

Growth of renewables in Europe

Effects on Day-ahead, Intraday and Imbalance Markets

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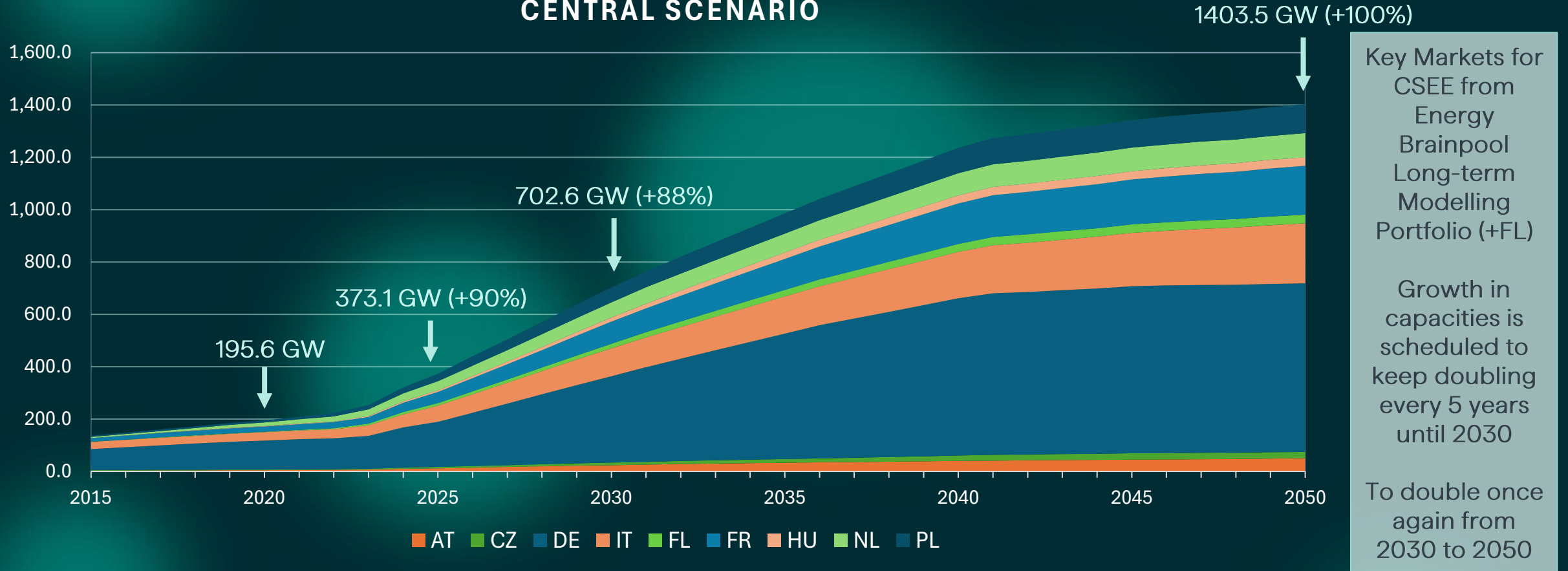
Agenda:

- **Renewable growth in EU**
 - Installed capacity numbers across Europe – outlook
 - The loudest effect – negative DA prices
 - Different fundamentals per region
 - Day-ahead Markets – tip of the Iceberg?
- **Challenges ahead**
 - Built-in constraints on regulatory and infrastructural side
- **Bridging solutions**
- **Conclusion**



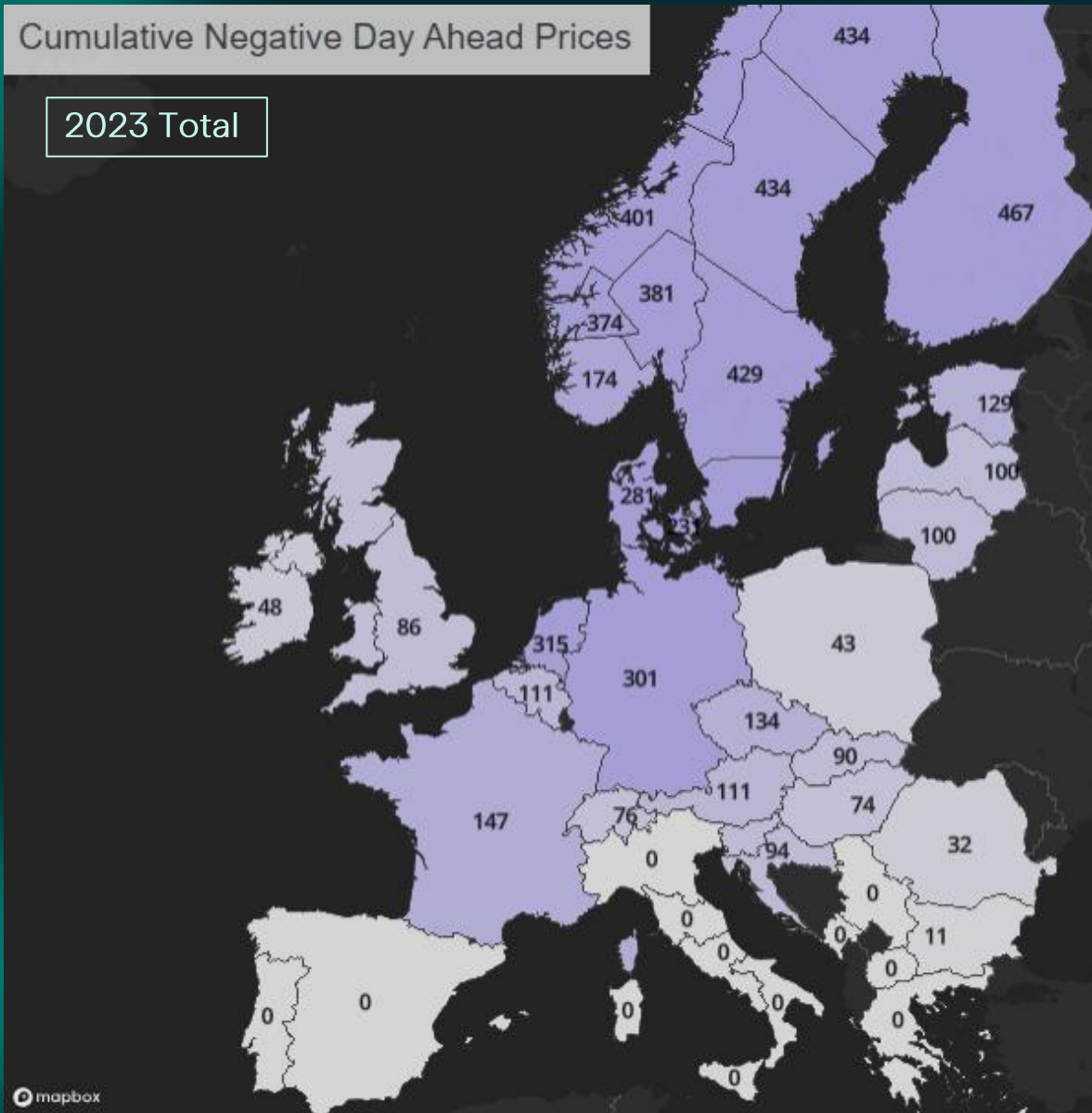
Renewable growth in EU – Installed capacity numbers

COMBINED WIND AND SOLAR ENERGY INSTALLED CAP. (GW)
CENTRAL SCENARIO



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Renewable growth in EU – negative day-ahead prices



2023 record year for negative prices

First year to spread to multiple European Markets.

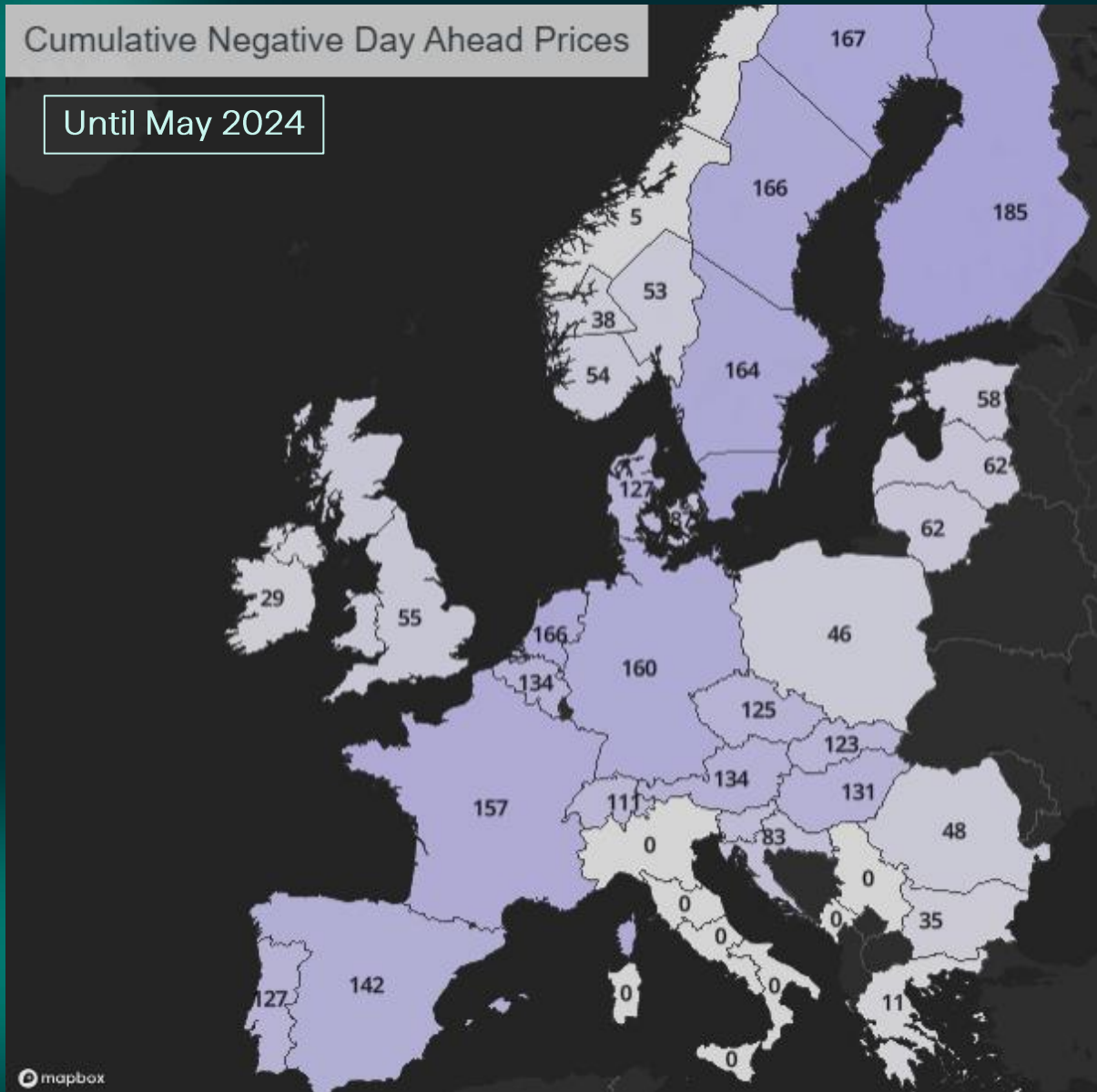
GoO prices drove Nordic negative prices with Finland seeing Olkiluoto 3 Nuclear go live.

2023 also saw Dutch, German and Hungarian solar reach a threshold level.

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Renewable growth in EU – negative day-ahead prices



2024 is the first year that sees solar based negative prices outside the weekend and for the first time in the Nordics.

Portugal and Spain “introduce” negative prices – excess wind and solar generation

France has an oversupply of nuclear generation (for a change) combined with wind and solar.

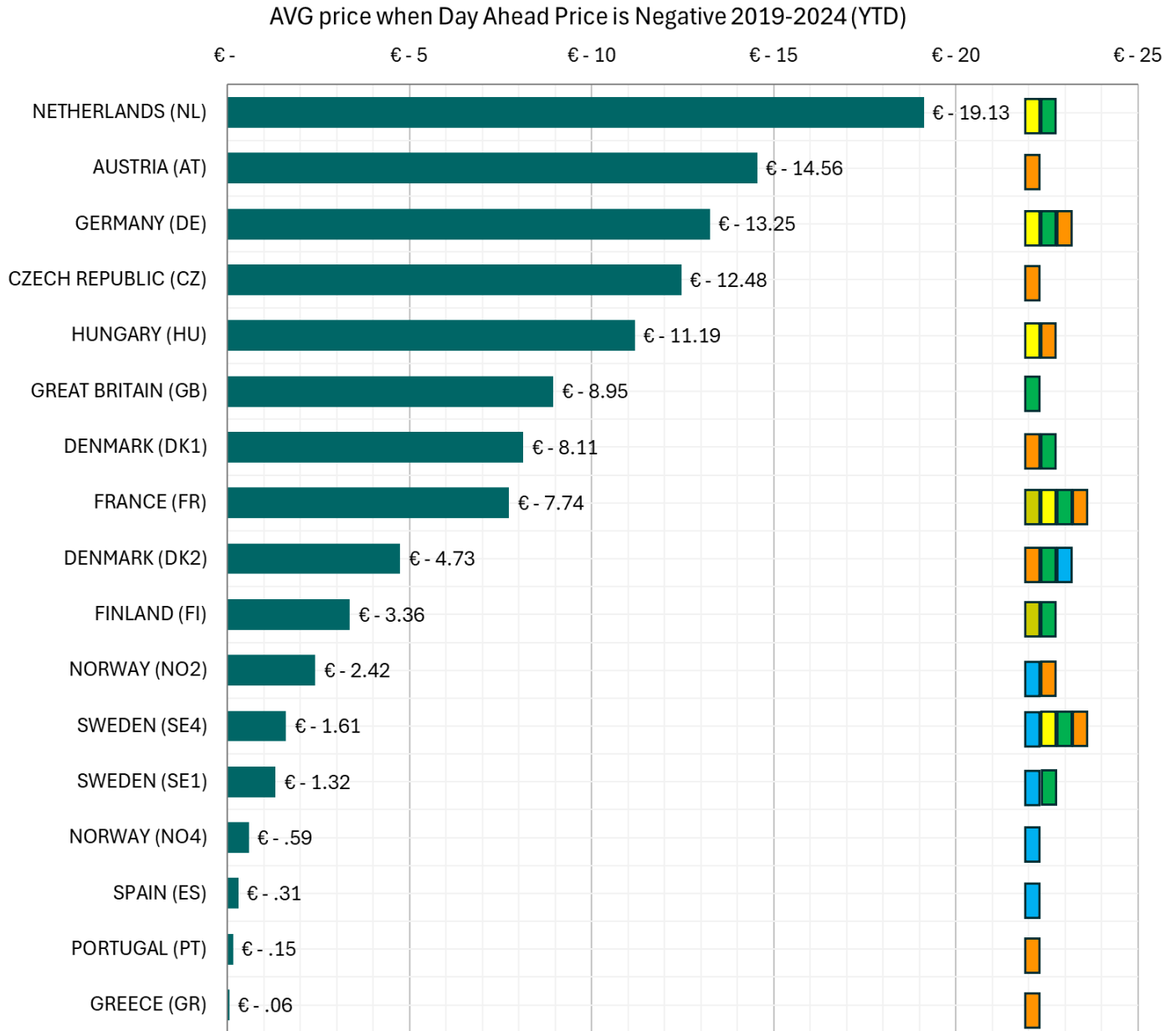
Eastern Europe have negative prices regularly outside the weekend and holiday periods as well

Interconnector bottlenecks are still an issue

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Renewable growth in EU – How low can you go?



The depth of prices depends on the cause of negative prices and the alternative revenues

Availability of ramp down capacity and intelligent subsidy schemes limits the severity of negative prices

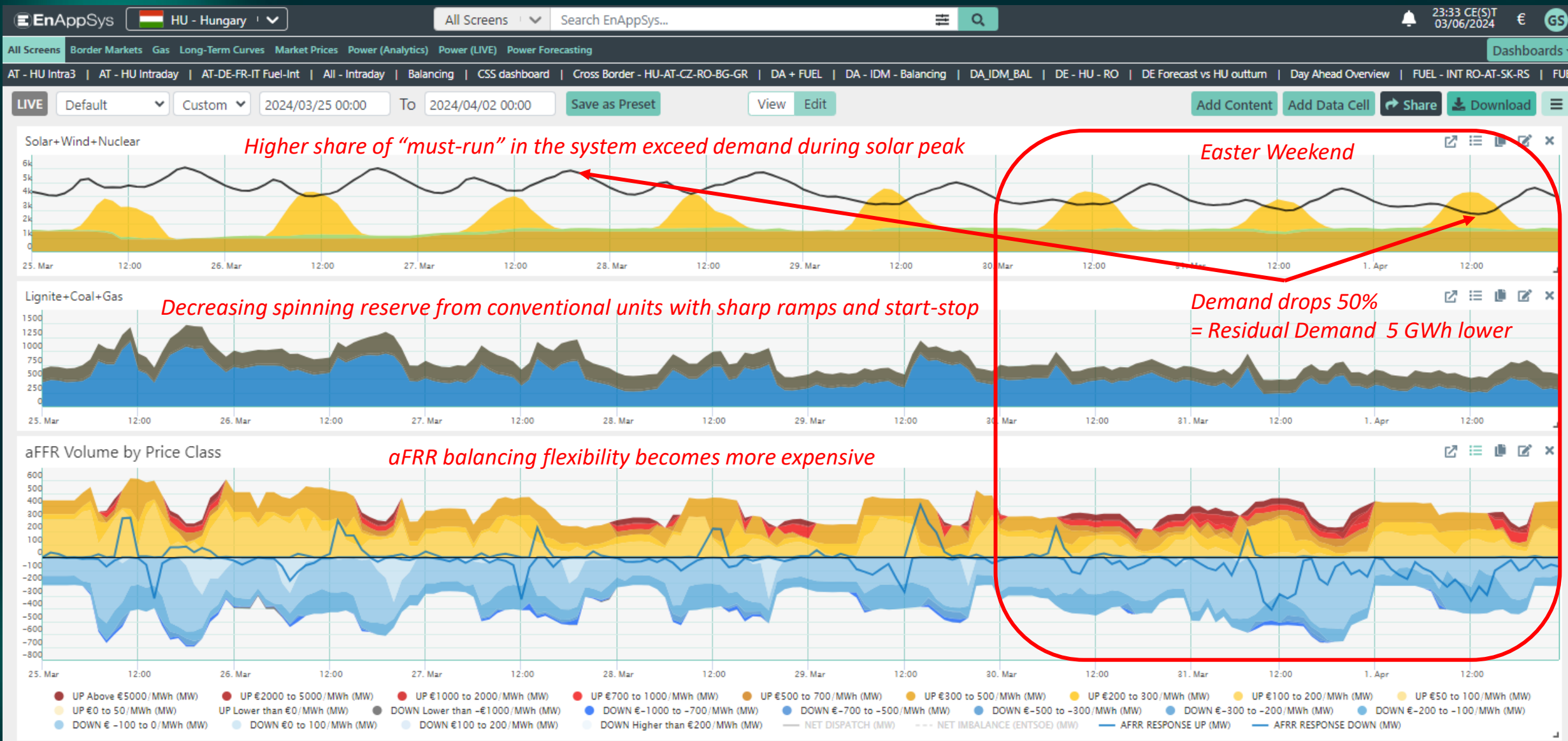
Western European markets have less lower negative prices in 2024 compared to 2023

In Eastern Europe it's the other way around

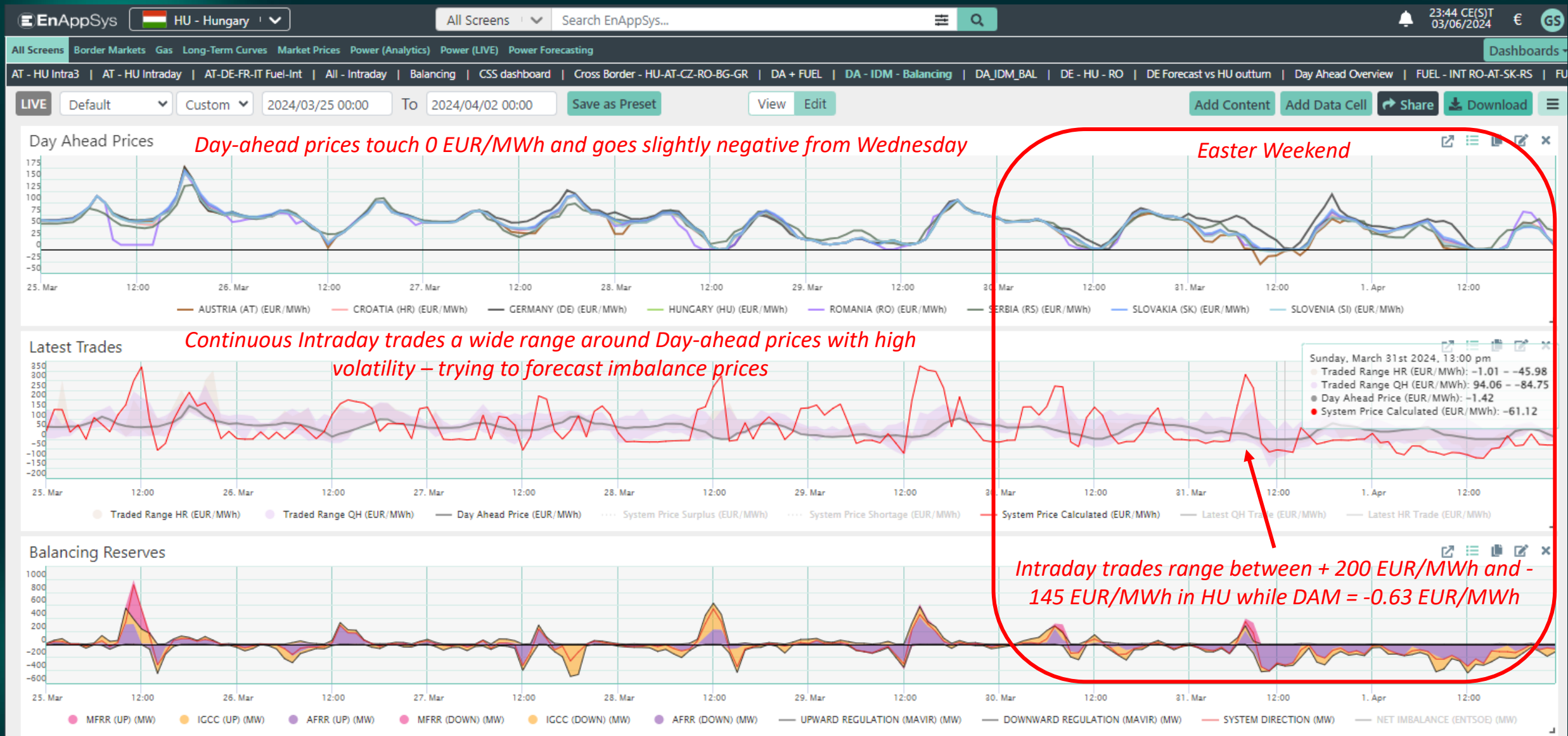
- High Must-Run Generation
- High Solar
- High Wind
- Guarantees of Origin
- Imports

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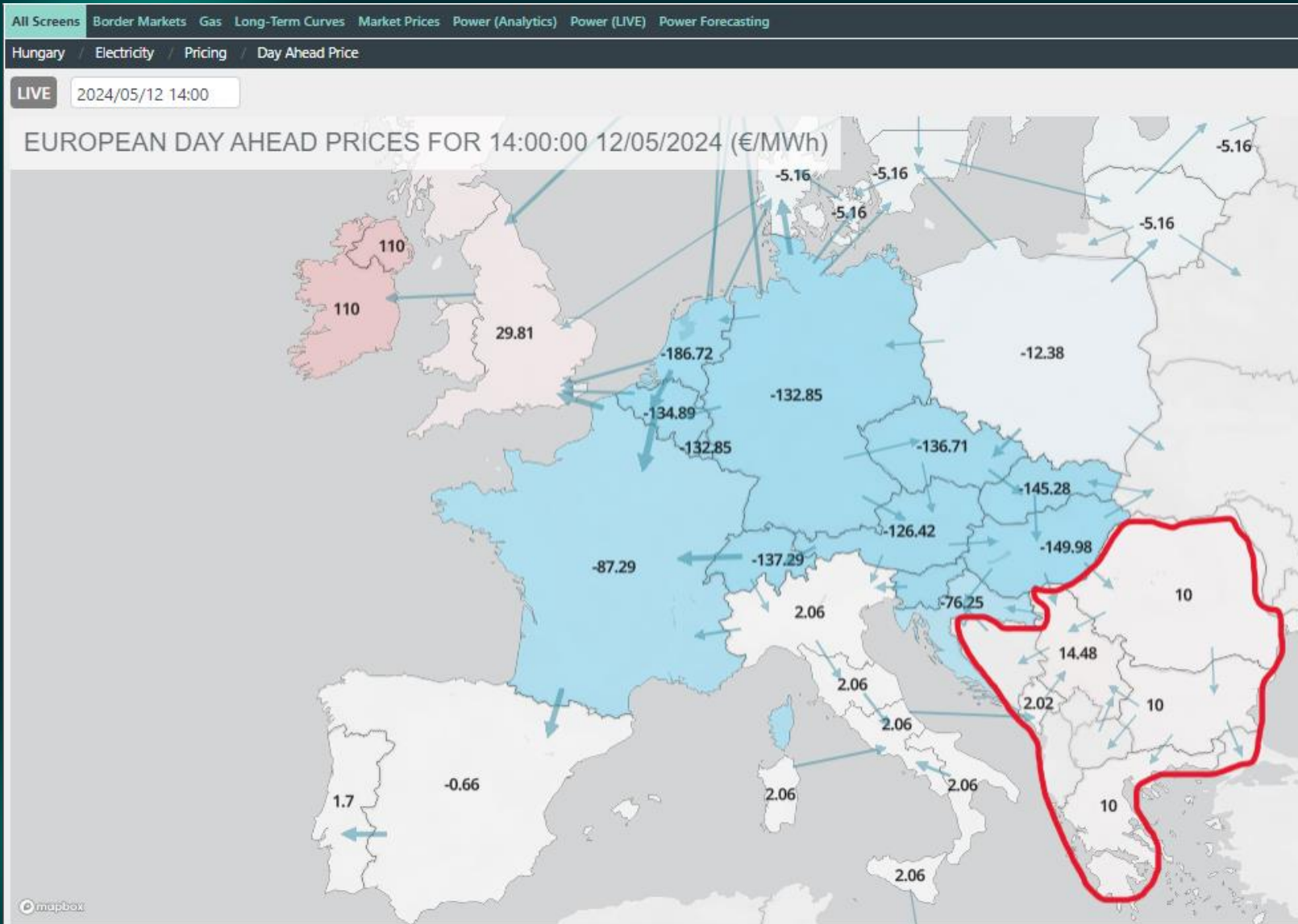
Negative Day-ahead markets – Knock on effects



Negative Day-ahead markets – Tip of the Iceberg?



Negative Day-ahead markets – Tip of the Iceberg?



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Hungarian spot decouples from SEE on outages, curtailments

(Montel) The spread between Hungarian spot power and its southeast European peers has widened in recent sessions to nearly EUR 60/MWh on the back of outages and net transfer capacity (NTC) curtailments in Hungary.

Power for delivery on Wednesday settled at EUR 64.85/MWh on Hungary's day-ahead power exchange Hupx, significantly below the Romanian and Serbian day-ahead equivalents at EUR 100.56/MWh and EUR 108.57/MWh, respectively.

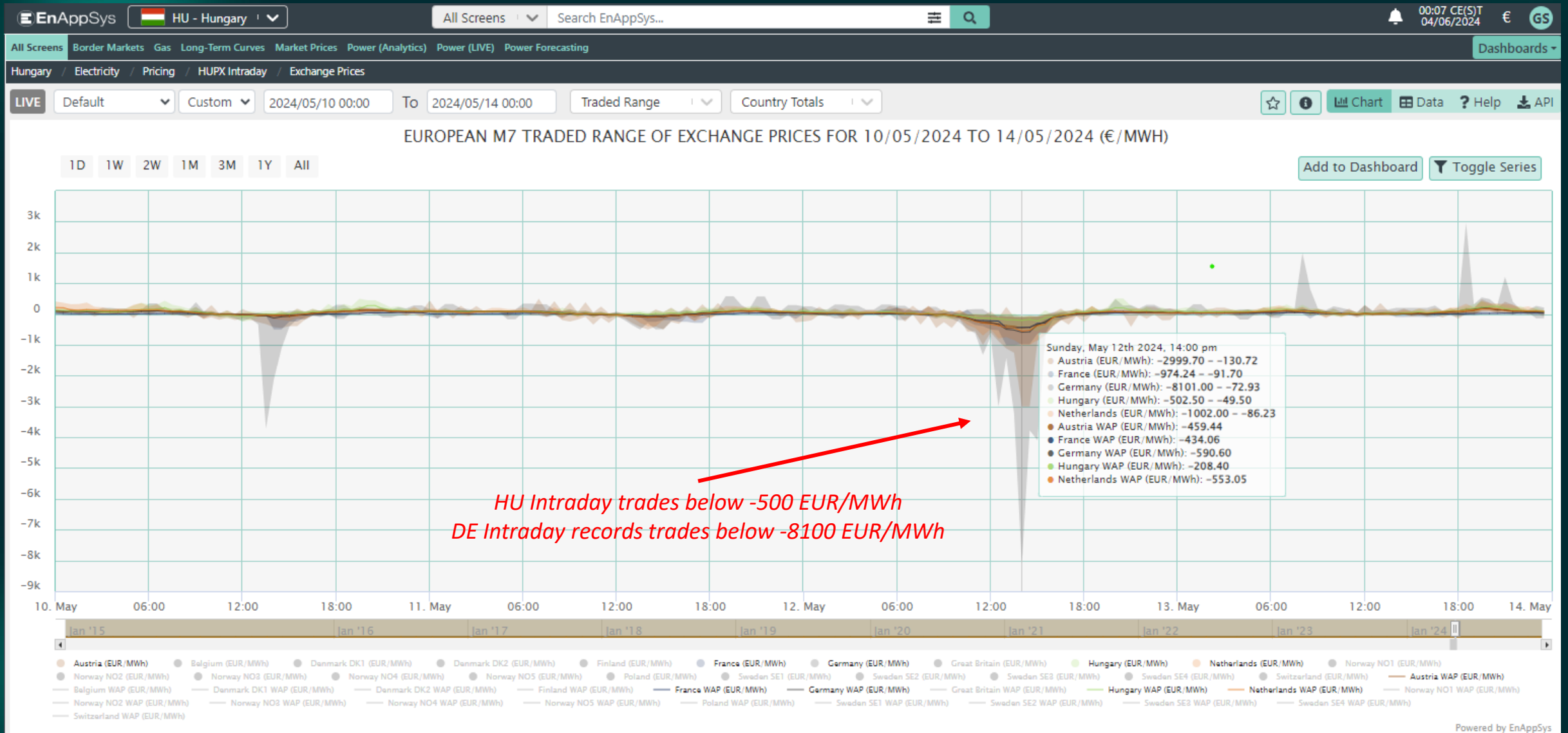
The spread between the Hupx day-ahead value and the Romanian, Serbian, Bulgarian and Greek equivalents was even higher on Monday, reaching nearly EUR 60/MWh.

On Sunday, the spreads between Hungary and Romania reached close to EUR 160/MWh during certain hours.

Weekend of 11-12 May

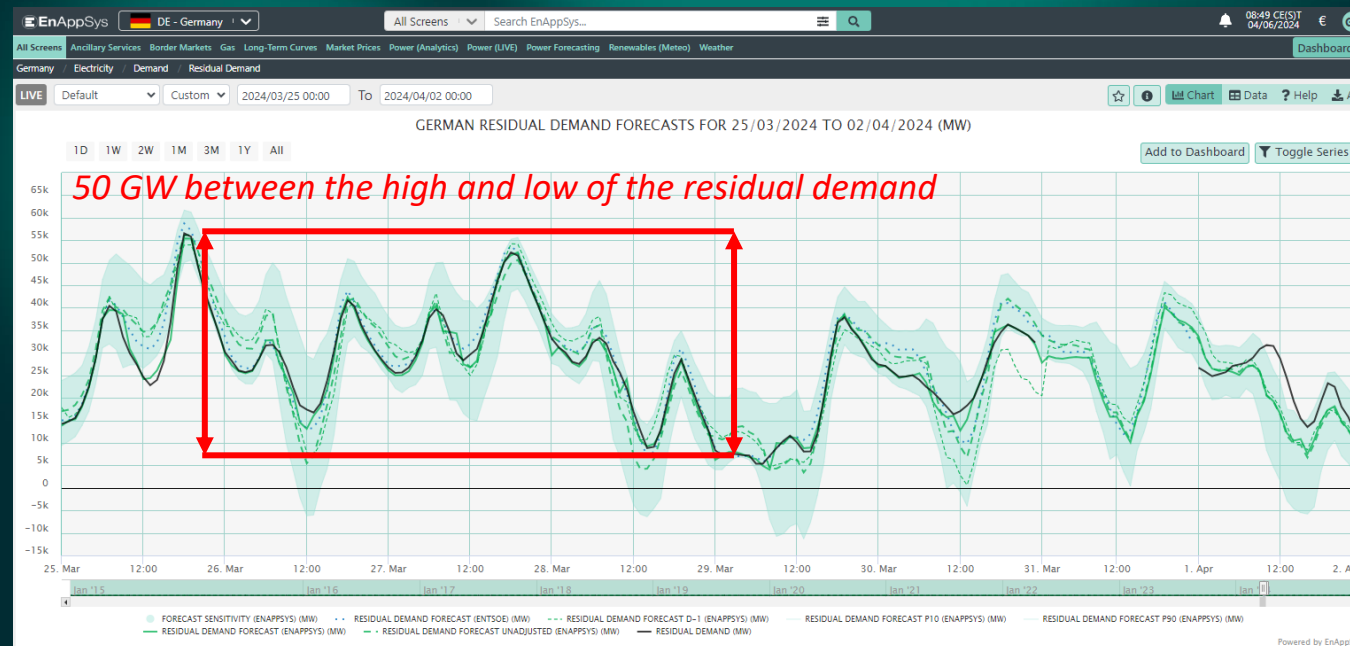
- SEE decoupling from rest of Europe
- Lowest Day-ahead prices of 2024 so far
- Intraday Markets across Europe go far lower...

Negative Day-ahead markets, but Intraday is Major League



Challenges ahead – Conclusion

- Negative prices are signals for more flexibility
 - Flexibility for supply and demand
 - Batteries and demand response in the spotlight
 - Current battery solutions can help in very short-term flexibility but not seasonally
 - DSR needed but will not be able to fill the gap even between the daily and weekly highs and lows of residual demand
 - (DE 50 GW “swing” during the Easter Weekend, in HU 5.5 GW)

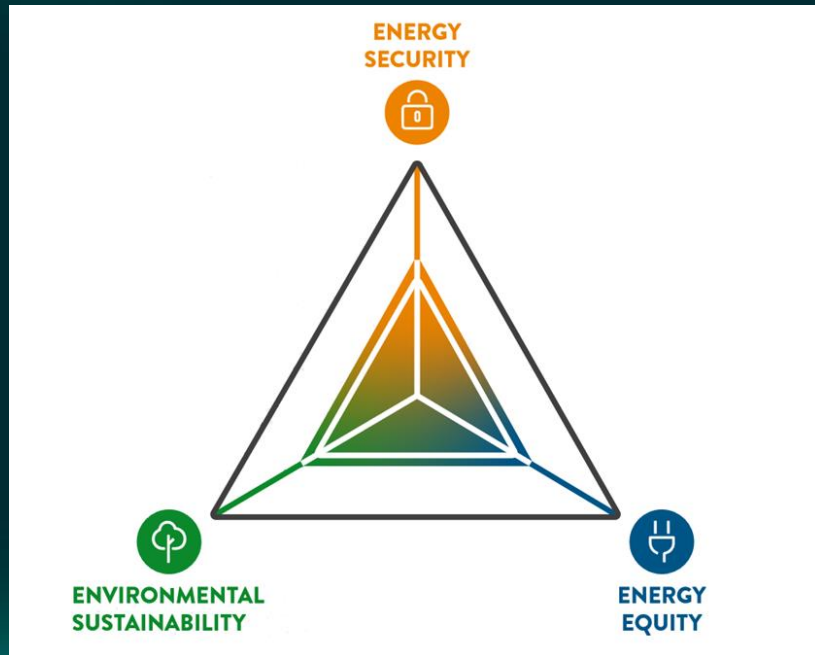


Challenges ahead – Conclusion

- Flexibility between different markets
 - Seasonal flexibility exists – for example Hydro Reservoirs (additional interconnectors!)
 - IDA – bridging solution between Day-ahead and Continuous Intraday
 - Quarter hourly hedging option for more market players could help extreme volatility
 - Price transparency below the “Tip of the Iceberg”
- Flexibility/Adaptability of the legal frameworks (FiT/PPA)
 - Market price driven wind/solar curtailment is there – tackled by outdated price structure
 - FiT/Fixed price PPAs lacks the proper price incentive to curtail production
 - Hinders future renewable investments via cannibalization of capture prices
 - Financial support could remain in a different format, but need to lighten the pressure on Short-term markets when the generation is not needed
 - For example 85% of Hungarian utility scale PV, ca. 3000 MW are in fixed price FiT at 120 EUR/MWh

Energy Trilemma – something to keep in mind

What we would like to achieve



WE OFFER 3 KINDS OF SERVICES
GOOD-CHEAP-FAST
BUT YOU CAN PICK ONLY TWO

GOOD & CHEAP WON'T BE **FAST**

FAST & GOOD WON'T BE **CHEAP**

CHEAP & FAST WON'T BE **GOOD**

What we would like to avoid

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