

MARKET REPORT 2025

WEBINAR

PRESENTATION OF KEY FINDINGS



WEBINAR AMPRION MARKET REPORT 2025

AGENDA



| | |
|-----------|--|
| 1.00 p.m. | Welcome Dr Hendrik Neumann – Chief Technical Officer (CTO) |
| 1.05 p.m. | Market Analysis Dr Peter Lopion, Advisor – International Regulatory Management and Market Development |
| 1.10 p.m. | Dunkelflaute Ramona Grügelsiepe, Advisor – International Regulatory Management and Market Development |
| 1.15 p.m. | Hellbrise Julia Klammer, Advisor – International Regulatory Management and Market Development |
| 1.25 p.m. | Keynote Future Developments: Dr Carsten Lehmköster, Managing Director Amprion Offshore and Director Economic Grid Management |
| 1.40 p.m. | Q&A Session Solveig Wright, Advisor – TSO Association Management and European Affairs |

WELCOME

TO THE PRESENTATION OF THE AMPRION MARKET REPORT 2025

Dr Hendrik Neumann
Chief Technical Officer (CTO)



Further information and the report is available
for download on our homepage:
amprion.net/market/market-report

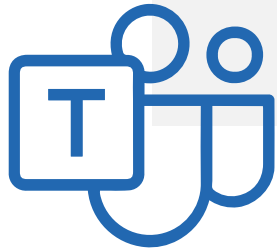


WEBINAR AMPRION MARKET REPORT 2024

HOUSEKEEPING RULES

Information for the webinar

- All participants are automatically muted
- Questions can be asked at any time via Slido
- Time will be provided for comprehension questions directly after the presentations
- Q&A session for in-depth discussion at the end



Scan QR-Code
to get to Slido:

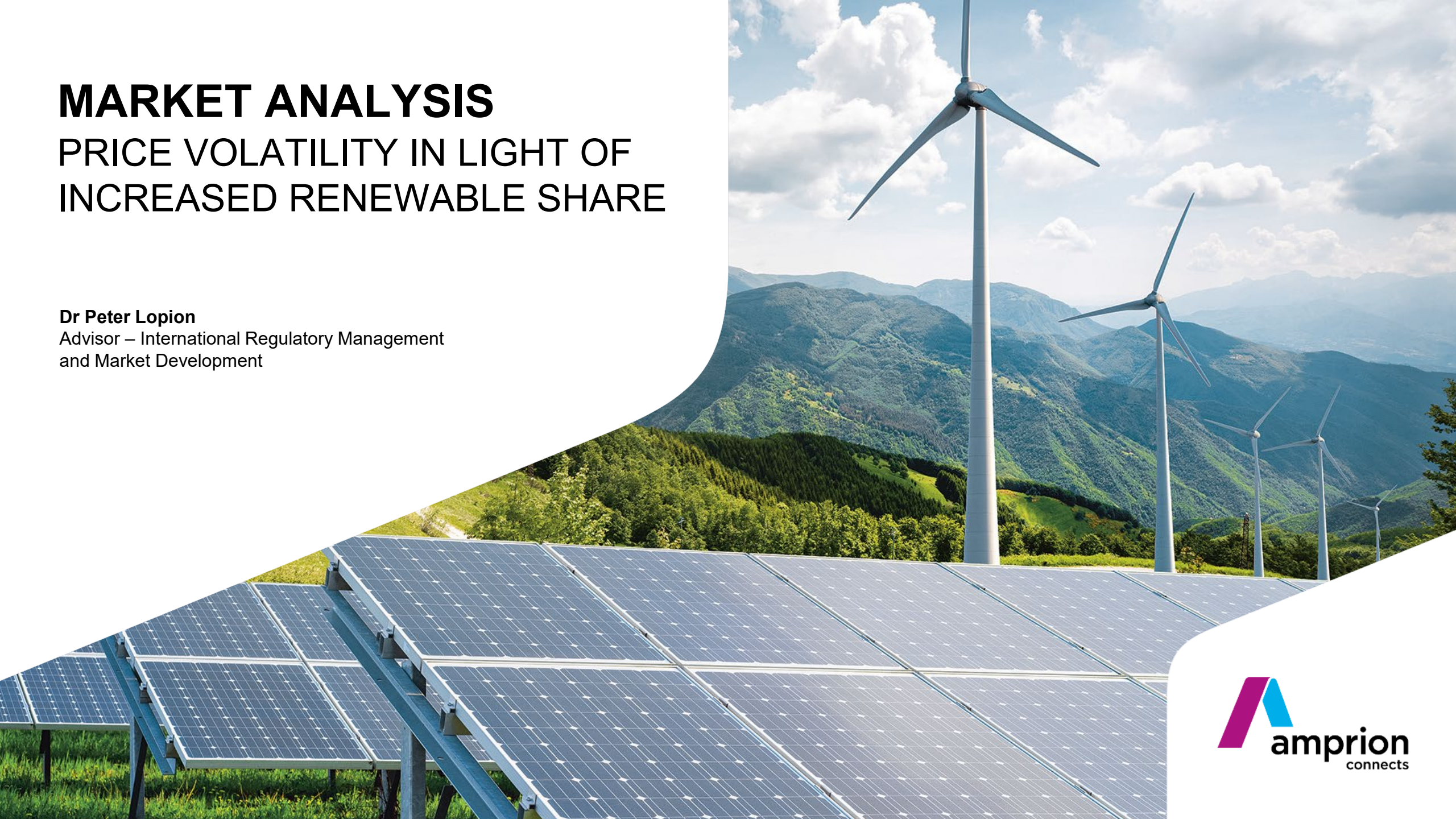


MARKET ANALYSIS

PRICE VOLATILITY IN LIGHT OF INCREASED RENEWABLE SHARE

Dr Peter Lopion

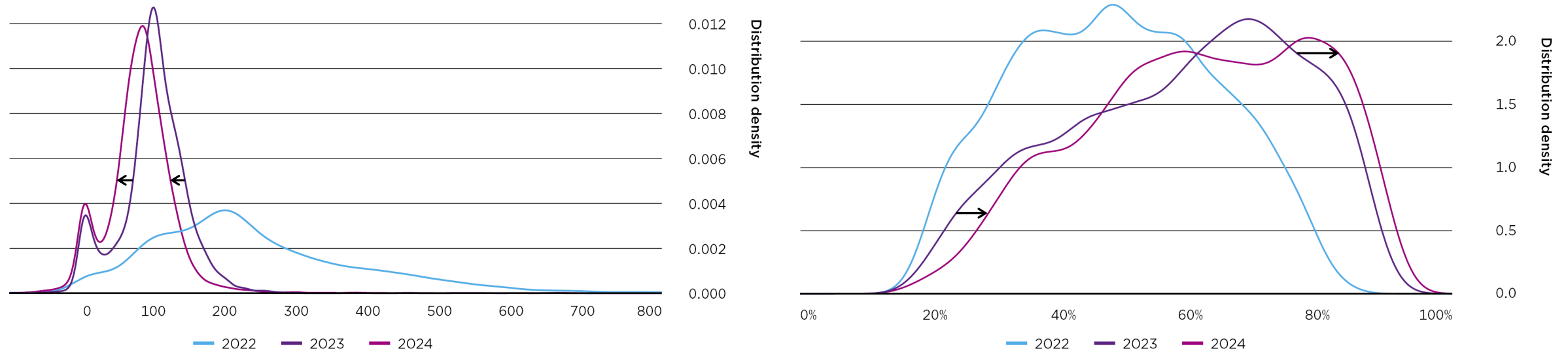
Advisor – International Regulatory Management
and Market Development



MARKET ANALYSIS

PRICE DEVELOPMENT

Price distribution shift correlates with the share of renewable energy



There is a trend towards increasing price volatility, driven by the rising share of renewable energy production and the decline in flexible electricity generation capacity.

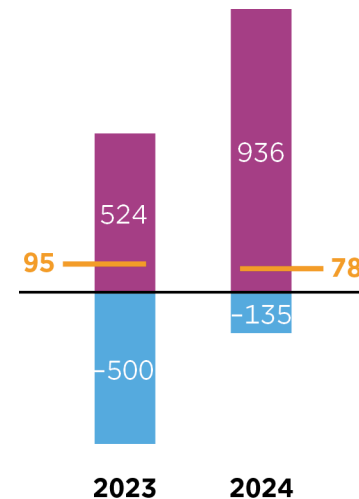
MARKET ANALYSIS

PRICE VOLATILITY

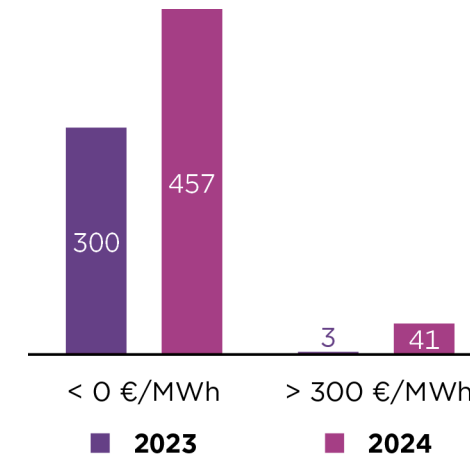
Trends in 2024

- Average wholesale electricity price decreased to 78 €/MWh
- High price fluctuation increased
- More hours with negative prices despite lower minimum value
- 41 hours with prices above 300 €/MWh in 2024

MAX. AND MIN. PRICE
IN DE-LU IN €/MWh



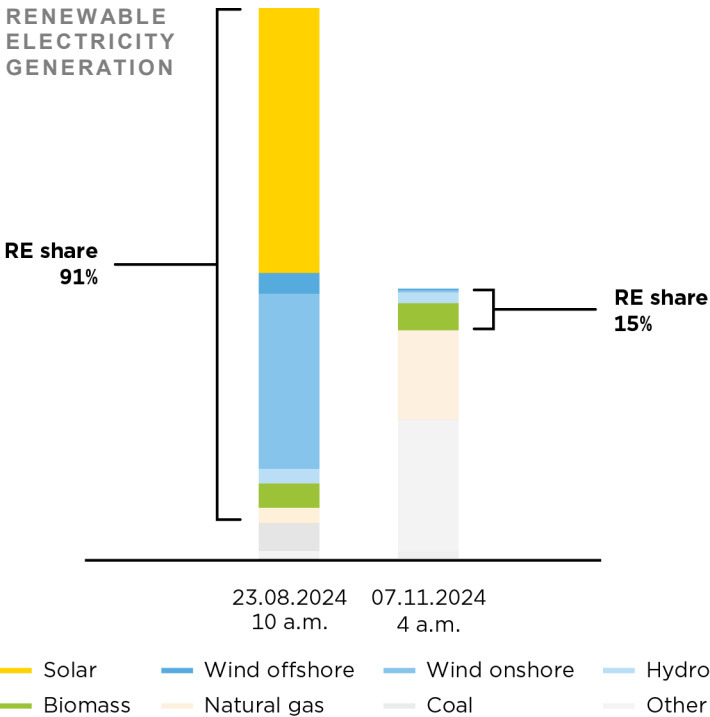
HOURS PER YEAR



Price volatility has contributed to a surge in grid connection requests for battery storage systems, currently exceeding 200 GW in Germany's transmission network.

MARKET ANALYSIS

RENEWABLE ENERGIE SHARE



The installation of renewable energy capacity continued to break records.

RENEWABLE ENERGIES

| | Solar | Wind onshore | Wind offshore | Hydro | Bio-mass | Sum |
|------|-------|--------------|---------------|-------|----------|-----|
| 2022 | 11% | 20% | 5% | 5% | 8% | 49% |
| 2023 | 12% | 26% | 5% | 6% | 8% | 57% |
| 2024 | 15% | 26% | 6% | 6% | 8% | 61% |

CONVENTIONAL ENERGIES

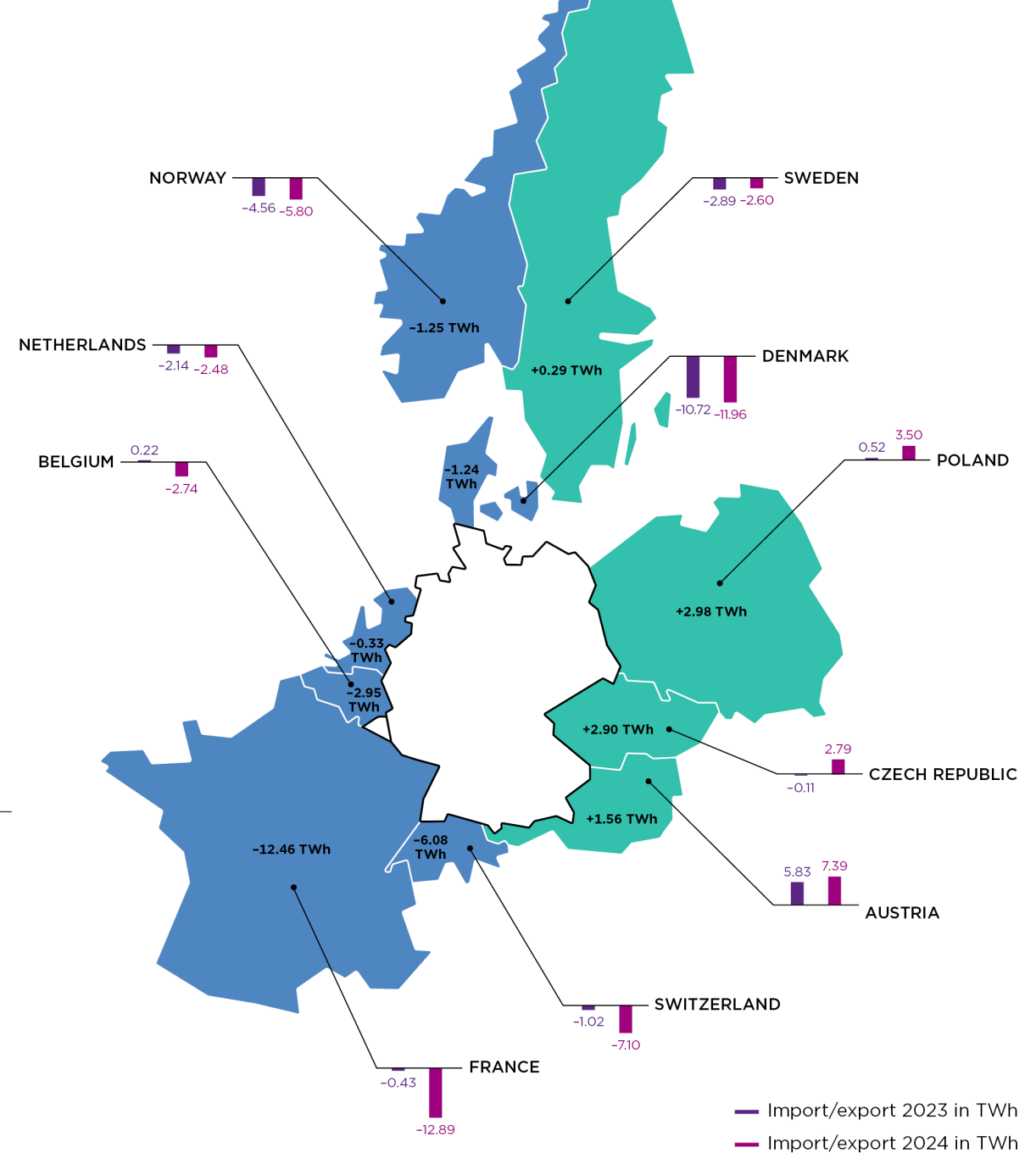
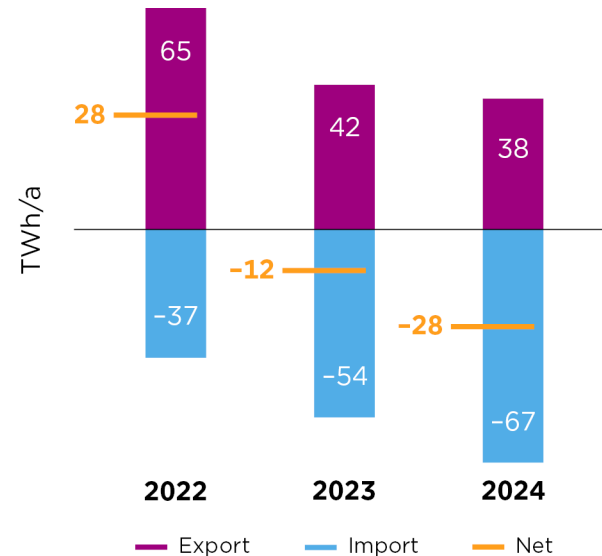
| | Natural gas | Coal | Nuclear | Others | Sum |
|------|-------------|------|---------|--------|-----|
| 2022 | 11% | 33% | 6% | 2% | 52% |
| 2023 | 11% | 26% | 2% | 3% | 42% |
| 2024 | 13% | 23% | 0% | 3% | 39% |

MARKET ANALYSIS

IMPORT & EXPORT

- Germany remained a net importer
- Significant North-South and West-East cross-country transit flows contribute to im- and exports
- Not all im- and exports are connected to consumption and production in Germany

A significant factor influencing Germany's import-export balance is the reduction in flexible generation capacity.



MARKET ANALYSIS

GRID OPERATION ANALYSIS

Decrease in both redispatch costs and volumes:

- “EnLAG2” significantly relieved Germany’s biggest congestion to date
- lower on-shore wind feed-in
- drop in commodity prices

Redispatch volumes



Redispatch costs



The 94 km-long line from Ganderkesee to Wehrendorf significantly relieved Germany's biggest congestion in the Emsland region.

MARKET ANALYSIS

CONCLUSION

The Price distribution shift correlates with the share of renewable energy.

A significant factor influencing Germany's import-export balance is the reduction in flexible generation capacity.

There is a trend towards increasing price volatility, driven by the rising share of renewable energy production and the decline in flexible electricity generation capacity.

The 94 km-long line from Ganderkesee to Wehrendorf significantly relieved Germany's biggest congestion in the Emsland region.

DUNKELFLAUTE

A HISTORIC COMPARISON

Ramona Grügelsiepe

Advisor – International Regulatory Management
and Market Development

DUNKELFLAUTE HISTORIC COMPARISON

- Average maximum of 5% nominal capacity from PV and wind for at least 24 hours

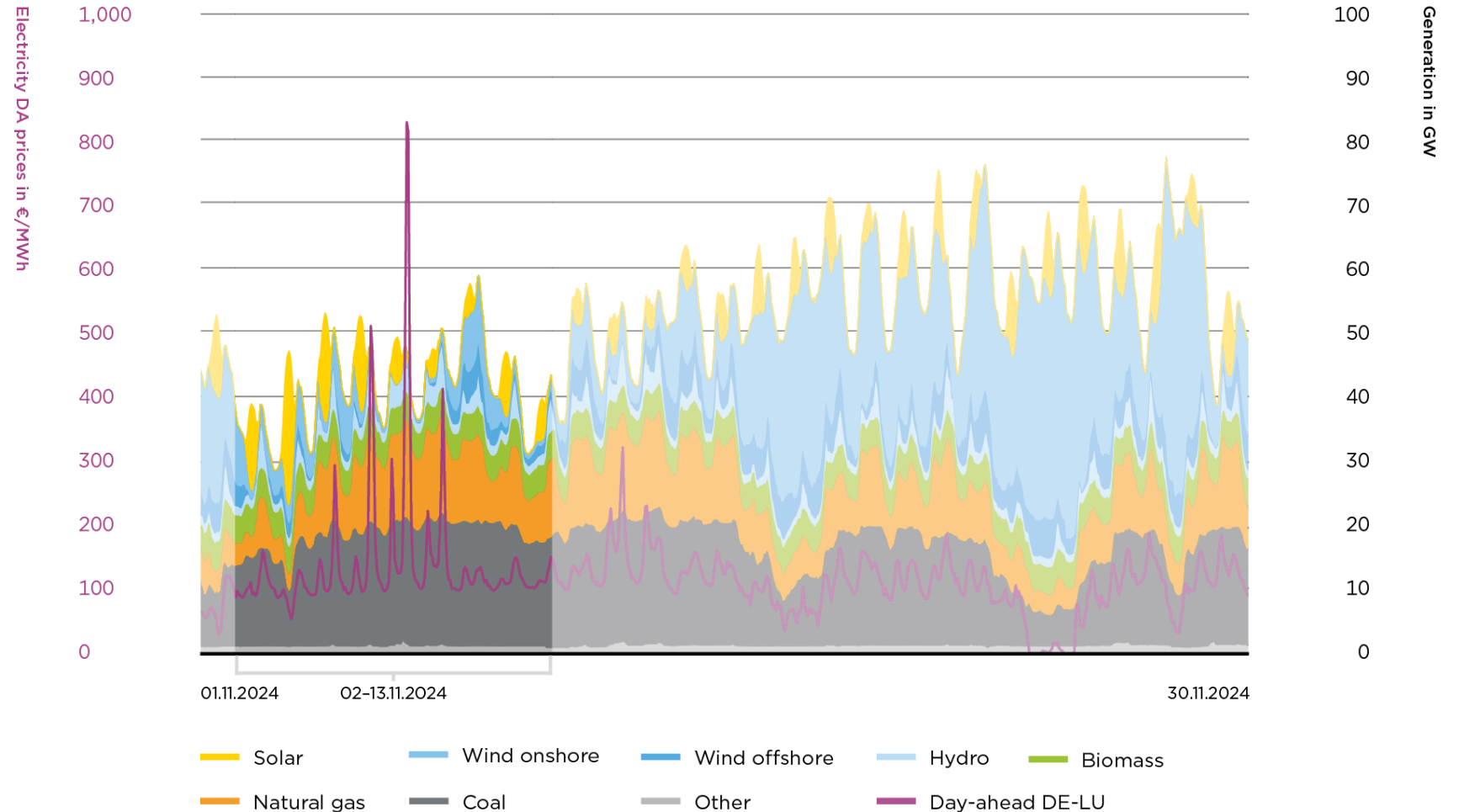
The year 2024 experienced an unprecedented *Dunkelflaute*, which lasted 263 hours, or nearly 11 days, marking the longest such period since 1982.



DUNKELFLAUTE NOVEMBER 2024

- 11-day-*Dunkelflaute* in early November 2024
- Favorable weather conditions positively affected prices remaining well below the December 2024 highs

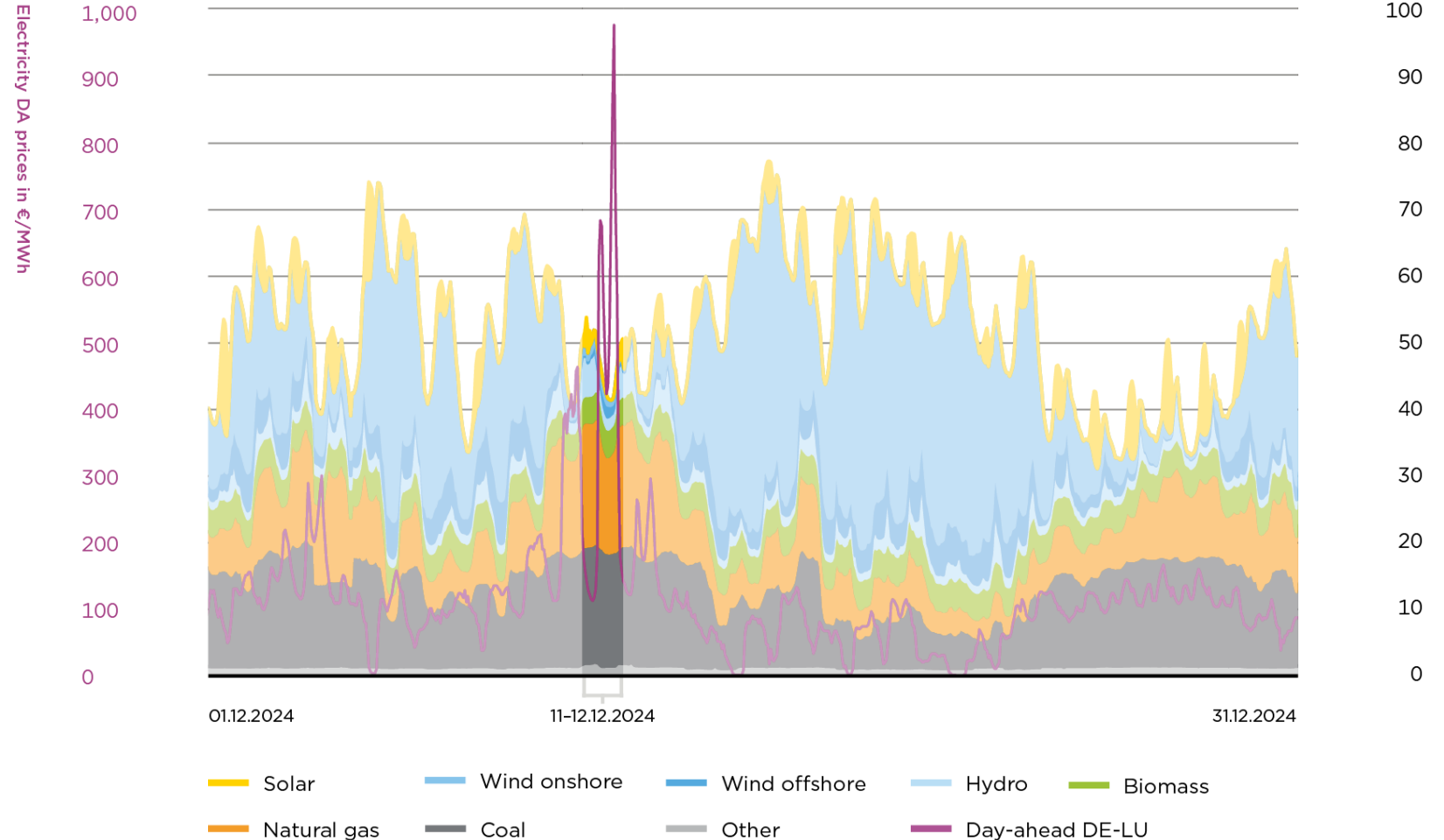
There may be similarly long **Dunkelflaute** periods in future and weather conditions and imports may not always be as favorable as in November 2024.



DUNKELFLAUTE DECEMBER 2024

- Less critical situation of resource adequacy
- Colder temperatures and low power plant availability
- Much higher prices

Higher electricity demand due to colder temperatures and low plant availability led to a significant increase of prices.



DUNKELFLAUTE CONCLUSION

Characterized by a drop in average electricity generation from renewables to a maximum of 5% of their nominal capacity over a specified duration.

Grid and market should be prepared for low renewable generation over a period of approximately ten days.

The year 2024 experienced an unprecedented *Dunkelflaute*, which lasted 263 hours, or nearly 11 days, marking the longest such period since 1982.

There may be similarly long *Dunkelflaute* periods in future and weather conditions and imports may not always be as favorable as in November 2024.

HELLBRISE

NEW CHALLENGES FOR GRID AND MARKET

Julia Klammer

Advisor – International Regulatory Management
and Market Development



HELLBRISE DEFINITION

- periods when electricity generation from solar and wind is particularly high
- In the past a positive situation with large amounts of low-cost electricity
- Now reached a level which has noticeable effects on the overall grid and market
- 99 GW of total installed PV capacity plays a crucial role

About half of German PV producers receive fixed feed-in tariffs with no exposure to market prices and no incentive to reduce their production in case of negative prices.

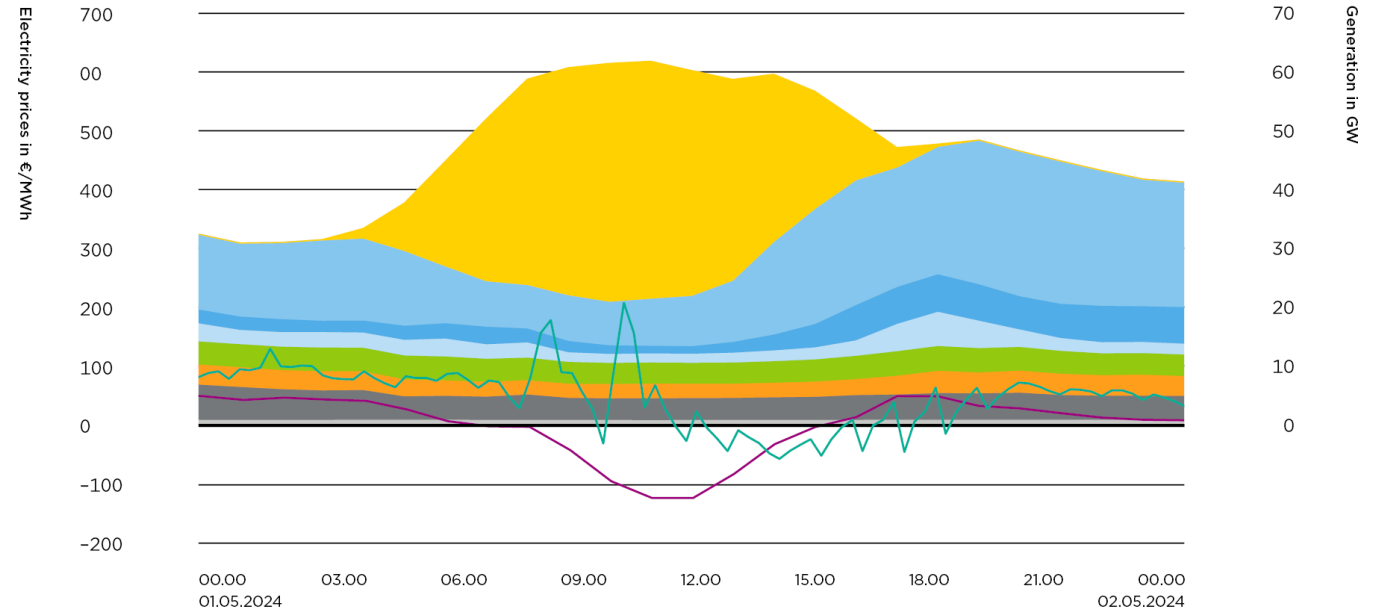
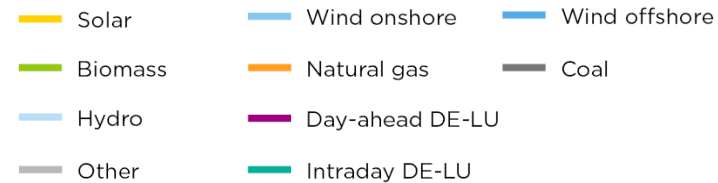


HELLBRISE

1 MAY 2024

- Significantly negative DA prices
- No market or grid problem
- Negative prices provide **market incentives** for storage and flexibility

Flexibility will be central to integrating this surplus production into the grid.

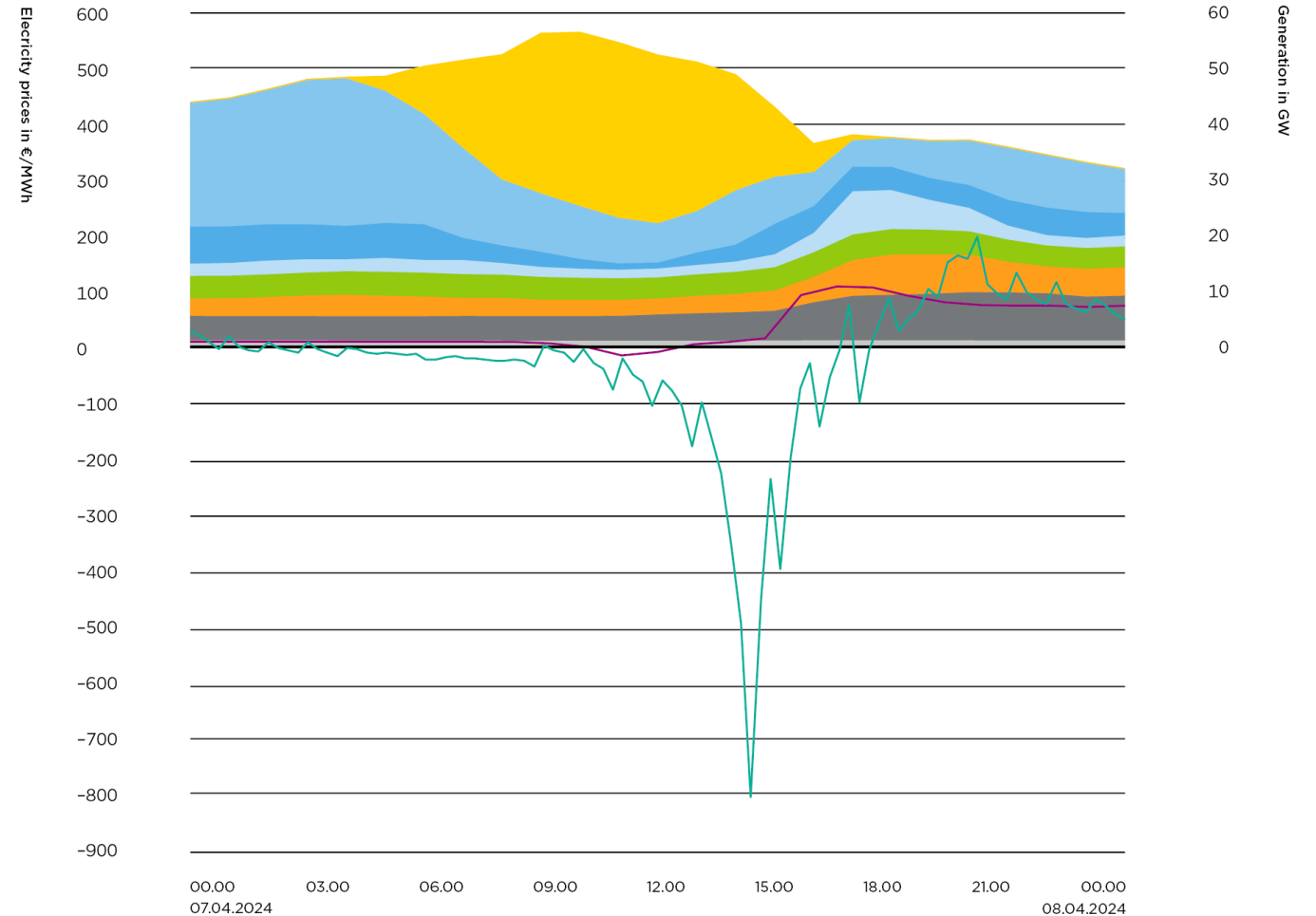
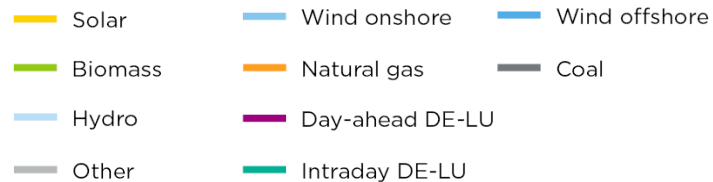


HELLBRISE

7 APRIL 2024

- Significantly negative ID prices
- Surplus of unforecasted PV in Germany and neighbouring countries
- Tense situation in the intraday market

Due to the high installed capacity of PV, production forecasts are gaining in importance. Deviations from the forecasts have a major impact on the intraday market.



HELLBRISE CONCLUSION

Characterized by periods when electricity generation from solar and wind is particularly high.

Increasing risk that generation may considerably exceed load.

About half of German PV producers receive fixed feed-in tariffs with no exposure to market prices and no incentive to reduce their production in case of negative prices.

Flexibility will be central to integrating this surplus production into the grid.

QUESTIONS?

WE ARE HAPPY TO ADDRESS COMPREHENSION QUESTIONS DIRECTLY
QUESTIONS ON CONTENT AND FURTHER QUESTIONS IN THE Q&A SESSION



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FUTURE DEVELOPMENTS

BIDDING ZONE REVIEW

Dr Carsten Lehmköster

Managing Director Amprion Offshore and
Director Economic Grid Management

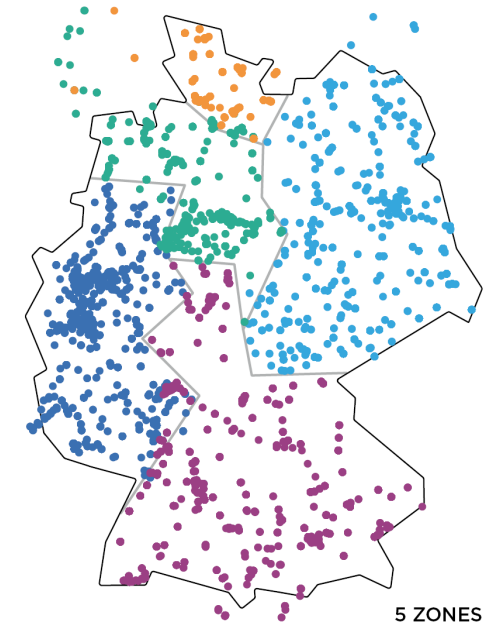
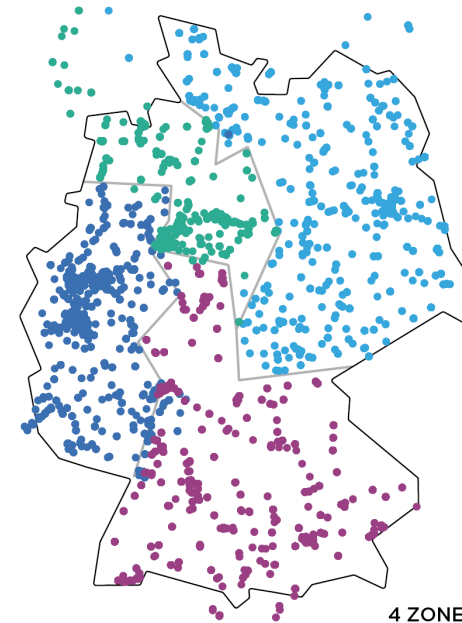
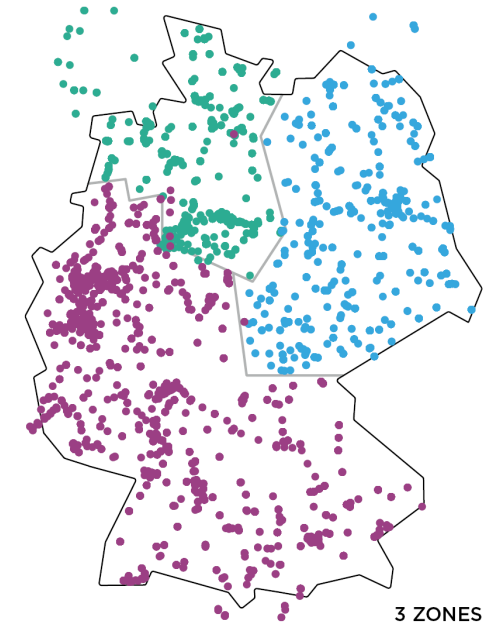
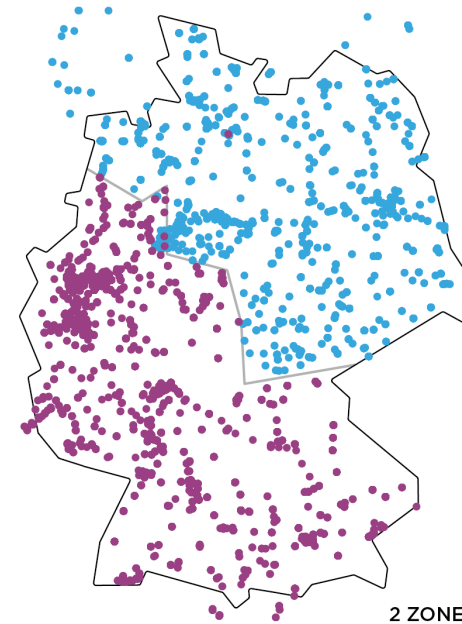


FUTURE DEVELOPMENTS

BIDDING ZONE REVIEW STUDY

- Bidding Zone Review Study aims to determine the most efficient configuration of bidding zones
- Potential configurations split the DE-LU bidding zone in up to 5 individual zones and could affect renewable energies and price volatility
- Bidding zone reconfigurations aim to better reflect physical reality and therefore reduce redispatch and resulting costs
- Other aspects are often not considered

The most effective bidding zone configuration evaluated results in an estimated positive monetised benefit of less than 1% of the simulated system costs in the Central Europe region.

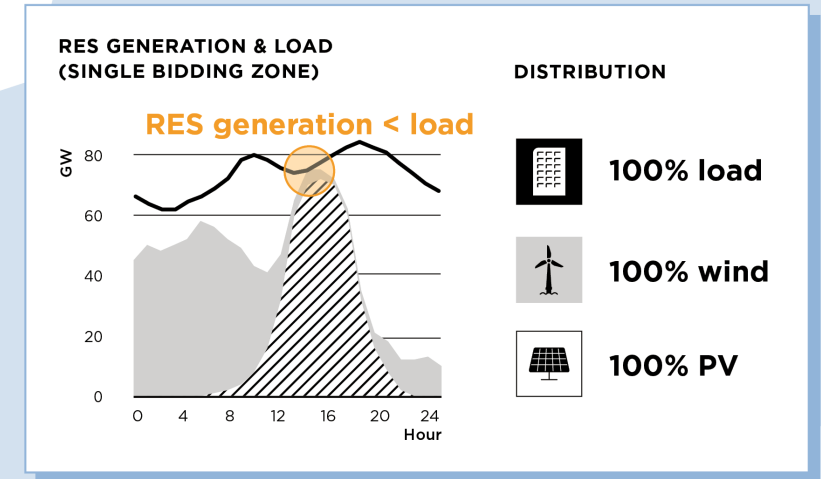
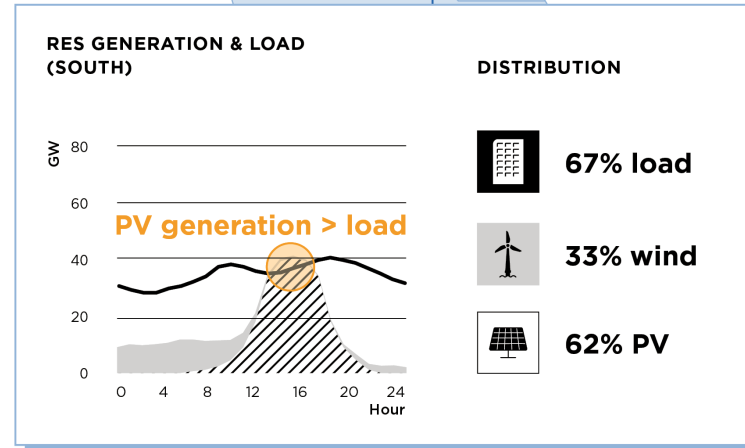
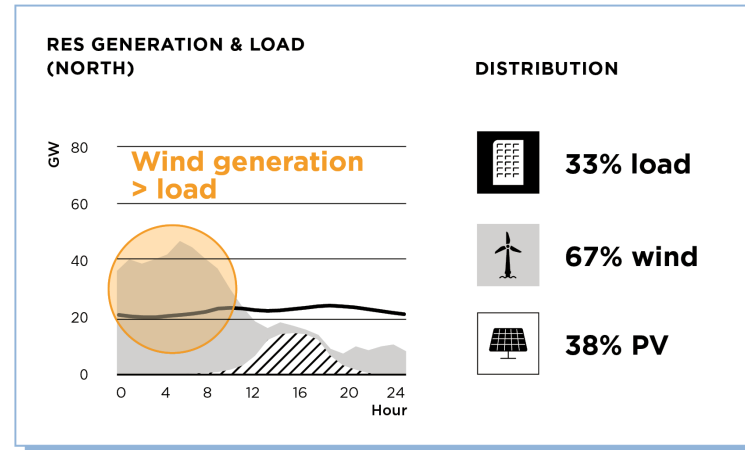


FUTURE DEVELOPMENTS

IMPACT OF BIDDING ZONE SPLIT (SUBSIDIES)

- High infeed of wind (north) and PV (south) → lower market value in respective zones
- Subsidies offset difference between market prices and guaranteed remuneration for infeed
- If market prices decline, subsidies rise

Additional funding requirements for RES may exceed the savings in redispatch.



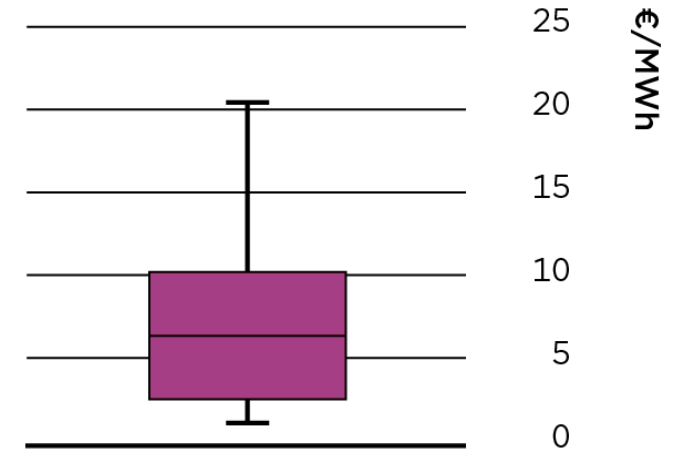
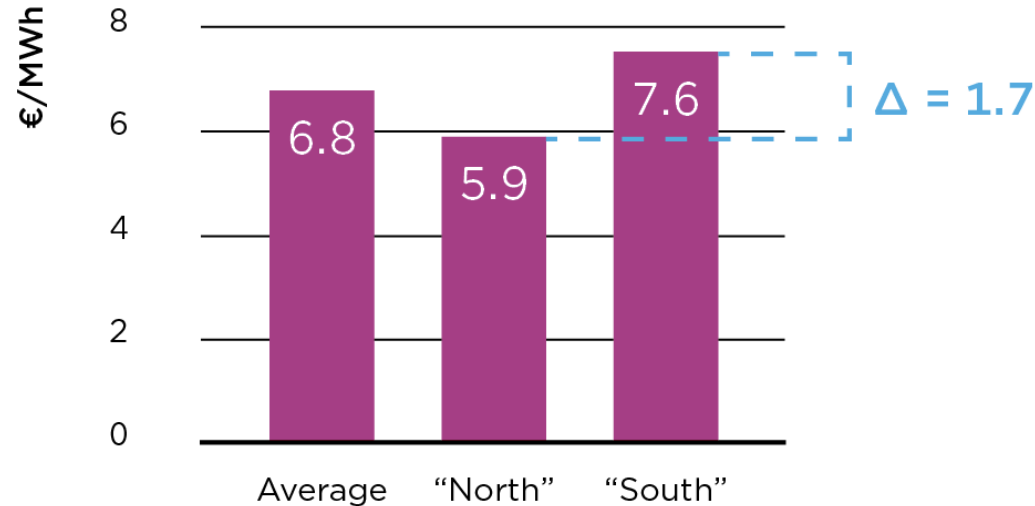
LEGEND

— Load Wind PV

FUTURE DEVELOPMENTS

IMPACT OF BIDDING ZONE SPLIT (GRID TARIFFS)

- Benefit in southern zone is 7.6 €/MWh on average
- Benefit in northern zone is 5.9 €/MWh on average
- Overall average benefit in tariffs is 6.8 €/MWh
- North has less benefit due to connected production (mainly windfarms) in the DSO-grid
- For the end consumer depending on grid structure the savings can vary in grid reduced grid tariffs from 20+ €/MWh to approx. 1 €/MWh



Savings in grid tariffs would be equivalent of the expected electricity price differences.

FUTURE DEVELOPMENTS

IMPACT OF BIDDING ZONE SPLIT

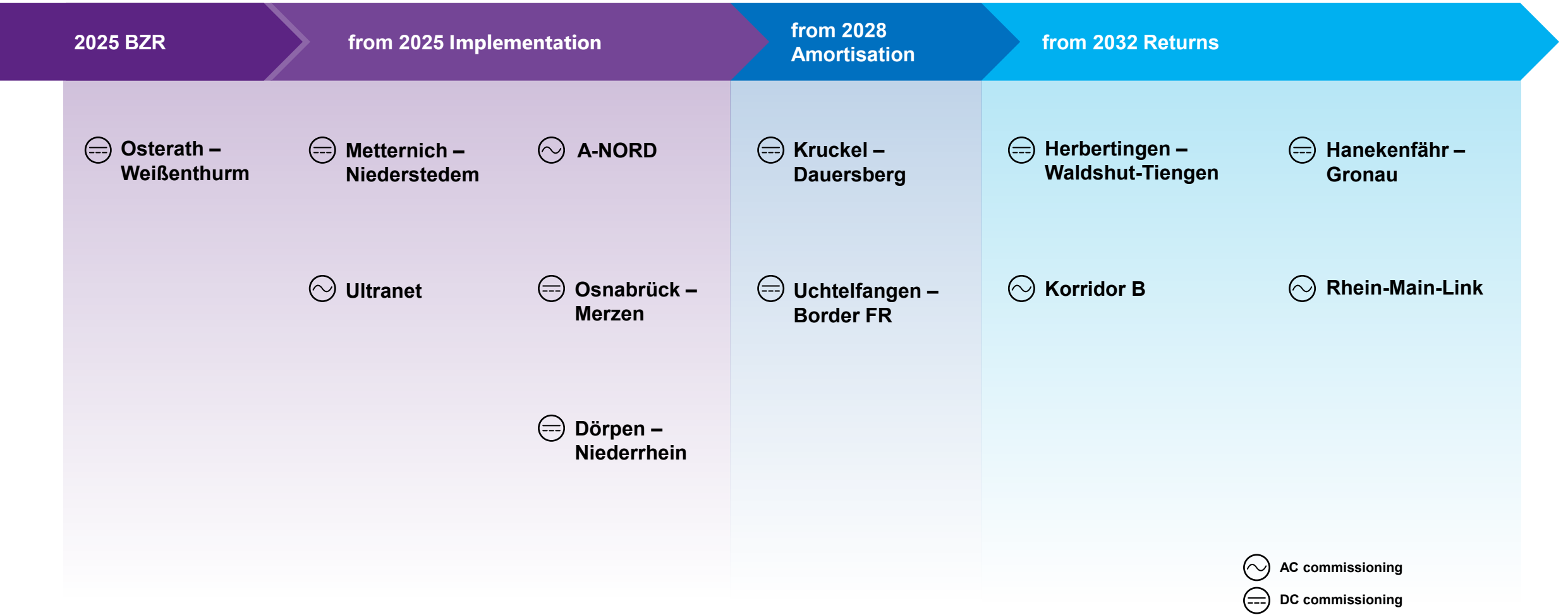
- Bidding Zone Review Study includes a study on transition costs if the bidding zone DE-LU were split
- Implementation of split would take approximately 3 years
- Amortisation of bidding zone split would take approximately 4 years (worst case 6 years)
- Actual returns from a split of the bidding zone could only be expected after 2030
- Amprion alone will commission numerous projects up to the early 2030s
- These new connections will have a considerable effect on grid congestion and have the potential to render the bidding zone split superfluous without having achieved actual savings

Regardless, grid expansion remains as no-regret measure to integrate large amounts of RES generation in DE-LU.

| Amprion-projects (selection) | Planned Commissioning |
|---------------------------------|--------------------------|
| Osterath – Weißenthurm | 2025 |
| Metternich – Niederstedem | 2026 |
| Ultrahnet | 2026 |
| A-Nord | 2027 |
| Osnabrück – Neuenkirchen/Merzen | 2027 |
| Dörpen West – Niederrhein | 2027 |
| Kruckel – Dauersberg | 2028 |
| Uchtelfangen – Grenze FR | 2028 |
| Herbertingen – Waldshut-Tiengen | 2032 |
| Korridor B | 2032 |
| Hanekenfähr – Gronau | 2033 |
| Rhein-Main-Link | 2033 |

FUTURE DEVELOPMENTS

POSSIBLE BIDDING ZONE SPLIT – TRANSFORMATION COSTS



Q&A SESSION

Solveig Wright

Advisor – TSO Association Management and European Affairs

Dr Carsten Lehmköster

Managing Director Amprion Offshore and
Director Economic Grid Management

Dr Peter Lopion, Ramona Grügelsiepe, Julia Klammer

Advisors – International Regulatory Management
and Market Development



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THANK YOU VERY MUCH FOR YOUR PARTICIPATION IN OUR WEBINAR

In case you have any further questions, please do not hesitate to contact us at:
MarketReport@Amprion.net
We are looking forward to your message.



The report is available for download on our homepage:
amprion.net/market/market-report