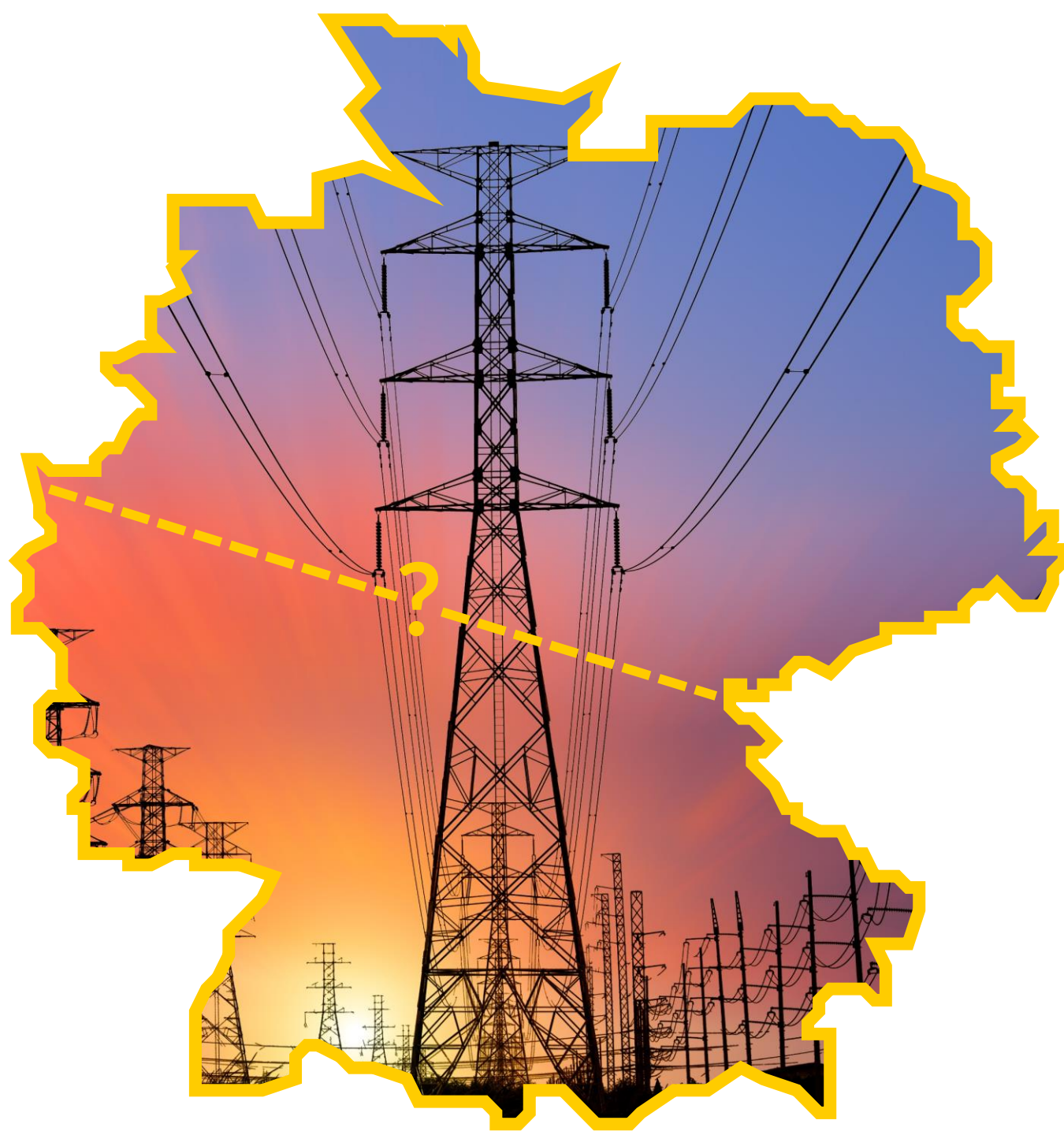


# Implications of a potential bidding zone split for the demand allocation in Germany

Enerday 2024 - Exploring Energy Demand Dynamics

12 April 2024



## I. Motivation

## II. Method

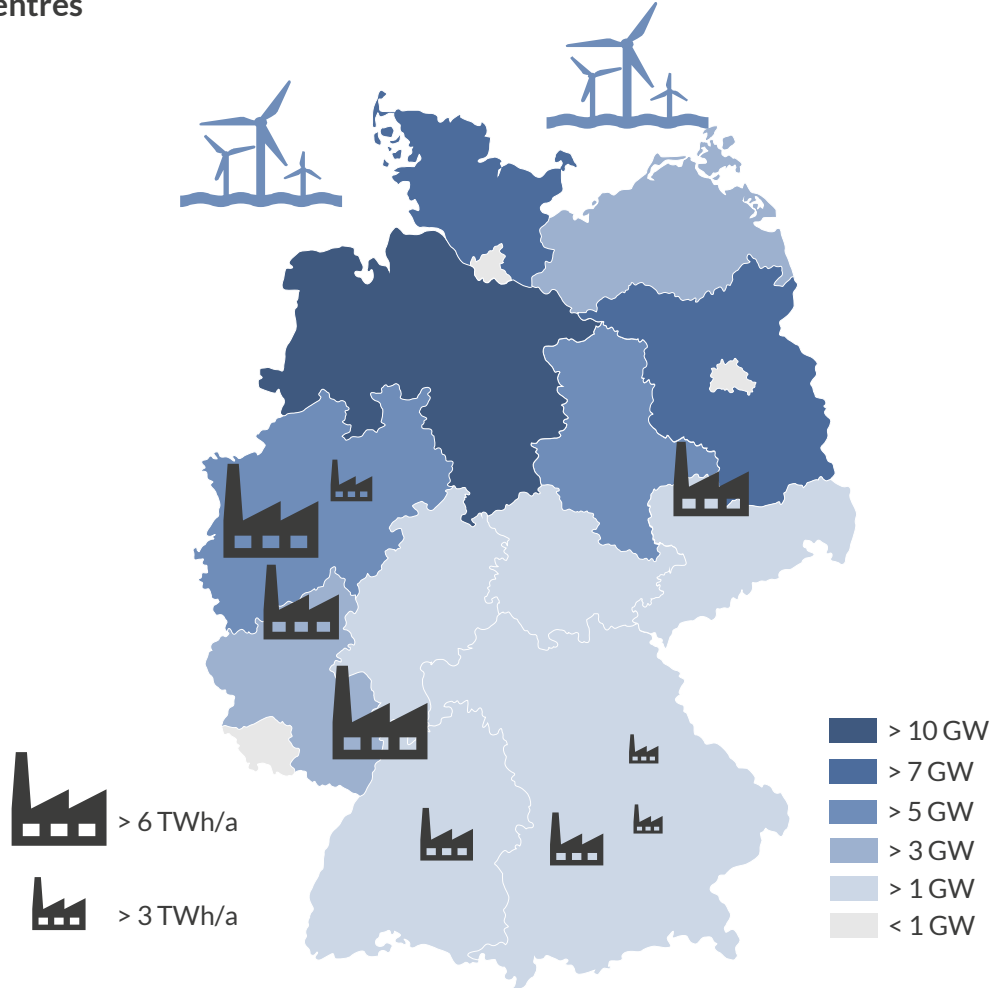
## III. Results

1. Power price impacts of a bidding zone split
2. Operating electrolysers under a split scenario
3. Cost impacts for industry

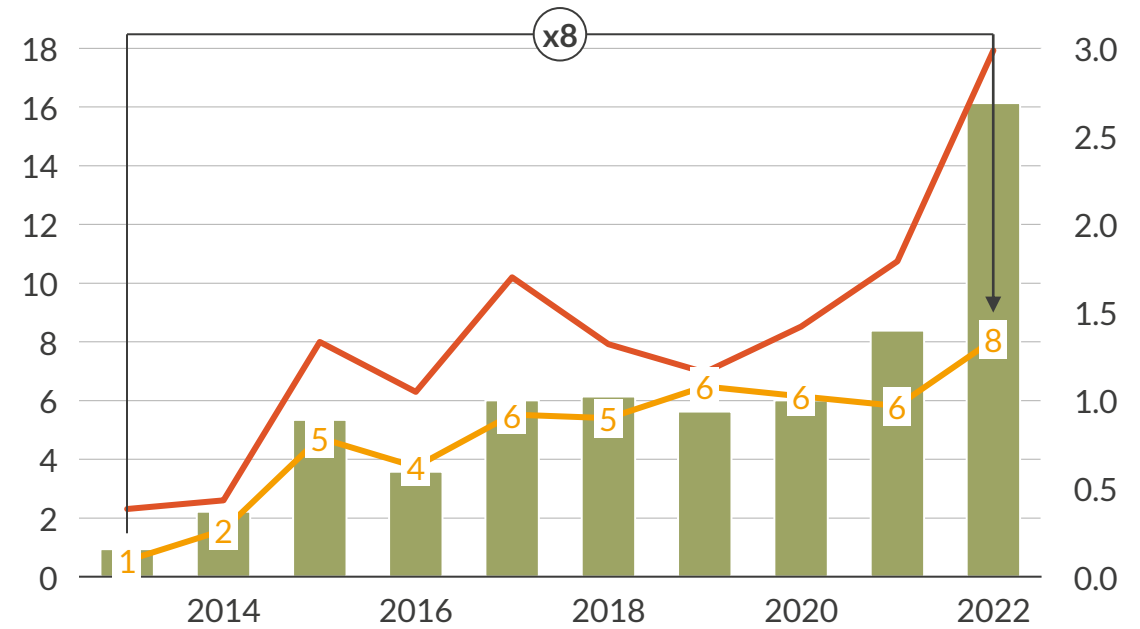
## IV. Conclusion

# Current load centres in the South do not match renewable generation in the North – without new localised incentives this trend will persist

Installed wind power capacity by federal state<sup>1</sup> and industrial consumption centres



Curtailed and redispatched generation TWh



Can a price zone split provide sufficient localised incentives to reduce the existing supply-demand imbalance?

Redispatched generation (Red line), Curtailed generation<sup>2</sup> (Yellow line), Curtailement and redispatch cost (Green bars)

1) Includes onshore and offshore wind capacities (2021). 2) Volume of *Einspeisemanagement*, now *Redispatch 2.0*.

## I. Motivation

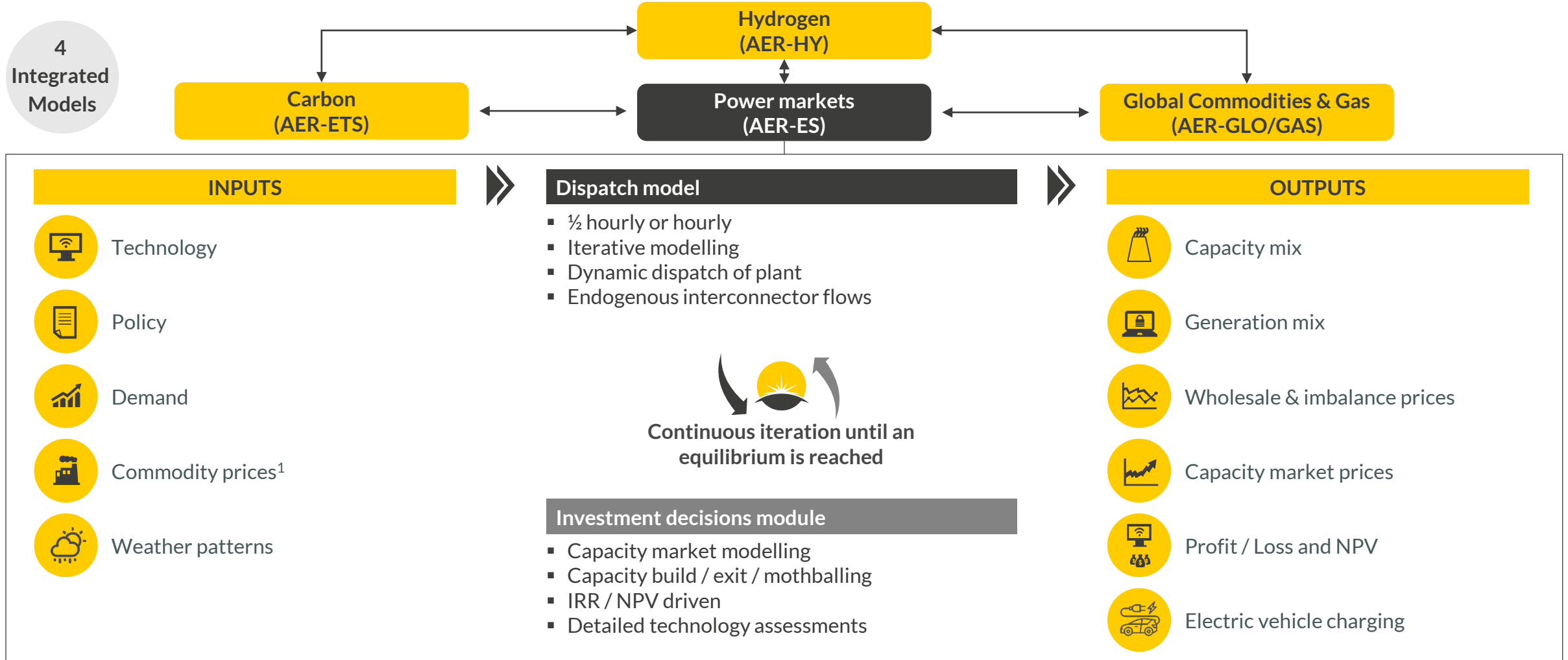
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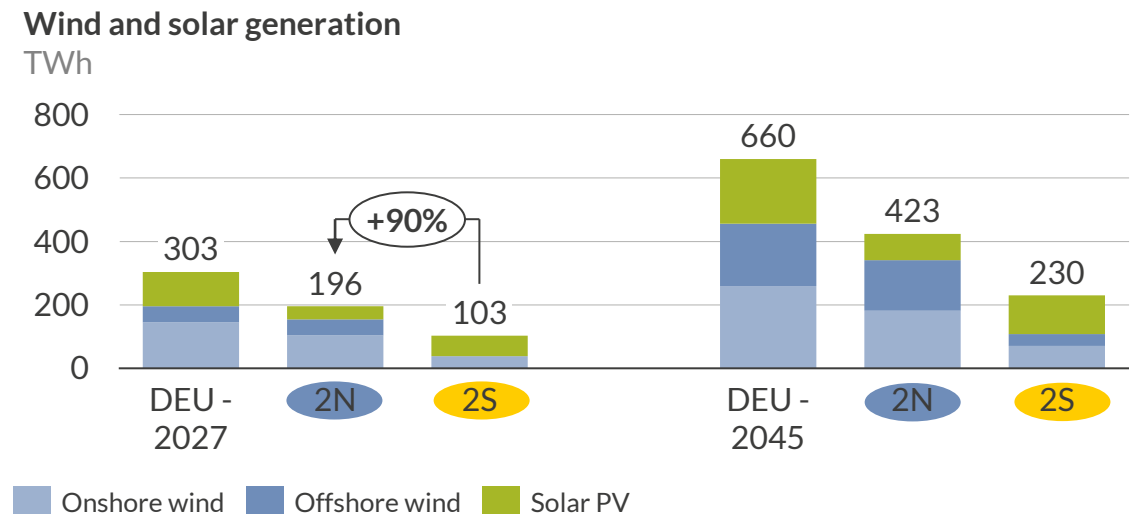
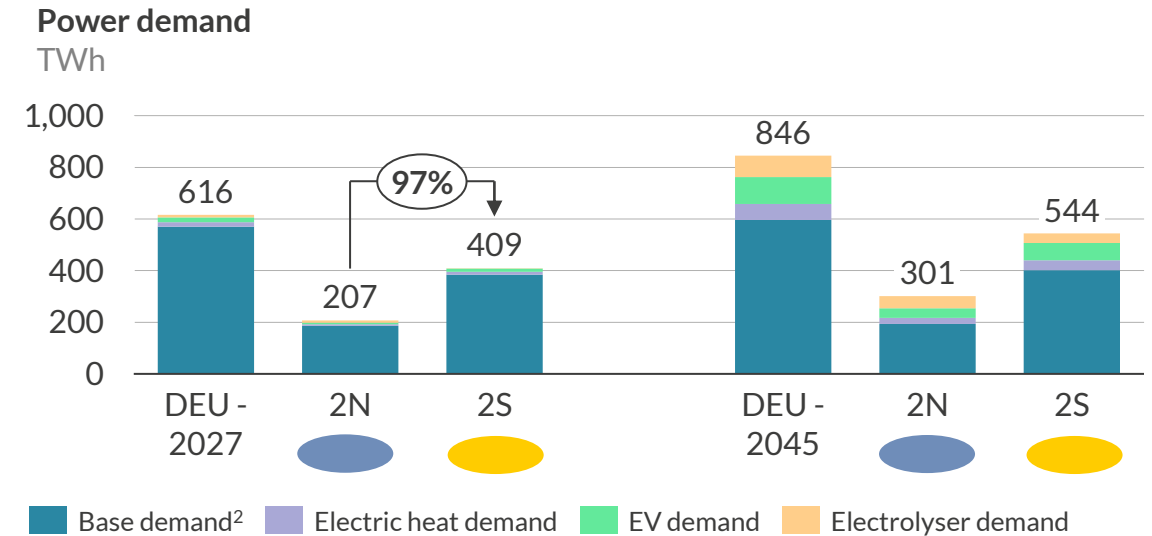
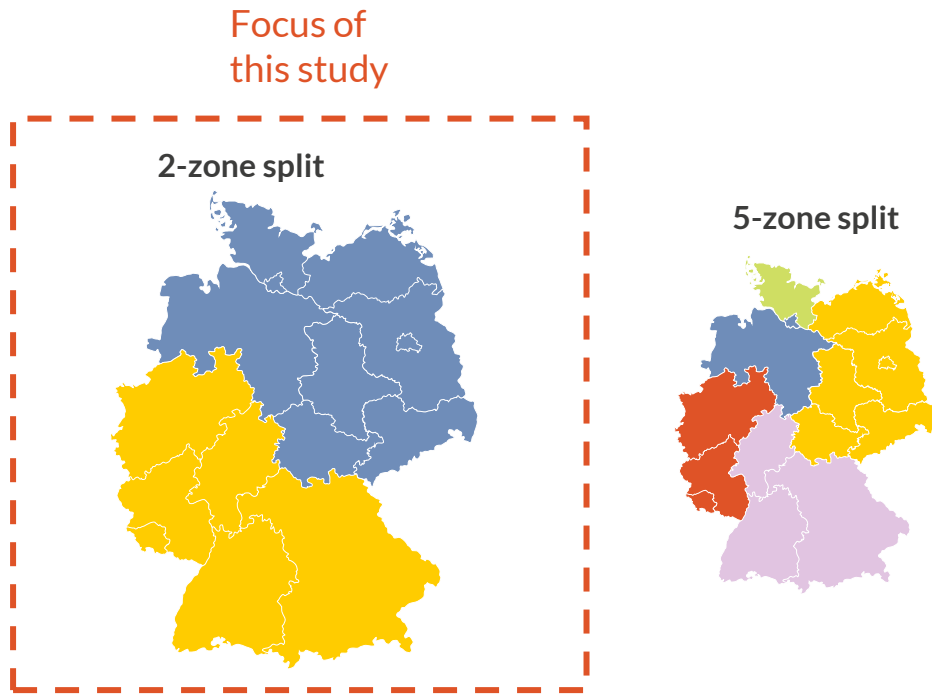
# European-wide dispatch and capacity optimisation model AERES, developed by Aurora Energy Research



1) Gas, coal, oil, carbon and hydrogen prices fundamentally modelled in-house with fully integrated commodities and gas market model.

# While smaller bidding zones increase locational incentives, a two-zone split likely has the least distortions on the existing power market

Next to other ACER<sup>1</sup> proposals, the two-zone split into North and South is the focus of this study as it is deemed the most likely configuration.



1) Agency for the Cooperation of Energy Regulators. 2) Includes power demand industry, households, commerce, and transport.

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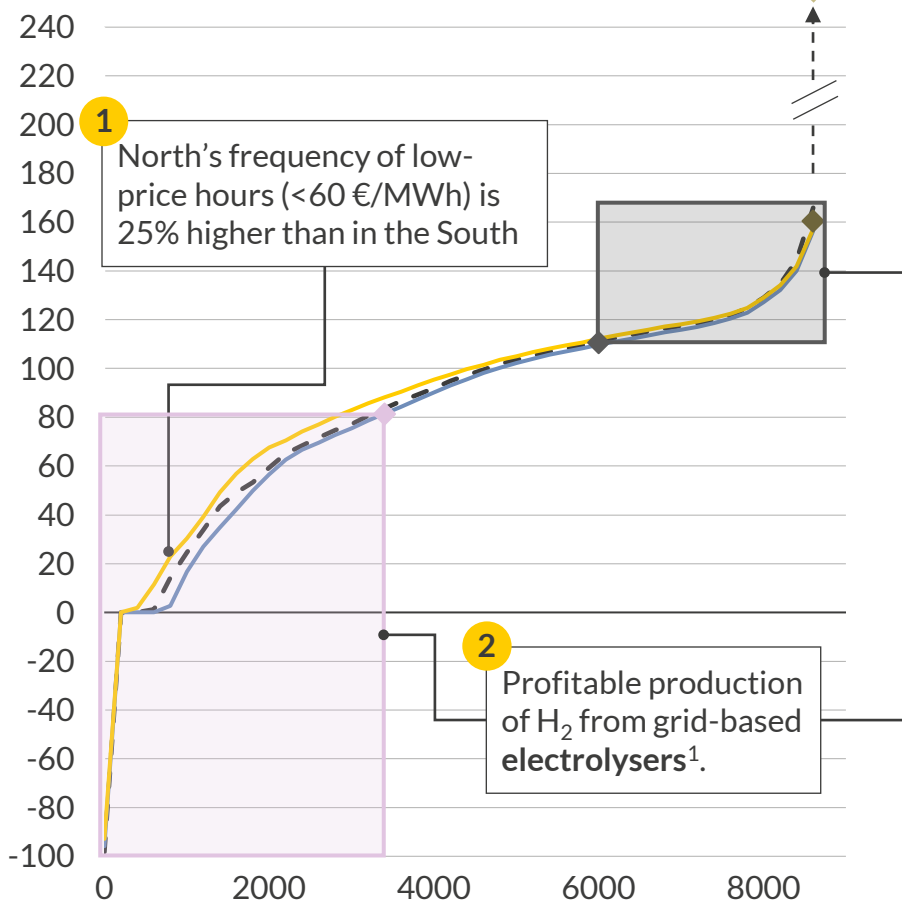
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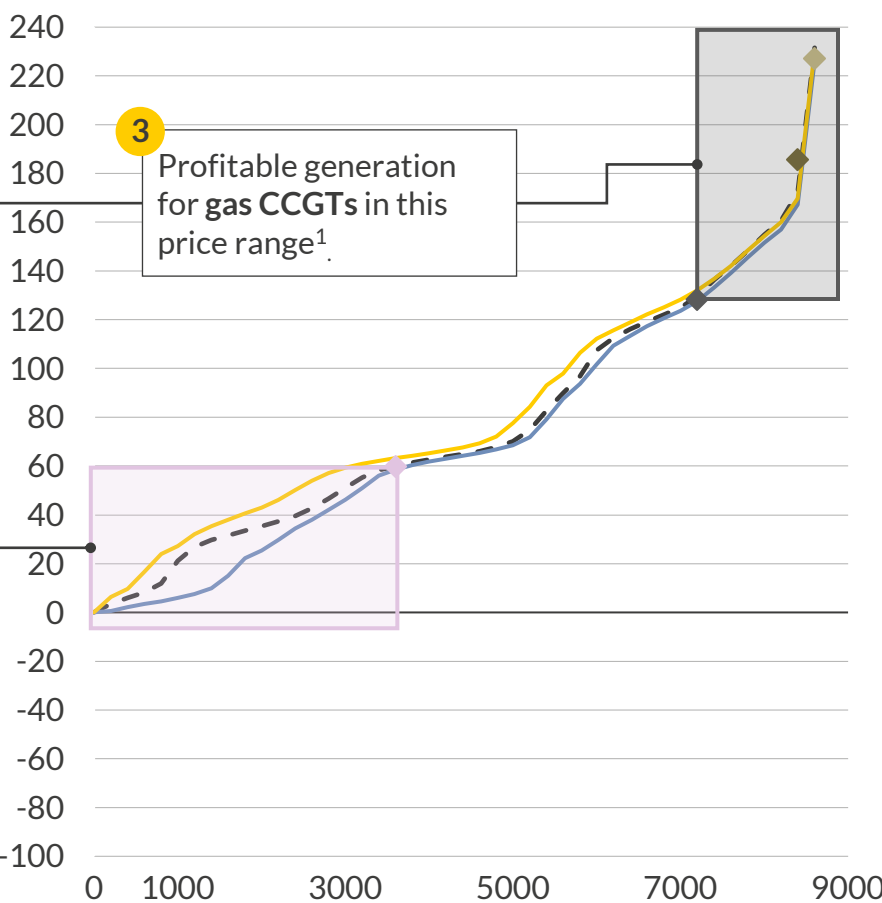
## IV. Conclusion

# The northern price zone is characterised by more low-price hours, while the price zones are similar regarding high-price hours

Price duration curve (PDC) 2030  
€/MWh (real 2022)



Price duration curve 2050  
€/MWh (real 2022)



--- DEU (no split) — North — South<sup>1</sup> SRMC<sup>2</sup>: ◆ electrolyzers ◆ gas CCGTs ◆ gas OCTGs ◆ H<sub>2</sub> peakers

## Impact of bidding zone split on electrolyzers and peakers

- 1 A bidding zone split leads to diverging prices between zones especially during low price hours. This is driven by the concentration of wind generation in the North.
  - 2 More and lower low-price hours allow flexible consumers like grid-connected electrolyzers to produce green hydrogen at lower costs in the North.
  - 3 A bidding zone split has only limited effect on dispatchable thermal assets as high price hours are very similar between both price zones.
- The locational steering effect based on the price differences is therefore very low for dispatchable thermal assets and comparatively high for grid-connected electrolyzers and other flexible consumers.

1) Area determined based on intersection of SRMCs from electrolyser and gas CCGTs and the PDC curves. 2) Short-run marginal costs.



# A split of the German bidding zone would mean that grid-based electrolysers in the Northern zone would not require a PPA to procure green power

## Effect on electrolyser projects in Germany



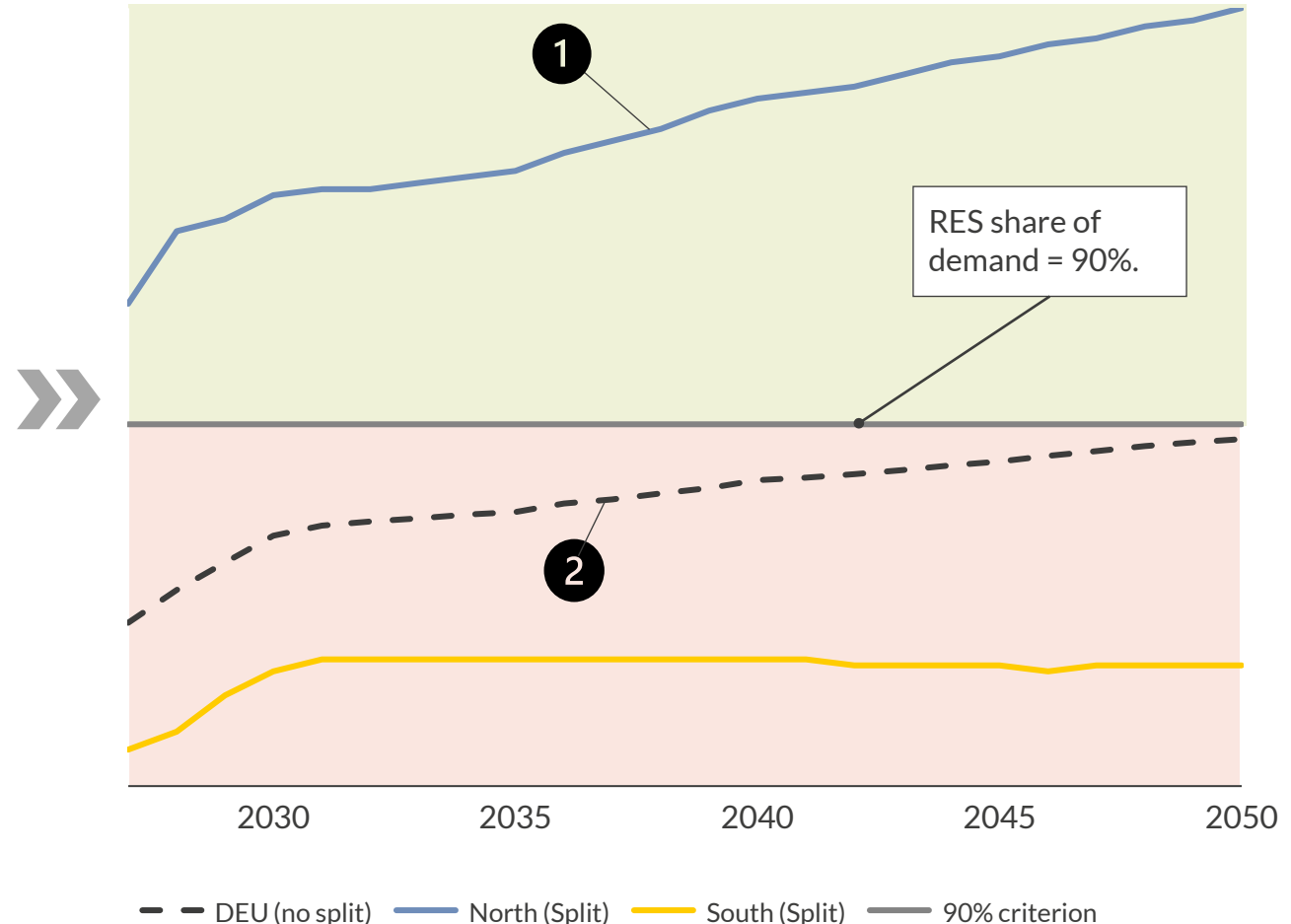
**1** With a price zone split, the northern zone would have a RES share of demand > 90%.

As a result, the production of green H<sub>2</sub> from grid-based electrolysers would be permissible without a PPA.

**2** If the price zone split is not enacted, the German grid is not expected to reach 90% renewables as a percentage of demand until after 2050.

Electrolysers would continue to require PPAs under RED-II.

## Renewable generation relative to power demand<sup>1</sup> (“RES share”)

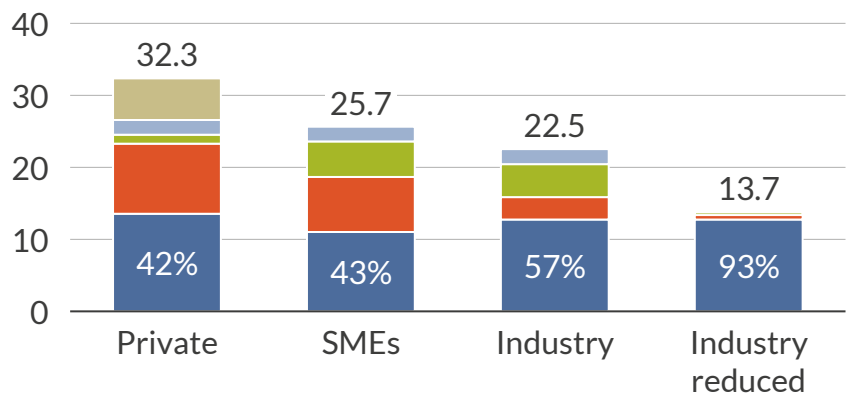


1) Analysis based on the July 2023 publication of Aurora Central. RES share of demand is higher than 100% as Northern Germany is a net exporter of electricity.

# Industrial power prices in the South are expected to increase by 3% in 2030 compared to a single zone, having a limited effect on OPEX of most industry

## 1 Exposure to wholesale power prices and international competitiveness

Power price components by consumer group in H1 2022<sup>1</sup>  
€ ct/kWh (real 2022)

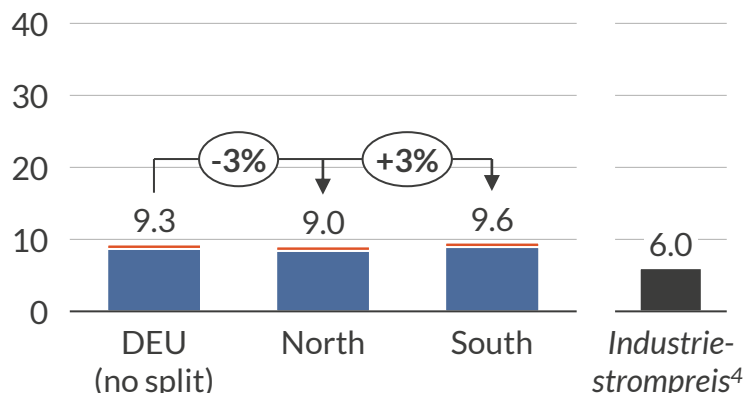


VAT Electricity tax EEG levy Grid fees Procurement

- Energy-intensive industrial consumers are more vulnerable to increases of wholesale prices (procurement costs), as they make up more than 90% of their power costs.

## 2 Industrial power prices with a bidding zone split

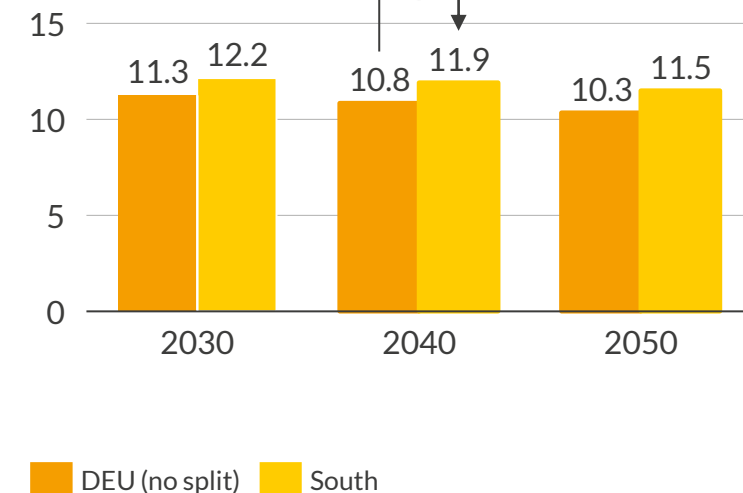
Power prices for energy-intensive industry in 2030<sup>3</sup>  
€ ct/kWh (real 2022)



- European competitiveness of energy-intensive industry is hardly affected by a bidding zone split. However, global competitiveness of southern consumers would come under further pressure.































## 3 Cost impact on industrial profitability

Power costs in the steel industry employing EAFs<sup>5</sup>  
% of OPEX



- For the steel industry in the South, power costs would make up 1.1 percentage points more of their OPEX compared to a single bidding zone.
  - Assuming that electric arc furnaces are employed as means of decarbonisation.

# A bidding zone split is beneficial from a system perspective, but additional regional instruments are needed

Instrument		Reliable capacity	Hydrogen	Energy-intensive industry	Renewables	+ Advantages	- Disadvantages
System-wide instruments	1  Bidding zone split					<ul style="list-style-type: none"> <li>Hourly regional price signals</li> <li>Market-based solution</li> <li>Rather easy implementation</li> </ul>	<ul style="list-style-type: none"> <li>Reduced market liquidity</li> <li>Higher prices for consumers and industry in the South</li> </ul>
	2  Grid fees for generators					<ul style="list-style-type: none"> <li>Regional investment incentives</li> <li>Grid costs are shared between consumers and generators</li> </ul>	<ul style="list-style-type: none"> <li>No regional hourly price signals</li> <li>Difficult to estimate adequate fee, especially in the long run</li> </ul>
	3  Time-variable grid fees					<ul style="list-style-type: none"> <li>Granular (regional) price signals</li> <li>Can tap large flexibility potential</li> </ul>	<ul style="list-style-type: none"> <li>Rather difficult to implement, depending on digitalisation</li> <li>Risk exposure for consumers</li> </ul>
	4  Auctioning excess generation					<ul style="list-style-type: none"> <li>Could possibly reduce redispatch management cost and curtailed renewables generation</li> </ul>	<ul style="list-style-type: none"> <li>Rather small expected impact</li> <li>Risk of strategic gaming, unless very well designed</li> </ul>
Targeting specific actors	5  Regional EEG subsidies					<ul style="list-style-type: none"> <li>Effective steering of regional renewables buildout, lowering redispatch and congestion cost</li> </ul>	<ul style="list-style-type: none"> <li>Requires more complex subsidy/auction system</li> <li>No regional hourly price signals</li> </ul>
	6  Regional subsidies for H2-ready plants					<ul style="list-style-type: none"> <li>Can steer regional deployment of new H<sub>2</sub>-ready gas plants effectively</li> </ul>	<ul style="list-style-type: none"> <li>Targets only sites for new plants</li> <li>Requires complex subsidy/auction system</li> </ul>



# Agenda

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## I. Motivation

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## IV. Conclusion

# Key takeaways

## Can a price zone split provide sufficient localised incentives to reduce the existing supply-demand imbalance?

- 1** The price zone split would mostly influence buildout decisions for flexible consumers and less for dispatchable capacities. This results from the fact that there are 25% more low-price hours (<60 €/MWh, in 2030) in the North compared to the South, whereas the more expensive price hours (>120 €/MWh) are similar in both bidding zones.
- 2** A price zone split allows the production of grid-based green hydrogen as early as 2027 in the North. A high renewables share in the power mix allows the RED compatible consumption of power from the grid alleviating the need for a PPA.
- 3** Industrial power prices in the South are expected to increase by 3% in 2030 compared to a single price zone. Settlement decisions for industrial facilities are therefore unlikely to be influenced by a zone split.
- 4** The two-zone price split is beneficial but cannot provide granular price signals for the grid. Alternative or additional policy instruments are likely necessary if stronger locational signals for dispatchable capacities, industrial demand and renewables are desired. Targeted instruments such as regionalised subsidies for renewables, dispatchable capacities or a grid fee reform could lead to the desired incentives.

## Details and disclaimer

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### Publication

Implications of a potential bidding zone split for the demand allocation in Germany

### Date

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### Prepared by

Lukas Günner  
(lukas.guenner@auroraer.com)

### Max Fydrich

(max.fydrich@auroraer.com)

### Claudia Günther

(claudia.guenther@auroraer.com)

### Approved by

Hanns Koenig

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