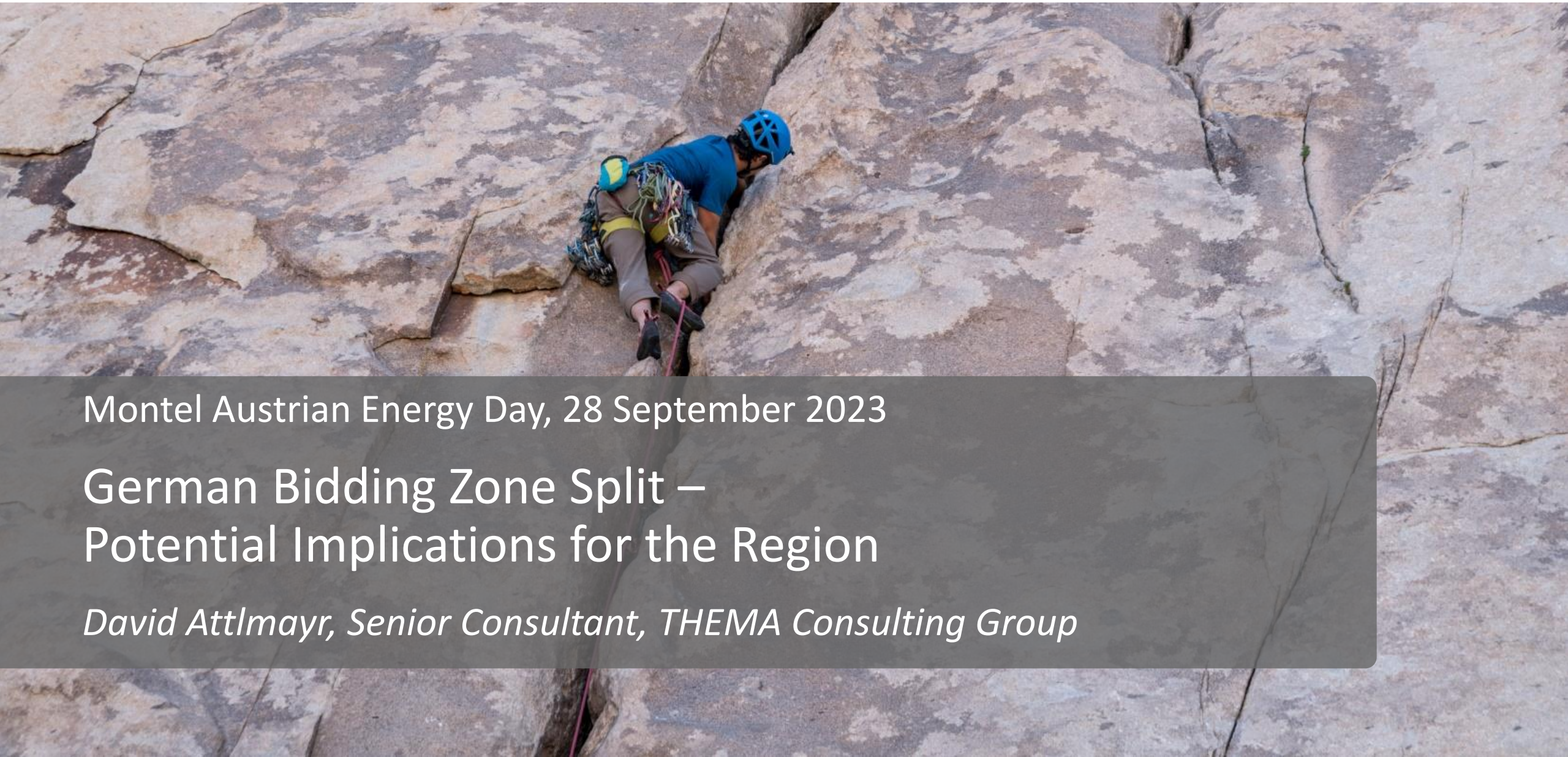


Montel Austrian Energy Day, 28 September 2023

German Bidding Zone Split – Potential Implications for the Region

David Attlmayr, Senior Consultant, THEMA Consulting Group

Agenda

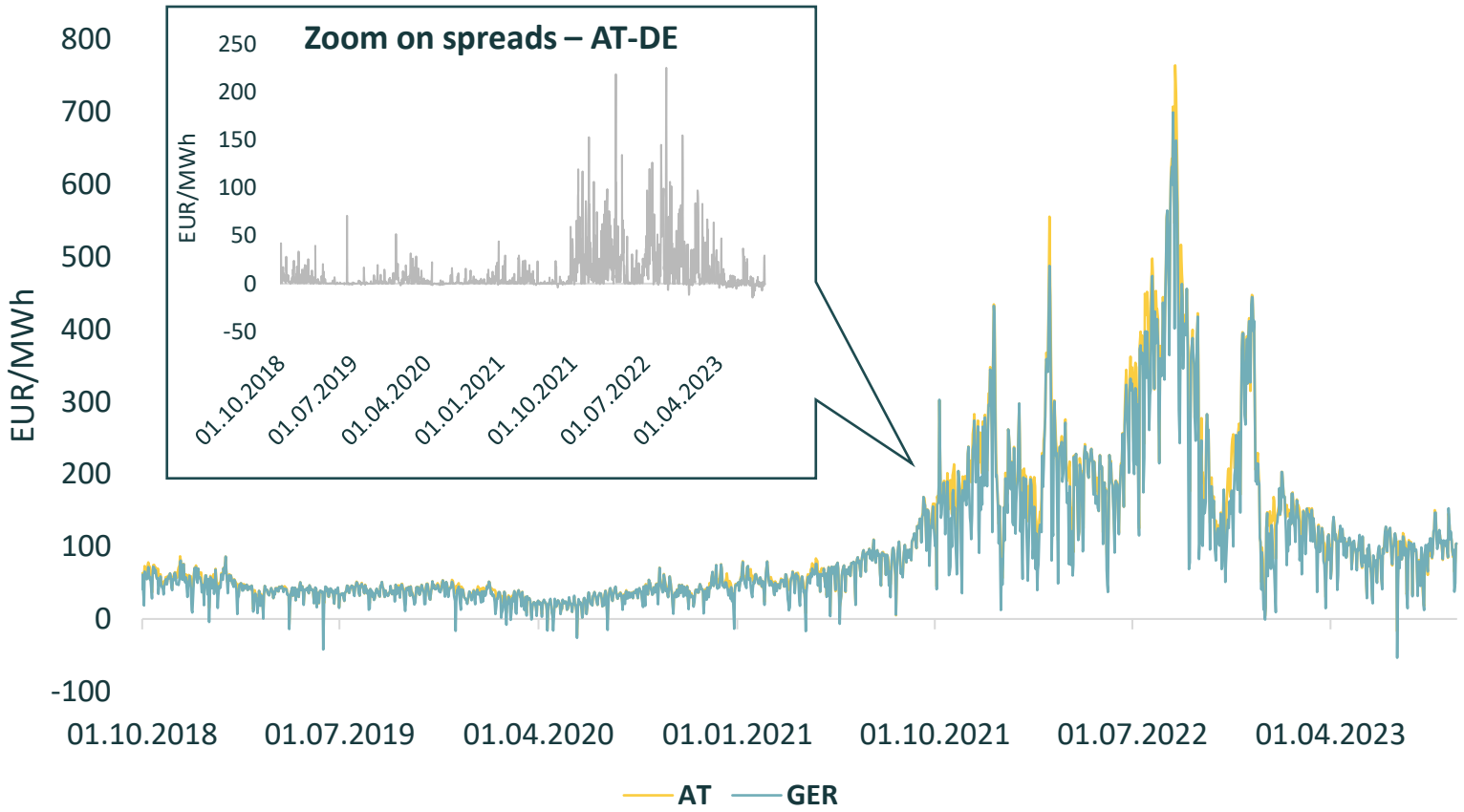
1. Where things stand - German and Austrian power market outlook
2. The grid situation in Germany: challenges and implications
3. Consequences of a potential bidding zone split for Germany and Austria

Agenda

1. **Where things stand - German and Austrian power market outlook**
2. The grid situation in Germany: challenges and implications
3. Consequences of a potential bidding zone split for Germany and Austria

Austrian day-ahead power prices usually trade at a premium to the German market since the AT-DE bidding zone split in October 2018

Day-ahead price developments in Germany and Austria since the bidding zones were split: Especially in times of high, or zero/negative prices, the zones decouple



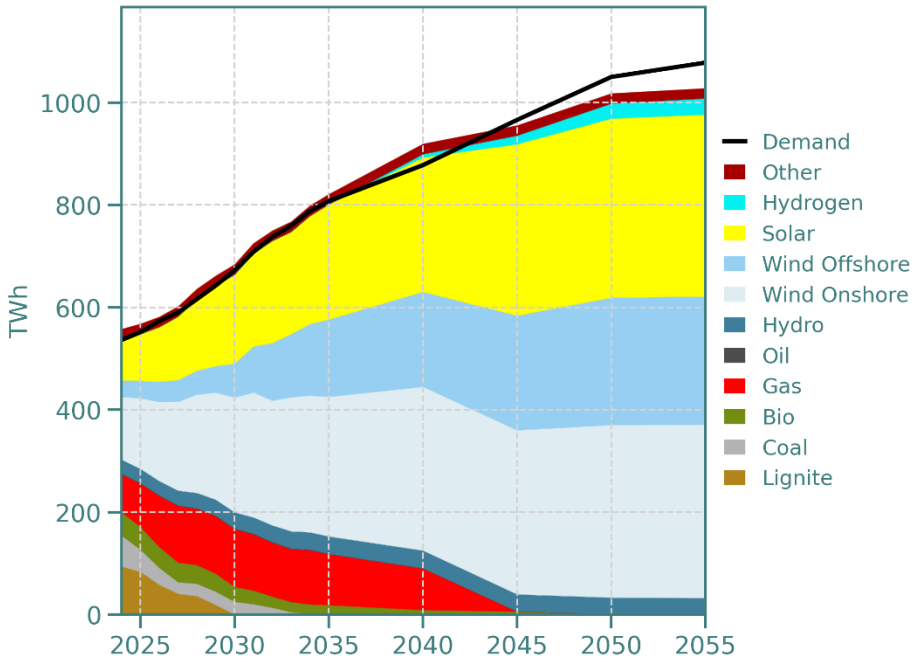
Source: Montel (2023); PHS = pumped hydro storage

Commentary

- Generally, Austria sees higher price levels than Germany
- Zero/negative prices in times of peak wind/solar generation in DE do not always spill over into Austrian market
- Hence, Austria´s power market is somewhat less volatile than the German wind- and solar-dominated power system, also due to PHS capacities
- Usually, the price premium is stronger in the winter due to lower hydropower availability/output

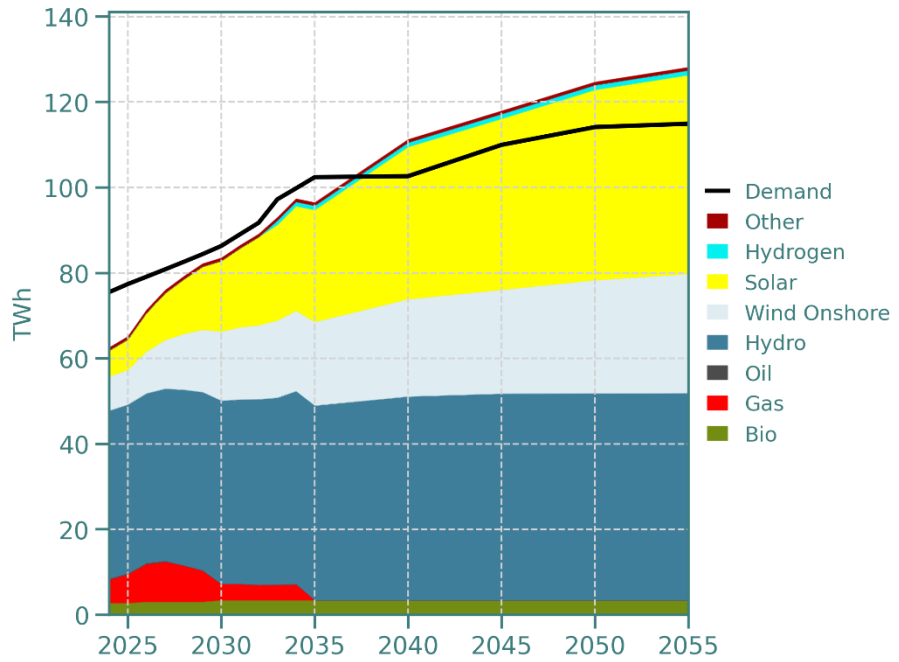
Germany focuses on wind and solar but solutions for flexibility will be in strong demand, while Austria struggles to achieve its RES buildout target and continues to depend on gas

Generation mix in Germany towards 2050 (THEMA Base - SEP23)



- Current RES boom only for solar so far, with onshore wind being unpopular. Offshore wind auction boom, but potentially unprofitable
- New supply-side flexibility options only after 2035 (hydrogen)
- Gas will remain price setting for the next decade at least

Generation mix in Austria towards 2050 (THEMA Base - SEP23)



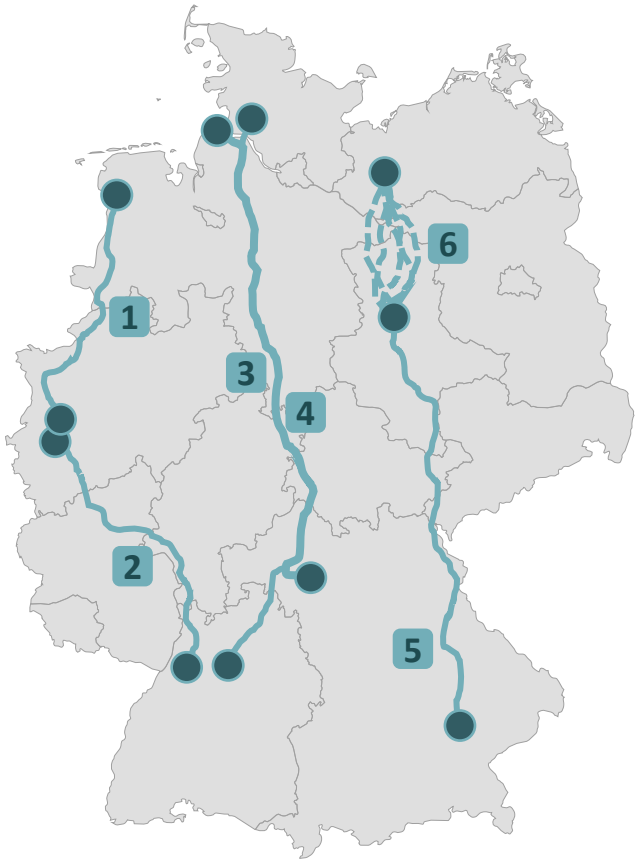
- Ambitious policy goals but increasingly difficult to achieve amid delays in regulation and local opposition
- Flexibility from hydropower well-suited for integration of RES
- Dependence on power imports in the short term

Agenda

1. Where things stand - German and Austrian power market outlook
2. **The grid situation in Germany: challenges and implications**
3. Consequences of a potential bidding zone split for Germany and Austria

In the absence of timely grid expansion, the German power system is confronted with internal challenges as a consequence of the *Energiewende*

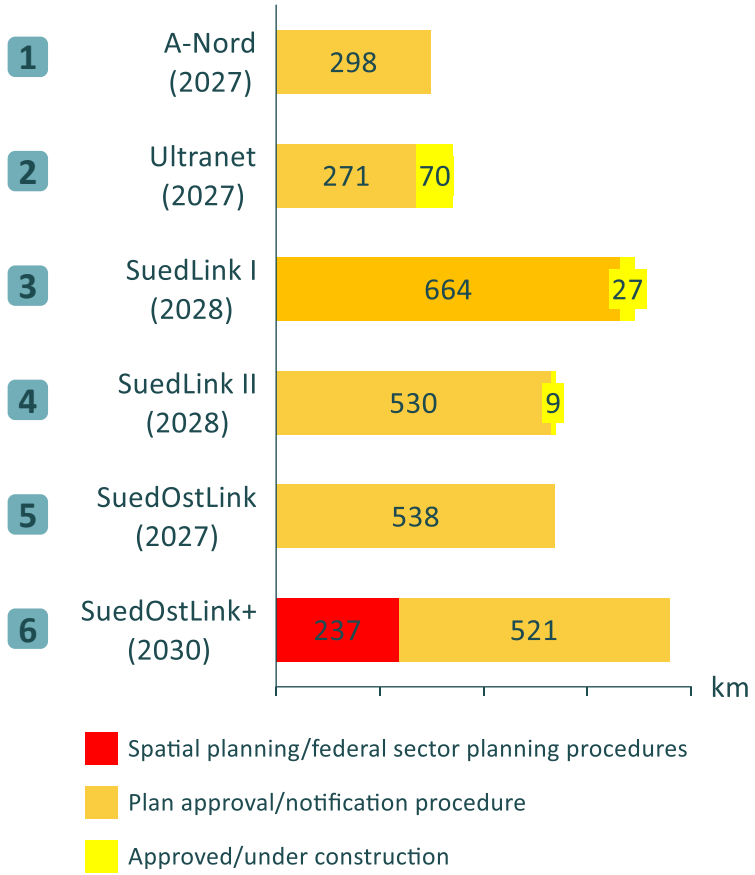
Despite existing delays and the urgent need to build new capacity…



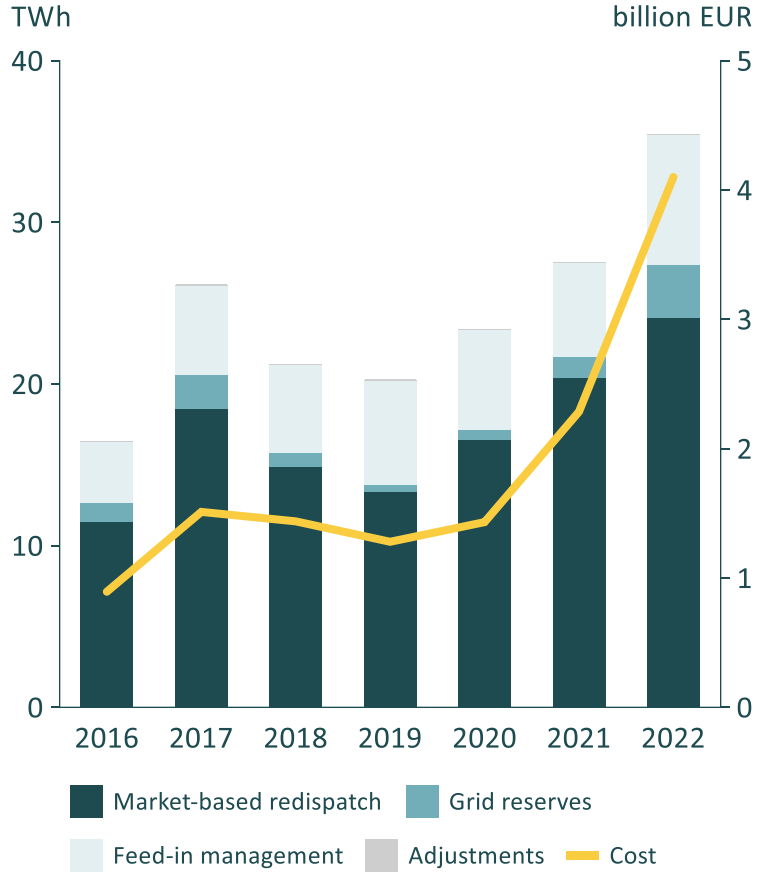
AC-DC converter stations (start-/end-points)

HVDC power line

… most HVDC projects are still in the final stages of plan approval procedure*



One consequence: redispatch needs and costs rapidly rising over the last years



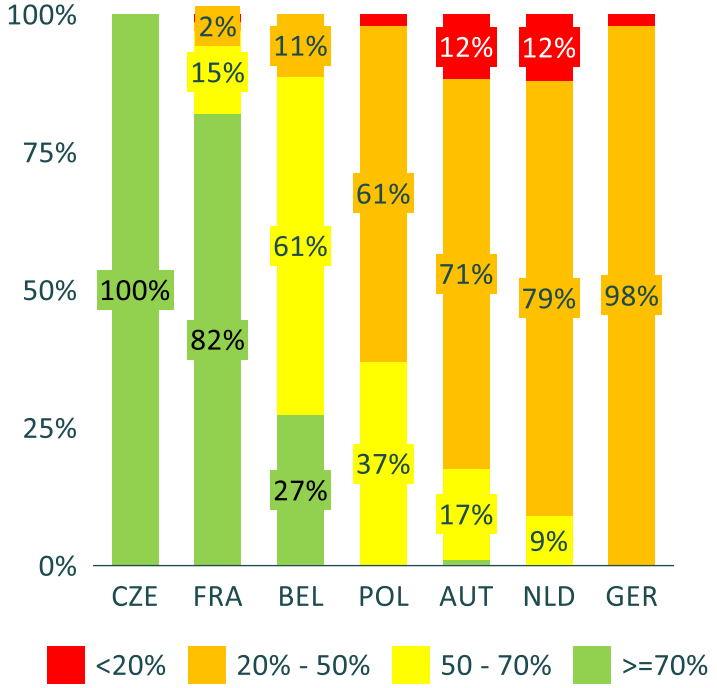
Sources: BNetzA (2023); netzausbau.de (2023); Monitoringbericht (2019-22); Netzengpassmanagement Gesamtjahr 2022;
**ACER estimates average lead times of more than 10 years for HVDC projects in Germany*

The German congestion issues also lead to problems in neighbouring markets

The country still has a long way to go with regard to 70% rule fulfilment and tackling loop flows

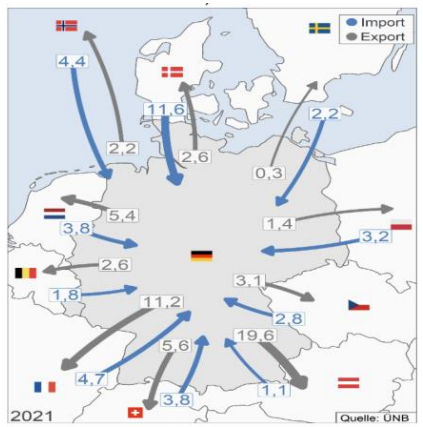
Germany (as many others) is far off from reaching 70% cross-zonal capacity target

Percentage of hours when the 70% target was reached in DE & neighbouring Core region (between 09.06.2022 – 31.12.2022)

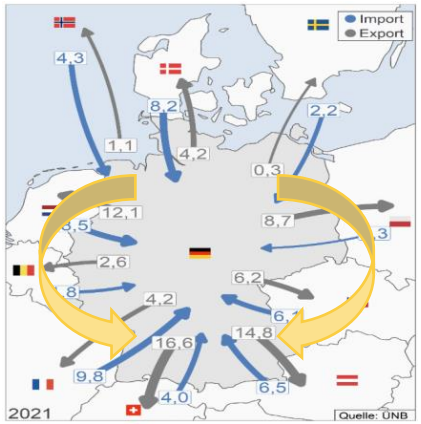


Loop flow* issue (& costly remedial actions) persists

Cross-border electricity trade (in TWh)



Physical flows (in TWh)



Commentary

- EU Electricity Market Regulation stipulates:
  - 70% of transmission capacity must be made available for cross-border trade
  - 30% may be used for internal and loop flows and reliability margin
- What can be done to increase cross-zonal trading capacity?
  - Grid expansion
  - Improved bidding zone design
  - Use of all remedial actions
  - Flow-based Market Coupling

*Sources: ACER (2023) Report on cross-zonal capacities and 70% MACZT; BNetzA (2023) Monitoringbericht; NEP (2023); *When electricity from one bidding zone passes through a bidding zone not involved in the commercial transaction and returns to the zone from which it originated*

European regulation includes two key triggers for bidding zone reform: The Bidding Zone Review process and the 70% rule

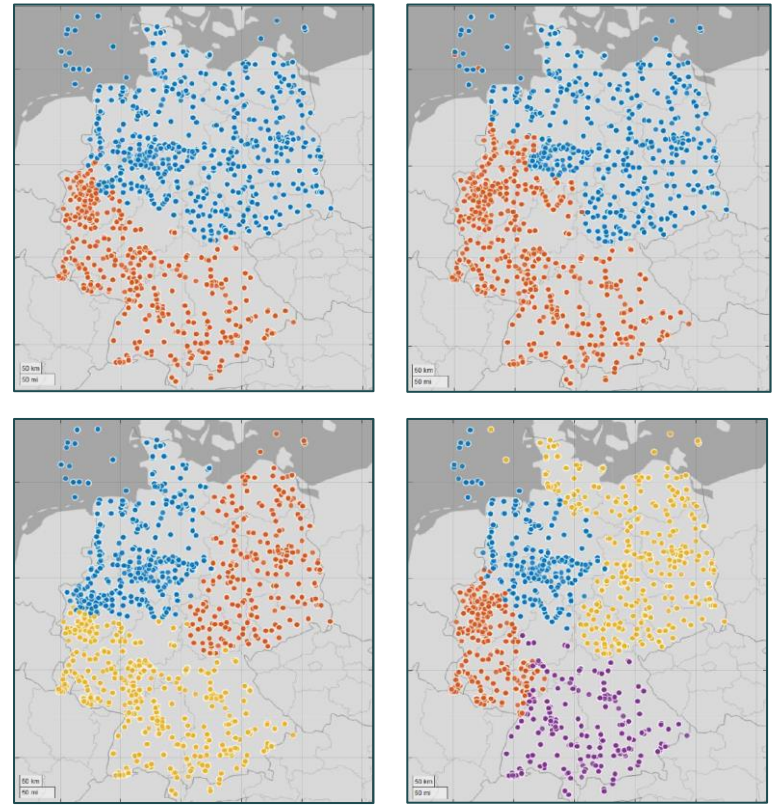
As shown in the previous slides, Germany currently does not fulfil the requirements to keep a unified bidding zone under EU regulation after 2026

Bidding zone legitimate if:

- **No long-term structural congestion inside** the bidding zone
- **No distortion of trade outside** the bidding zone

- Results of Bidding Zone Review (BZR) expected for February 2024
- Action Plans to implement 70% rule will expire at the end of 2025
- If a Member State cannot meet the 70% rule **from 2026, it is required to consider the need for a BZ reform**
- Decision on bidding zone redesign may be **escalated to the European Commission** in consultation with ACER if a Member State wants to keep existing configuration contrary to the recommendations of the BZR or when failing to comply with 70% rule*
- Discussion back on political agenda in Germany (Northern vs. Southern states, inner-coalitional differences in government)

Alternative proposals for German bidding zone design in ACER's BZ Review process



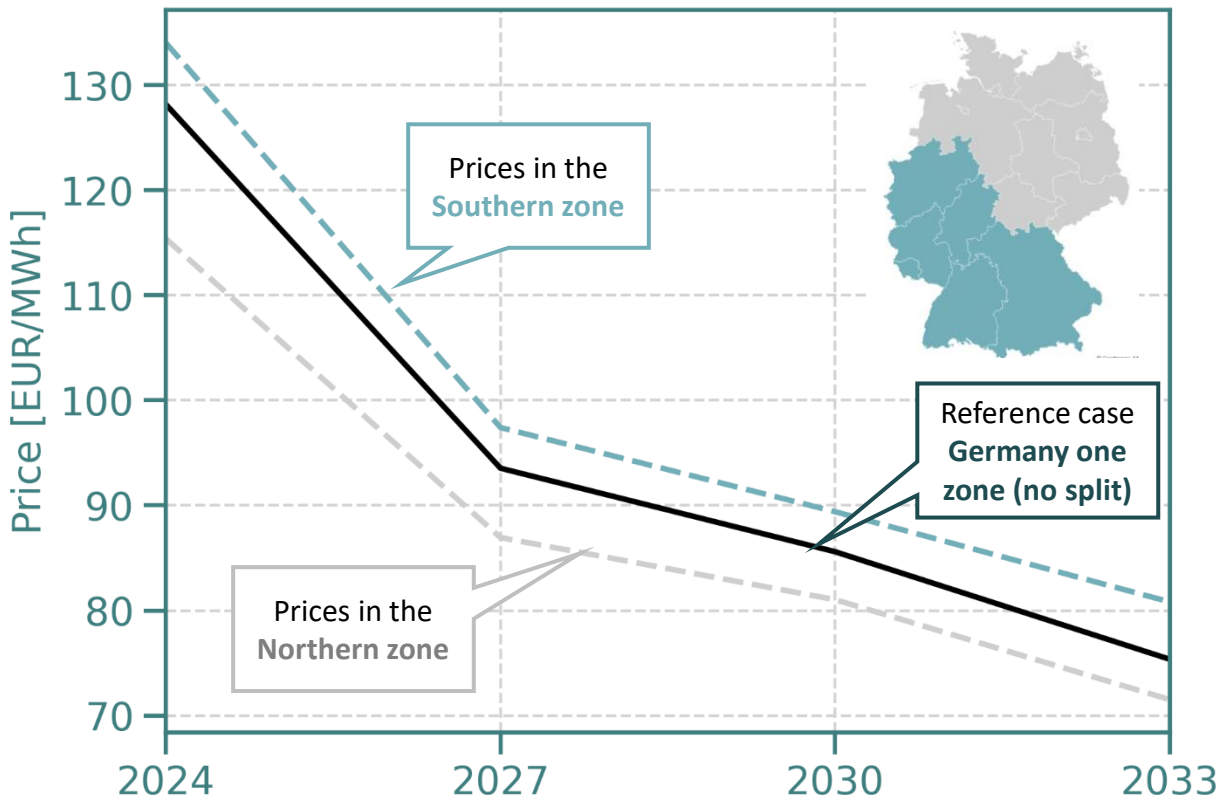
Sources: ACER (2022) Decision on alternative electricity bidding zone configurations; Electricity Market Regulation (EU) 2019/943;
** and if other affected Member States object*

Agenda

1. Where things stand - German and Austrian power market outlook
2. The grid situation in Germany: challenges and implications
3. **Consequences of a potential bidding zone split for Germany and Austria**

Splitting Germany into a Northern and Southern bidding zone creates a significant price spread, implying also significant impacts on neighbouring countries

Average annual power prices in two-zone split, North-Rhine Westphalia in the South (close to ACER Option 2, real 2023 EUR)



A split may address redispatch costs, loop flows and give incentives to new generation and demand location

- A bidding zone split would have a significant price impact in the respective bidding zones, with prices in the North significantly lower than in the South
- Spread most pronounced in 2024 and declining somewhat towards 2030. The reduction in spread is a result of the assumed HVDC upgrades (in NEP)
- Clear correlation between hourly wind feed-in in the North and the hourly price spread
- Market values (capture prices) would adjust accordingly, decreasing significantly in the North of Germany (by ca. 25% in 2024 and 20% in 2027) and increasing (also for solar PV) in the South
- Lower prices and increased number of low-price hours may increase the utilisation of electrolysers in the North, subject to whether they can operate flexibly and are price-sensitive

Source: THEMA calculations from Bidding Zone Study; NEP = Netzentwicklungsplan (German grid development plan)

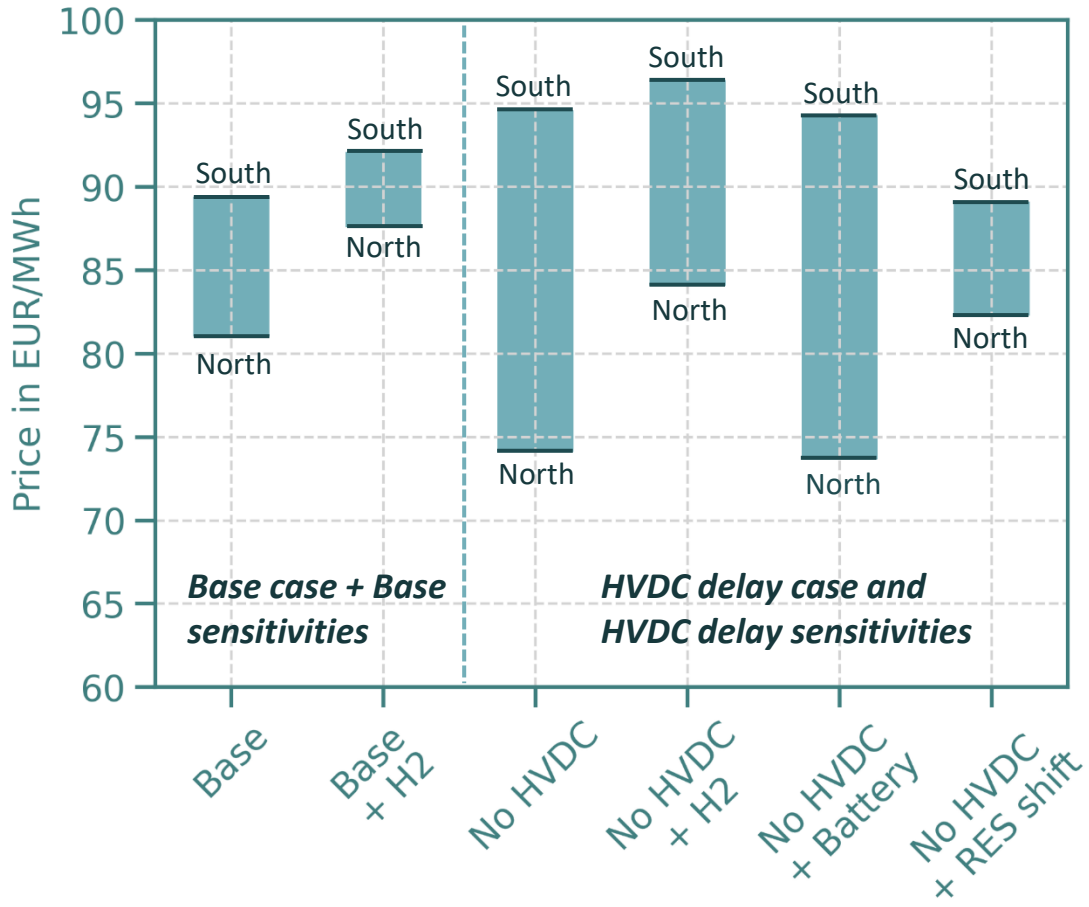
Internal grid developments in Germany are crucial for size of spread. Electrolyser investments or shifting RES from North to South could help to reduce congestions

Main drivers and sensitivities modelled in addition*

The analysis presented here focuses on the **year 2030**. Main insights:

- **["No HVDC"]**: **Without new HVDC** lines from N→S, price spread would be much higher. Base case assumes HVDC buildout according to NEP
- **["H2"]**: More electrolysers in the North would result in a reduction of the North-South price gap. But electrolysers would increase prices (more in North than in the South). **Base case and** the **HVDC delay** case with **15 GW** of **electrolysers in the North**
- **["Battery"]**: Batteries unlikely to reduce spreads/internal congestion. Markets modelled with **15 GW of new battery capacity in the North.** Almost no impact on prices as batteries have limited storage capacity
- **["RES shift"]**: Shifting RES from North to South can reduce spreads. Here, **60 TWh of wind generation in the North is replaced by a mix of PV and wind in the South** (RES distribution in Base Case from NEP)

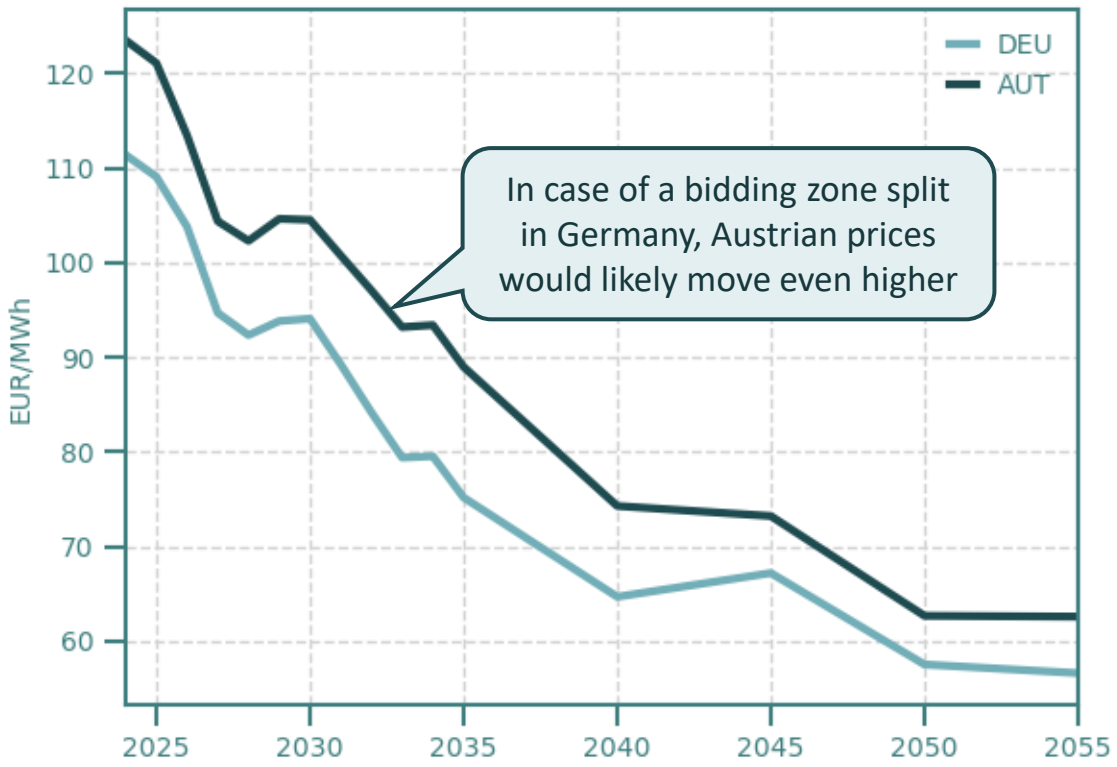
Price spreads in 2030 across sensitivities (THEMA simulations)



** Names in brackets refer to scenario in the figure to the right. The full study includes further and more granular sensitivities.*
NEP = Netzentwicklungsplan (German grid development plan)

A split would lead to higher, but potentially less volatile prices in Southern Germany. This could increase revenues of intermittent RES in Austria, but may tarnish PHS profitability

Future power price developments in Germany and Austria according to THEMA Base case (SEP23) – no split



Commentary

- Germany currently sees many hours with zero and near-zero prices due to the large northern wind surplus
- Number of hours with zero and negative prices would increase significantly in the North if market is split
- Meanwhile, the Southern zone would not only see higher price levels, but also fewer zero-price hours and less volatility
- Higher prices in Southern Germany could translate into similar price effects for Austria (currently, the correlation between Austrian and German prices is 70-80%)
- This may be good news for renewables operators (market values, especially for wind power, would increase), but less so for storage arbitrage as volatility may be reduced

PHS = pumped hydro storage

THEMA

CONSULTING GROUP

Navigate the energy transition with confidence