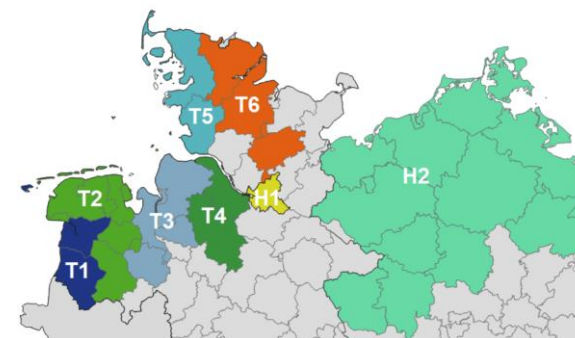
Implementation timeline

Two-year trial period with a simplified flat-rate allocation

Competitive auctions



Eligible participation regions



Volume determination and tendering

D - 1 month	Prequalification of participants
D - 2 days	Volume determination based on curtailment forecast ³
	Determination of available participants
D - 1 day 10:00	Allocation of volumes and confirmation by participants
Delivery	Energy procurement and consumption of volumes by participants
D + 1 month	Proof of consumption and settlement

D = power delivery day

¹ Energy Industry Act (*Energiewirtschaftsgesetz*). ² Bundesnetzagentur (BNetzA): Festlegung Zusätzlichkeitskriterien 13k EnWG ([bundesnetzagentur.de](https://www.bundesnetzagentur.de)). Large-scale heat pumps and electrolyzers are expected to have the lowest hurdles for fulfilling the criteria. ³ An update with the final available 13k volumes is provided at D-1 07:00AM

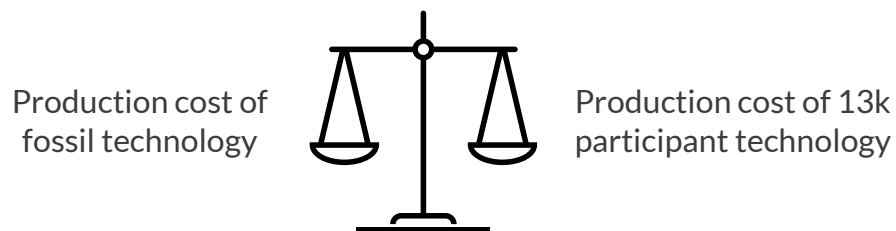
The 13k price is designed to make power-to-heat technologies competitive with fossil-based alternatives



Price determination

Within the two-year trial period:

- Power is awarded at pre-defined **13k price**
- 13k price** remains constant within each phase of the trial period.
 - TSOs reimburse participants based on the **difference between a reference price** and the **13k price**.
 - Reference price:** Either the day-ahead price or a cap of 542 €/MWh¹.
- The **13k price** is designed to reflect the cost of the currently cheapest heat generation technology with a discount (→ gas-based heat generation).
- Idea of the 13k price:**
 - 13k power is made available at a discount for power-to-heat applications (electric boilers and heat pumps) to replace fossil-based alternatives.
 - Incentivise flexible loads, such as electrolyzers, to allocate north of congestion areas.



Scenarios for compensation payments to 13k participants
€/MWh



■ Compensation ◆ DA-price²

[Deep dive on price formation](#)



1) The exact price cap is defined based on the maximum specific costs of the previous year's German domestic grid reserve. 2) Day-ahead price.

From a starting value of 40.4 €/MWh in phase 1, we expect the 13k price to remain slightly above that level until phase 3

Formula for 13k price calculation

13k price = (

Gas price reference
(€/MWh_{th})

+

CO₂ price reference
(€/tCO₂)

*

CO₂ emission factor
(tCO₂/MWh_{th})

+

Gas grid costs
(€/MWh_{th})

+

Gas tax
(€/MWh_{th})

+

Gas storage levy
(€/MWh_{th})

) * (1-1/3)

1

2

3

4

5

6

!

Discount of 1/3 as incentive for participation.

Data and sources		Phase 1	Phase 2	Phase 3
1	EEX THE ¹ natural gas futures ²	-	37.9	33.8
2	EEX EUA futures ²	-	66.9	68.7
3	CO ₂ emissions factor for gas as reported by the Federal Environment Agency		0.2	
4	Gas grid charges & metering point operation fees for industrial customers reported by BNetzA		4.1	
5	Gas tax as stated in Energy Tax Act ³		5.5	
6	Gas storage levy according to EnWG ⁴		2.5	

Estimated 13k price
€/MWh (nominal)

Phase	Period	Estimated 13k price (€/MWh)
Phase 1	Oct-Dec 2024	40.4
Phase 2	Jan-Dec 2025	43.9
Phase 3	Jan-Sep 2026	41.1

1) Trading Hub Europe. 2) For respective phase, an average over quarterly (gas)/monthly (CO2) products is used (Trading date: 12.09.2024). 3) See paragraph 2 (3). 4) *Energiewirtschaftsgesetz*, Section 35e.

Sources: Aurora Energy Research, Netztransparenz.de, Federal Network Agency, EEX, *Energiesteuergesetz*, Trading Hub Europe (THE), Federal Ministry for Environmental Protection, *Energiewirtschaftsgesetz*

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I. Introduction

II. The Use-Instead-Of Curtail Mechanism (\$13k EnWG)

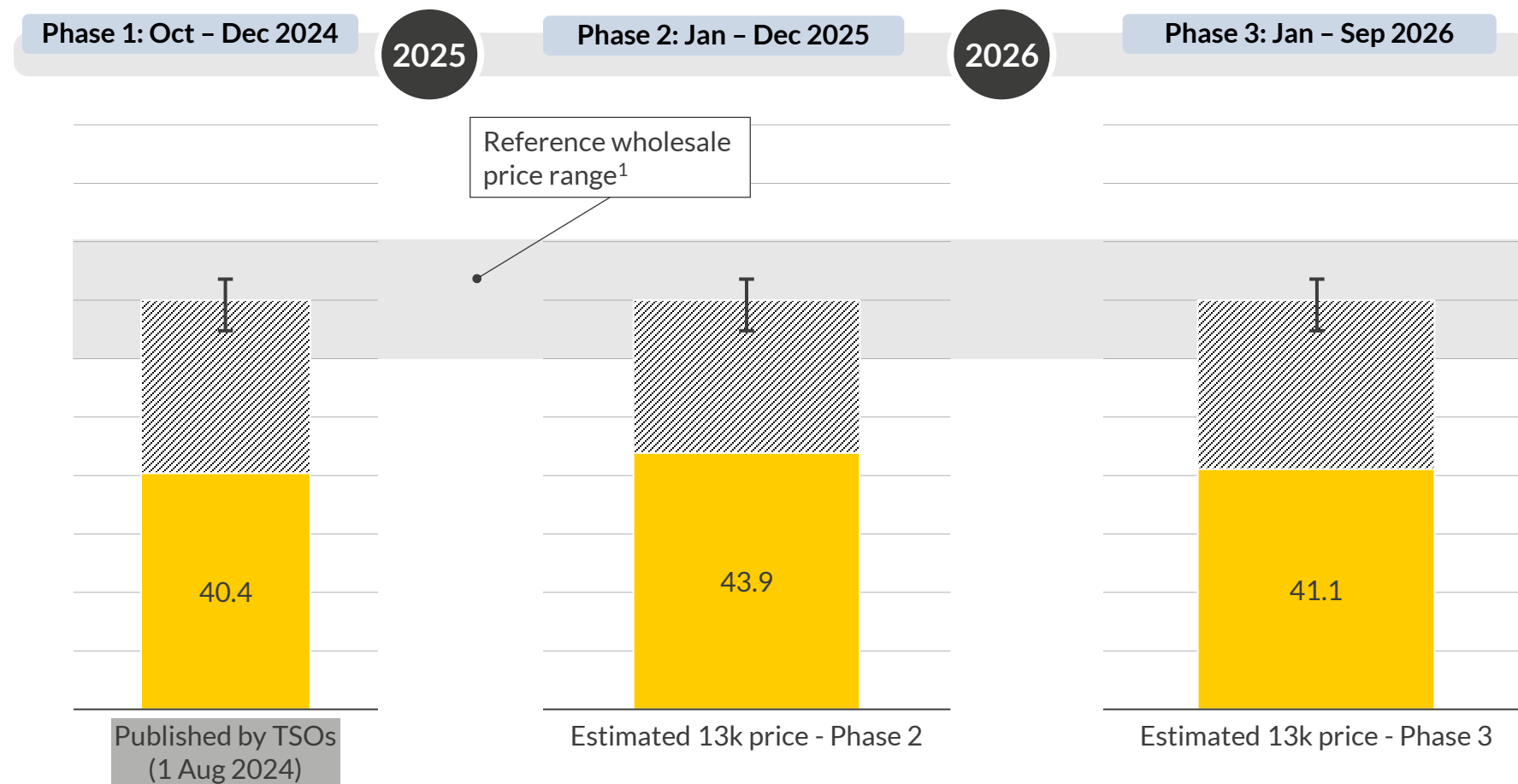
III. The Impact for Hydrogen Production

1. Price Impact
2. Volume Impact
3. Impact on Hydrogen Production Costs

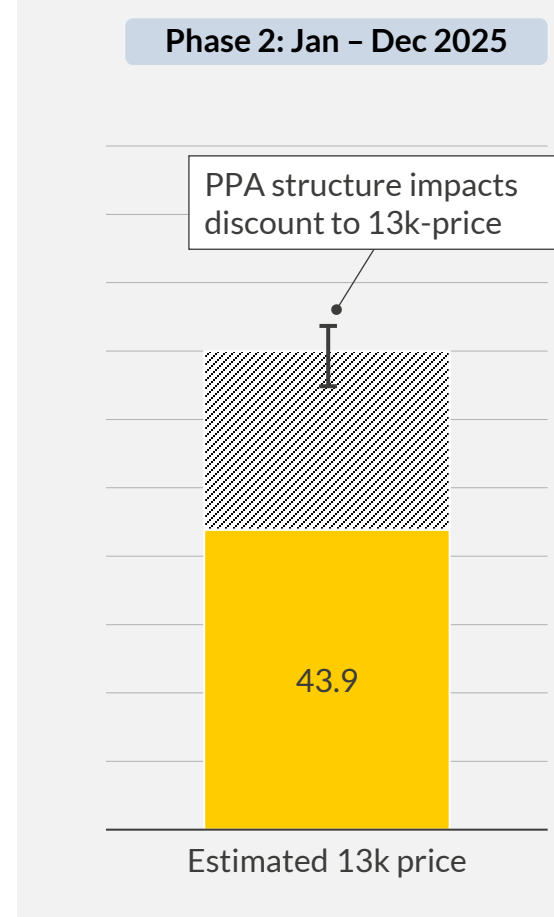
IV. Key Takeaways

The 13k price during the trial period is around 40% lower than a reference wholesale or PPA price

13k price in comparison to average wholesale price in hours of curtailment
€/MWh (nominal)



13k price in comparison to PPA price
€/MWh (nominal)

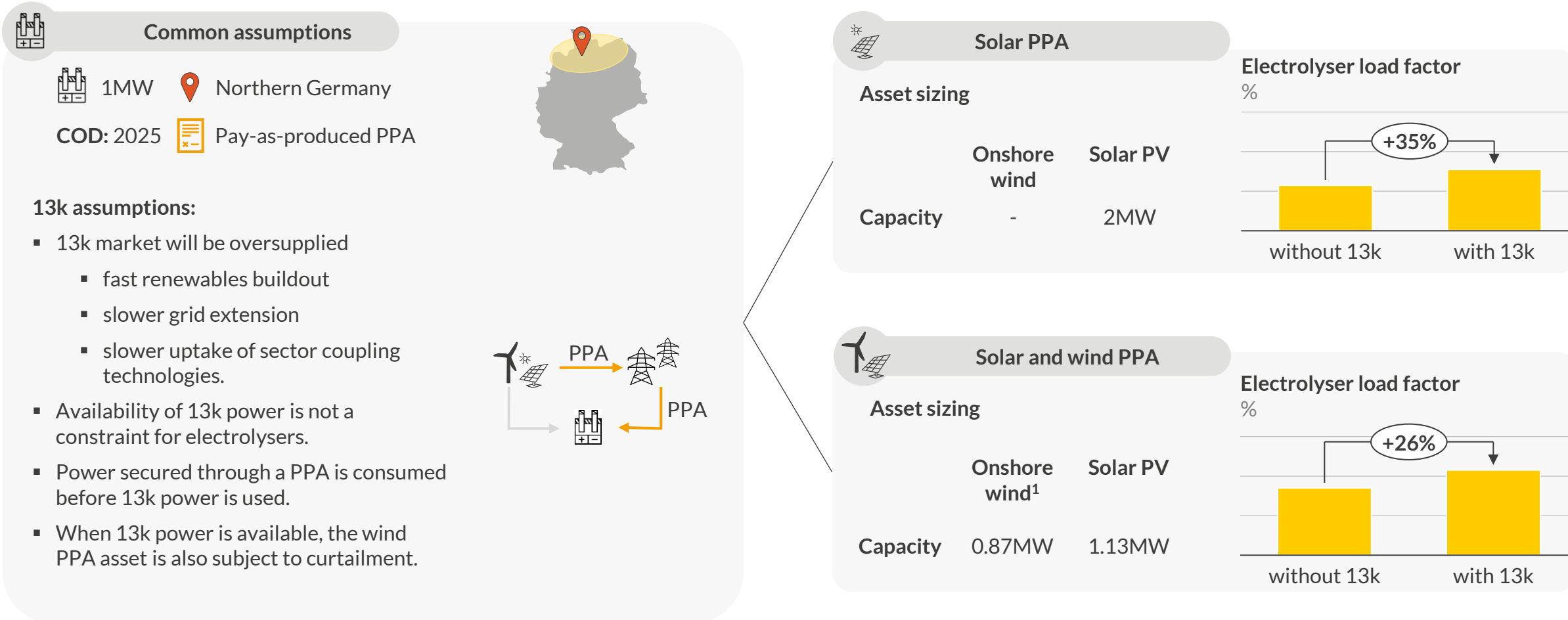


Discount to wholesale price 13k price

1) Represents the average historical wholesale electricity price range in 2023 during hours where grid curtailment was estimated to take place.

The option of procuring electricity through the 13k mechanism can increase annual electrolyser load factors by 26% to 35%

- Due to different PPA volumes, the procurement strategy of an electrolyser impacts the 13k impact on the LCOH.

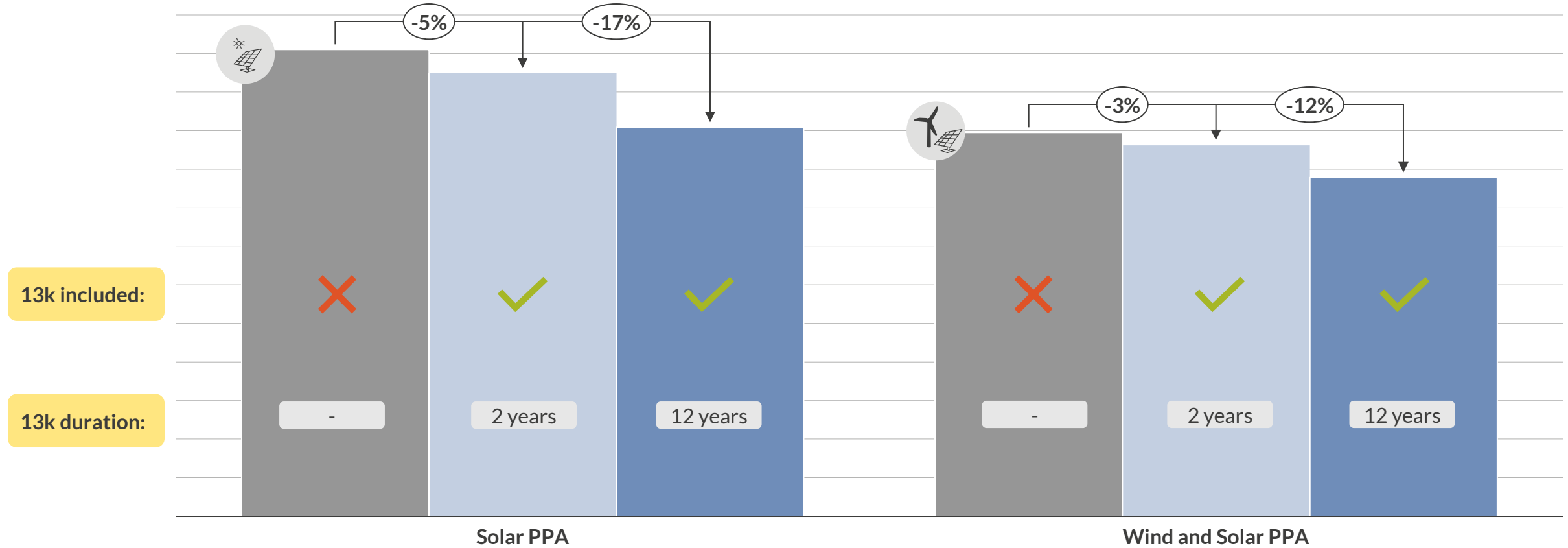


Chosen site
 Indication of eligible 13k regions
 Electrolyser load factor

1) In the event of curtailment, we assume that the onshore wind generation from the PPA asset is also curtailed.

Assuming 13k power to be available for 12 years, LCOH decrease by 12-17%; only participating in the trial period achieves a 3-5% decrease

Levelised cost of hydrogen (LCOH)¹, COD 2025
€/kg H₂ (real 2023)



■ PPA only ■ PPA and 13k power in trial period ■ PPA and 13k power available until 2036 (12 years)²

1) Assuming a discount rate of 10.5% and an electrolyser efficiency of 67%. 2) The 13k price is assumed to remain constant at the level of the final phase of the 2-year trial period and 13k power remains available until 2036.

Key takeaways

- 1** Curtailment is becoming an ever-increasing issue in the path to a decarbonised power system with costs reaching 2.5bn EUR and curtailed renewable electricity volumes of 10TWh in 2023.
- 2** The 13k mechanism is intended to extract economic rent out of the otherwise curtailed renewable energy to incentivise electric heat switching and electrolyser usage.
- 3** The mechanism will be implemented next month and run in a test phase for two years where power is made available for slightly above 40 €/MWh before changing to a competitive tendering process.
- 4** At our current projections for the testing phase, the 13k price could be around 40% lower than the average reference wholesale price in curtailment hours as well as a reference PPA price.
- 5** For electrolyzers, this price discount and a higher load factor could mean a reduction in LCOH of between 12% and 17%, which would make domestic electrolyser production significantly more competitive.

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Potential Bidding Zone
Split for Germany

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Renewables colocation:
New business models
with Batteries

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2 0 2 4

CfDs and PPAs
in Germany

S e p t
2 0 2 4

D e c
2 0 2 4

Outlook on new reliable
Hydrogen capacity in Germany

Portfolio Optimisation
in Germany

Details and disclaimer

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