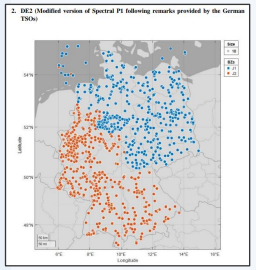
Bidding Zone Split in Germany

Nadja Helmer, Kirstin Ganz

What impact would an electricity price zone split have on Germany?

Background / Motivation

- The Bidding Zone Review is currently underway, after which it will be decided whether electricity price zones will be introduced in Germany and some other European countries



DE FR IT NL SE

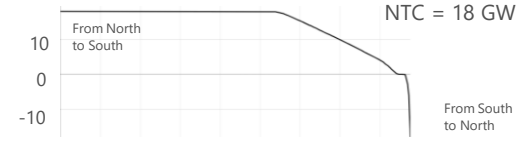
- Of the various options, the 2-zone option is considered
- Base for this analysis is a scenario without THG reduction emission goals

Research Questions

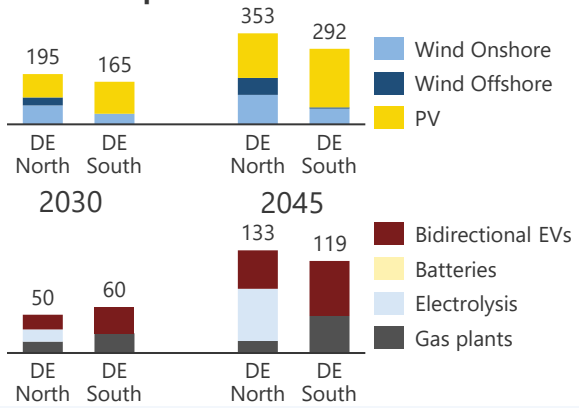
1. To what extent will the two German zones decouple?
2. How will the future energy system differ in North and South?
3. What effect will the electricity price zone split have on electricity prices?

Results and Conclusion

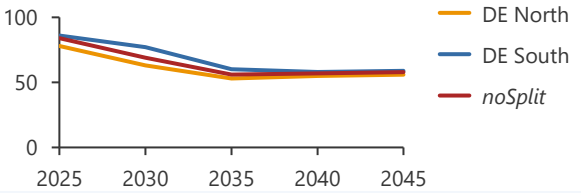
Netto electricity trade in 2030



Installed capacities in GW



Mean electricity prices in €$_{2019}$/MWh



- The assumed transmission capacities are essential for the development of the energy system of the individual zones and the resulting electricity prices
- With a free expansion of renewable energies (from 2035), slightly more onshore wind is expanded in the *Split* scenario than in the *noSplit* scenario due to regional cost differences.
- Without an electricity price zone split, no electrolysis is installed in Germany in 2030 without a minimum expansion target. In the *Split* scenario, however, 16 GW are already expanded in the north in 2030 due to the low residual load compared to *noSplit*.
- Bidirectional EVs are the preferred flexibility option in both scenarios due to the relatively low systemic investment costs and high potential. For this reason, no large-scale battery storage systems are installed. This does not correspond to the current development of the storage market in Germany.
- The market zone split increases electricity prices in the south by a maximum of 8 €/MWh in 2030 and decreases them in the north by a maximum of 6 €/MWh compared to scenario *noSplit*. The split into two electricity price zones reduces the redispatch costs and thus the grid fees for consumers. This cost saving applies to both zones and must be taken into account when calculating the costs for consumers.

General framework

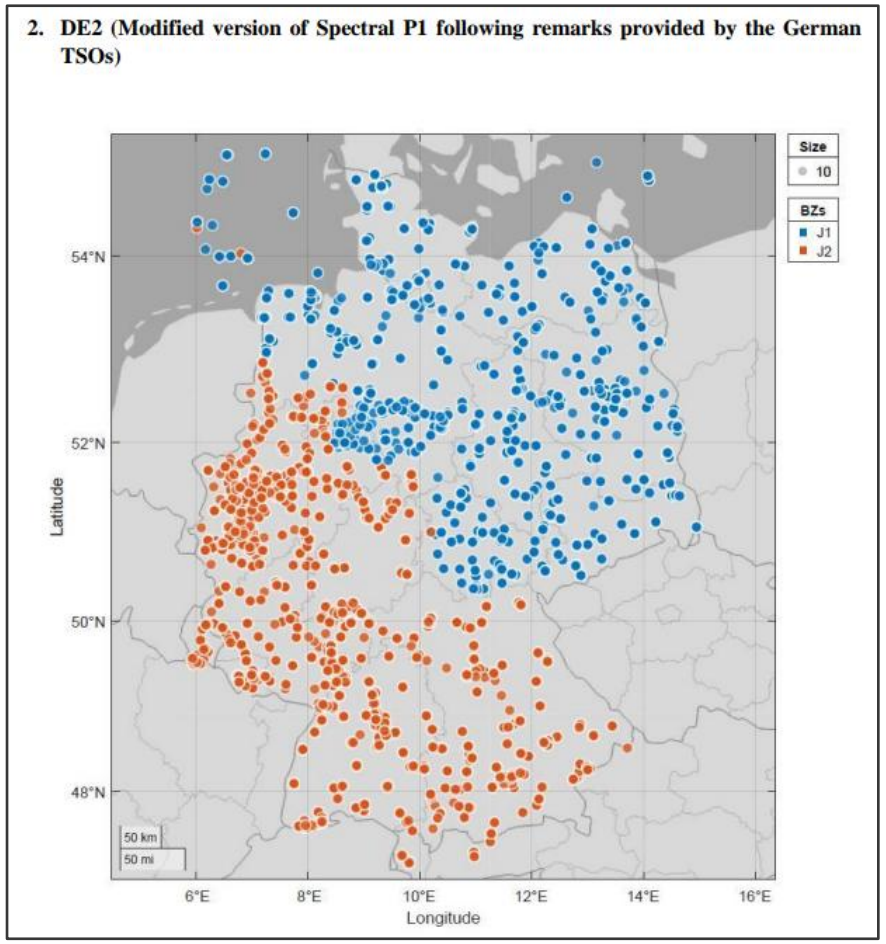
European Market simulation with a market split of Germany into 2 zones (scenario *Split*)

Specification of net transfer capacities (NTC) between the two zones DE North and DE South

No specification of THG reduction goals

Expansion of renewable energies fixed until 2030 based on political goals. These goals serve as minimum expansion after 2030.

Electrical flexibilities can be expanded freely in both zones. The expansion of smart charging electric vehicles is constrained by upper limits.



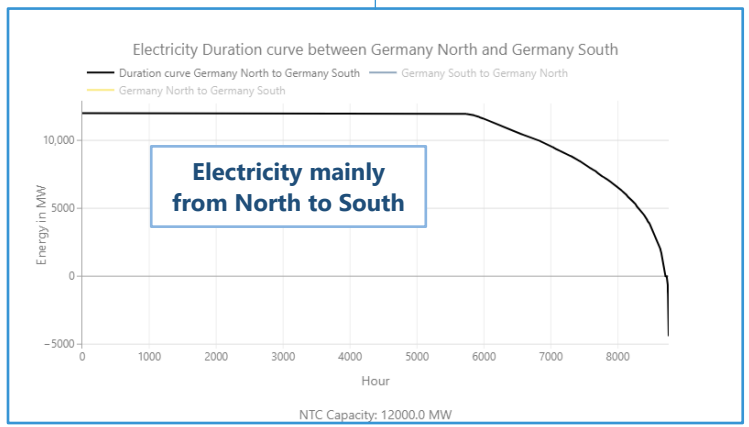
Quelle

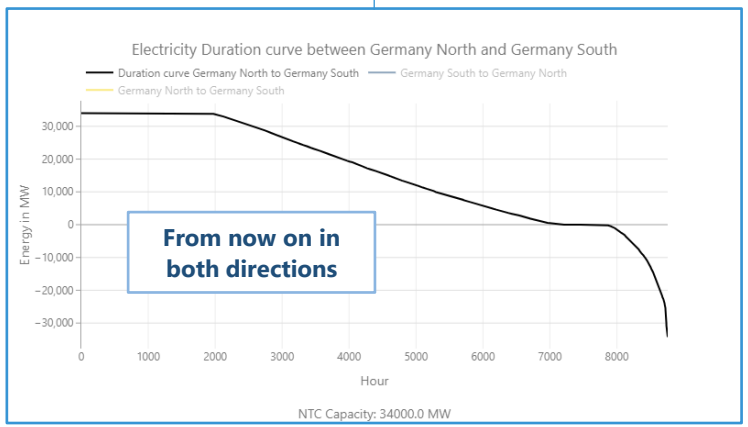
Research Questions

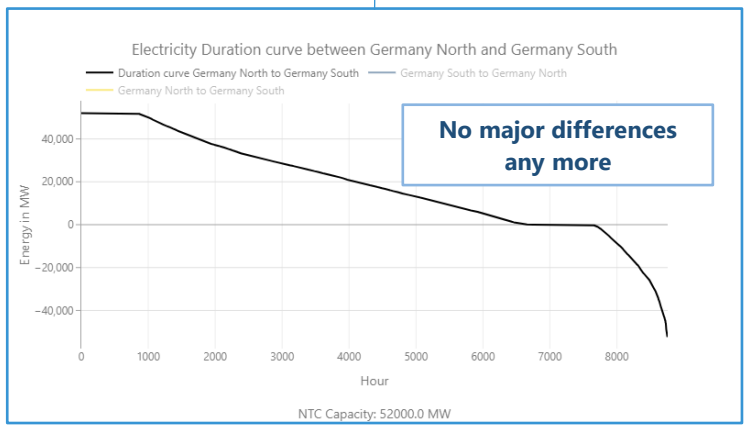
1. To what extent will the two German zones decouple?
2. How will the future energy system differ in North and South?
3. What effect will the electricity price zone split have on electricity prices?

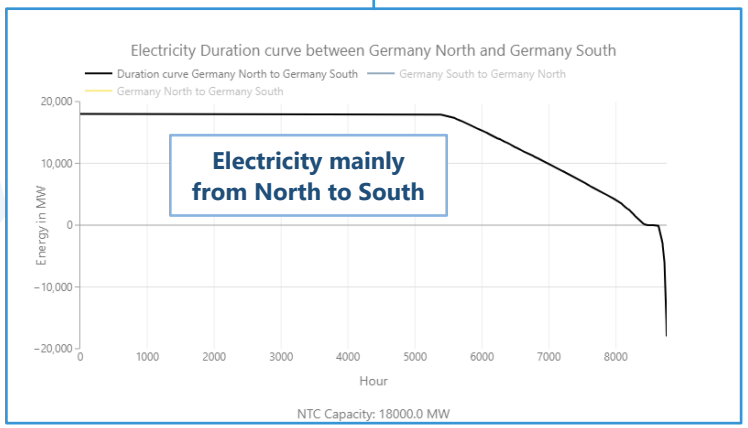
To what extent will the two German zones decouple?

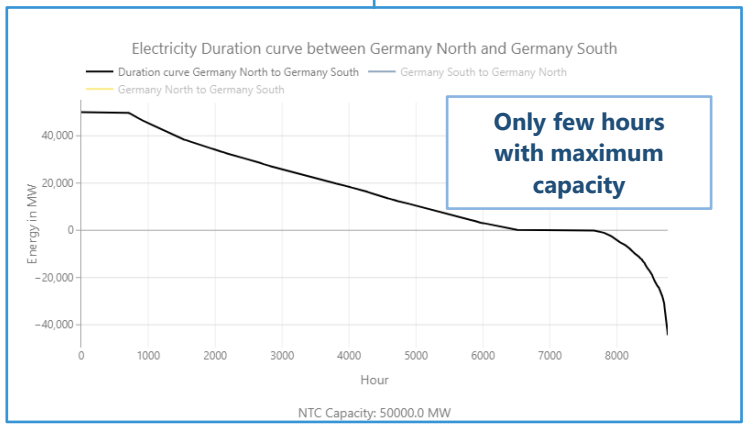
2025 2030 2035 2040 2045



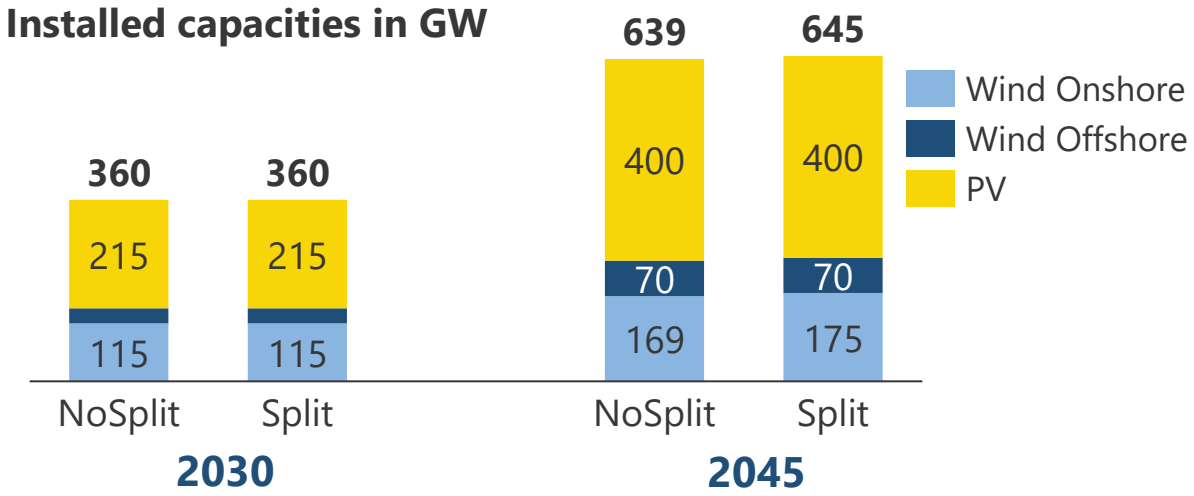








How will the future energy system differ in the event of an electricity price zone split?



Comparison to Germany without split

Expansion of renewable energies:

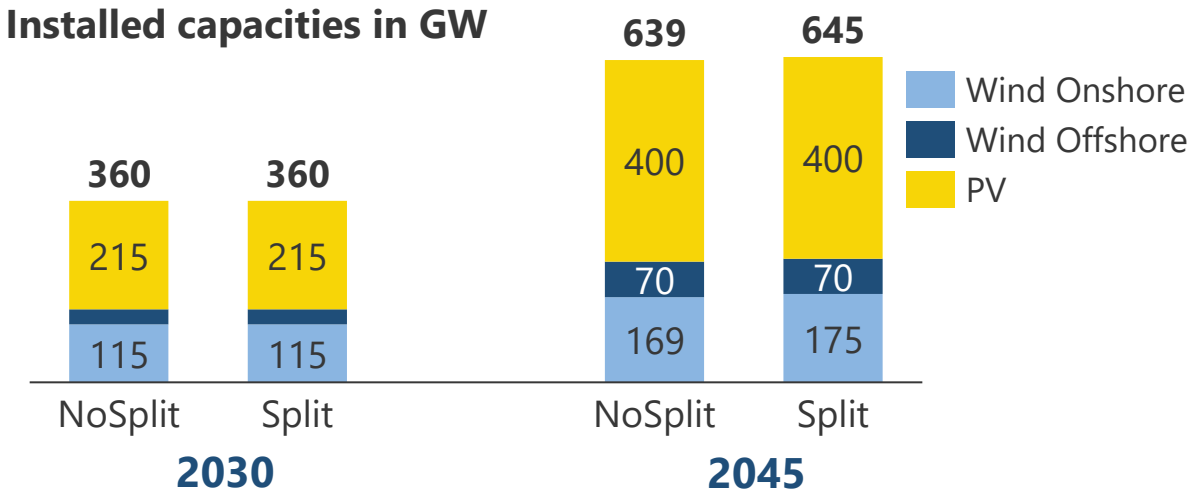
The expansion of renewable energies is fixed in both scenarios until 2030 based on political goals.

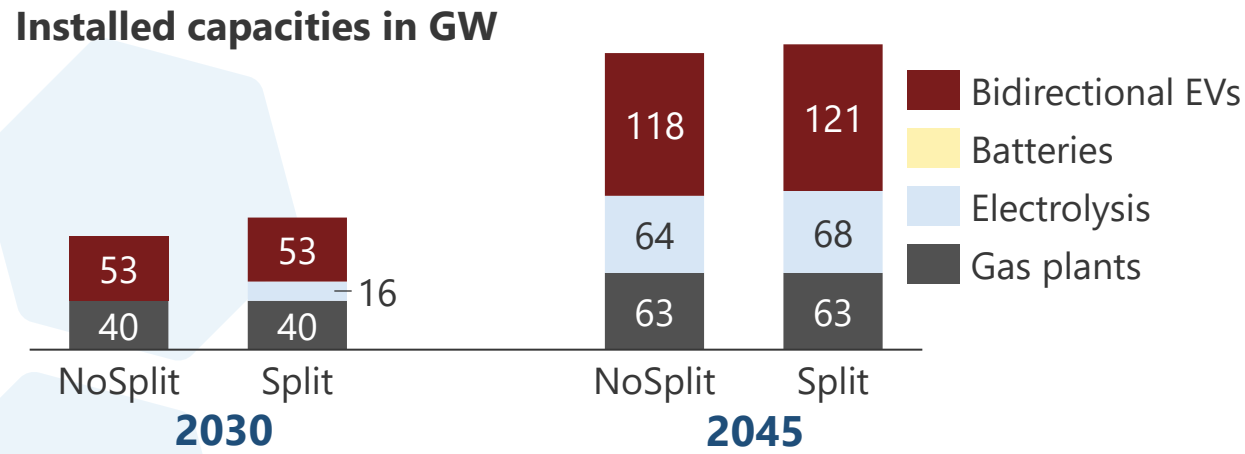
After 2030, wind and solar can be expanded beyond the political targets.

The investment costs for wind onshore differ regionally. The average costs in the north are lower than the average for Germany as a whole for the *noSplit* scenario.

In scenario *Split* the expansion of wind onshore exceeds the expansion in *noSplit* by 6 GW in 2045 due to the cost reduction.

How will the future energy system differ in North and South?





Comparison to Germany without split

Expansion of flexible assets:

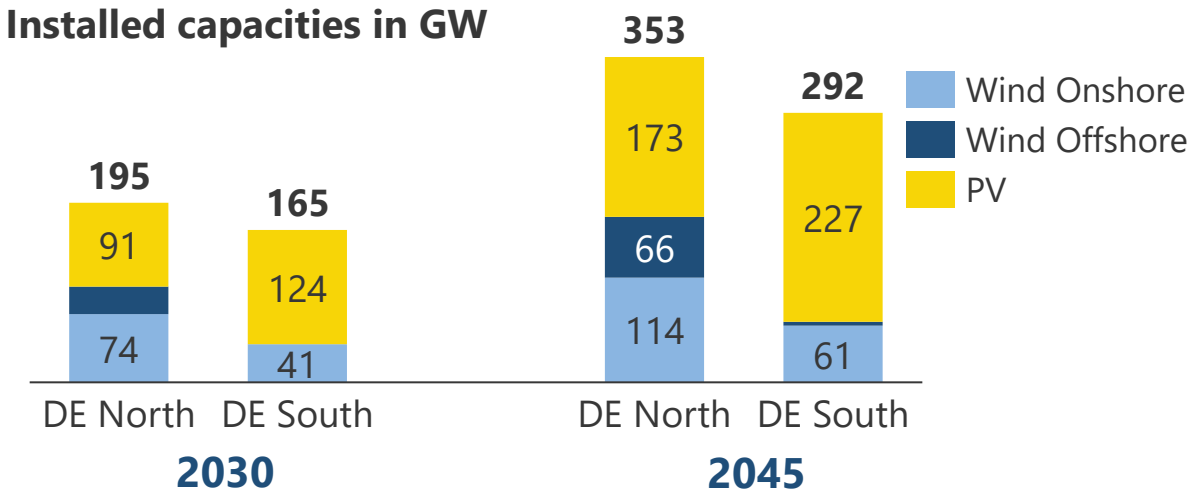
- 2030: Due to the low residual load in the north compared to *noSplit*, electrolysis is already being installed in the *Split* scenario. In *noSplit*, electrolysis is not expanded until 2035.
- 2045: Due to the higher expansion of onshore wind, more hydrogen is produced domestically in the *Split* scenario (net hydrogen imports of 25 TWh to DE compared to 45 TWh in *noSplit*).

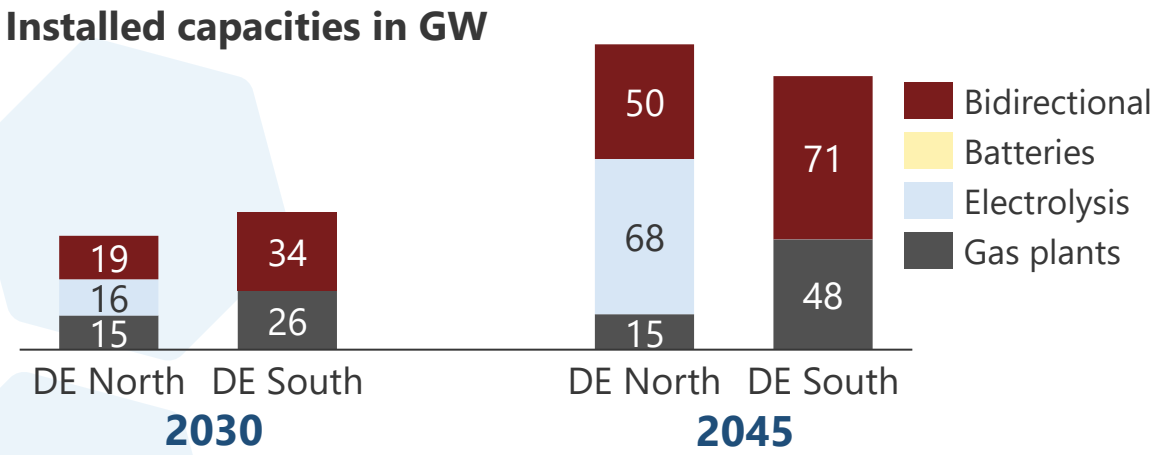
Similar expansion of bidirectional charging EVs in both scenarios*.

No relevant differences for gas plants.

*Due to the high expansion potential and lower investment costs, bidirectional EVs are preferred over large battery storage systems. The latter are not added endogenously in the scenarios considered here. This does not reflect the current storage market in Germany.

How will the future energy system differ in North and South?





Zonal comparison

Expansion of renewable energies: Fixed until 2030. Afterwards with endogenous expansion…

PV increasingly in the south

Wind increasingly in the north

Expansion of flexible assets:

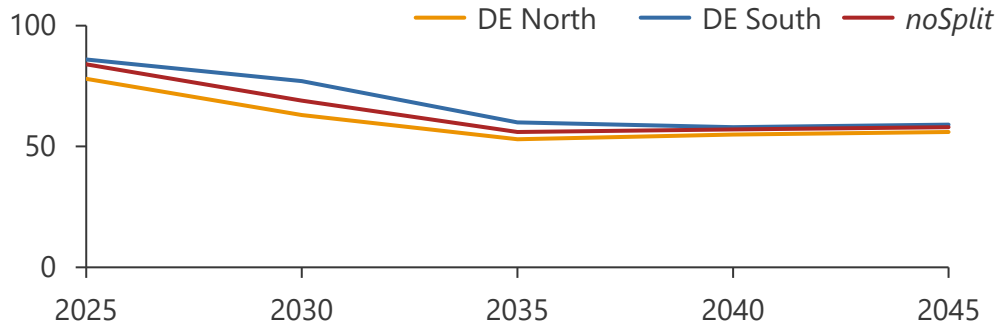
Expansion of bidirectional EVs in 2030 up to the upper bound. After 2030 follows more expansion, but not to the upper limit.

Due to the high level of renewable energy generation compared to the electricity load, electrolysers are only being built in the north. In the south, the demand for hydrogen is covered exclusively by imports (60% of which come from northern Germany).

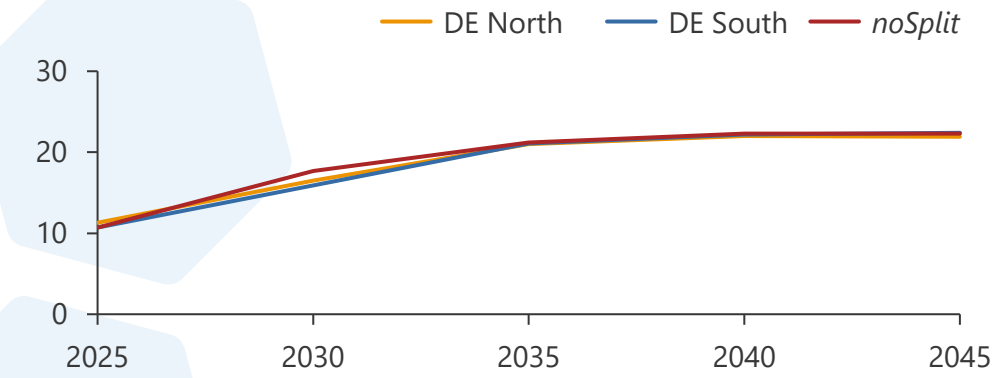
Higher expansion of gas plants in DE South.

What effect will the electricity price zone split have on electricity prices?

Average electricity price in €$_{2019}$/MWh

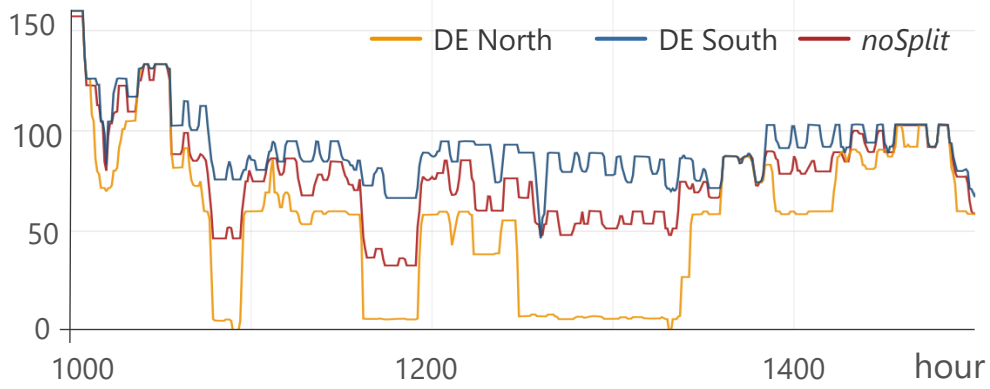


Volatility:
Mean daily standard deviation in €$_{2019}$/MWh



- The electricity price zone split increases electricity prices in the south by a maximum of 8 €/MWh in 2030 and decreases them in the north by maximum 6 €/MWh compared to the *noSplit* scenario.
- The zone split reduces the redispatch costs and consequently the grid fees for consumers. This cost saving applies to both zones and must be considered when calculating the electricity costs for consumers.
- The volatility of electricity prices remains similar in both scenarios.

Excerpt of the hourly electricity prices in €$_{2019}$/MWh für 2030



Conclusion

When modeling a zonal split in Germany, the net transfer capacities between zones (intra-German NTCs), along with the developing demand and assumed climate protection targets, are crucial for the results.

With a free expansion of renewables (from 2035 on), slightly more onshore wind is expanded in the *Split* scenario than in *noSplit* due to regional cost differences. Wind power is mainly located in the north and PV in the south.

Without an electricity price zone split, no electrolysis will be installed in Germany in 2030 without a minimum expansion target. In the *Split* scenario, however, 16 GW are expanded in the north as early as 2030 due to the low residual load compared to *noSplit*.

Bidirectional EVs are the preferred flexibility option in both scenarios due to the relatively low systemic investment costs and high potential. For this reason, no large-scale battery storage systems are installed. This does not correspond to the current development of the storage market in Germany.

The market zone split increases electricity prices in the south by a maximum of 8 €/MWh in 2030 and decreases them in the north by up to 6 €/MWh compared to the *noSplit* scenario. The split into two electricity price zones reduces the redispatch costs and thus the grid fees for consumers. This cost saving applies to both zones and must be taken into account when calculating the costs for consumers.