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Vienna, 11th June 2025 - ETCSEE

Volue Insight

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VOLUE
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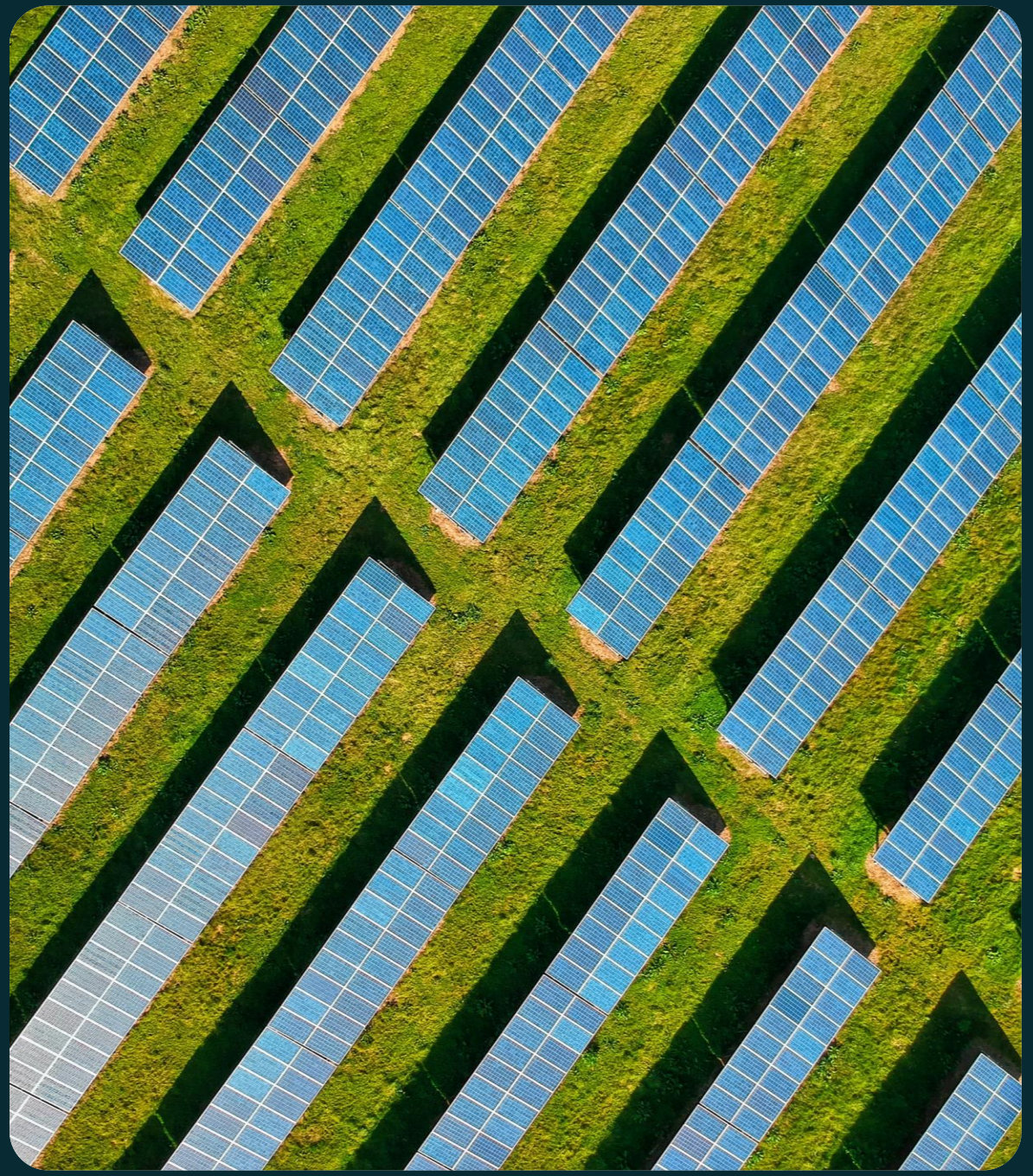
Pan-European Power Markets the role of FBMC in the East

Prices and XB spreads

Flow-Based Market Coupling

Observations

Conclusions



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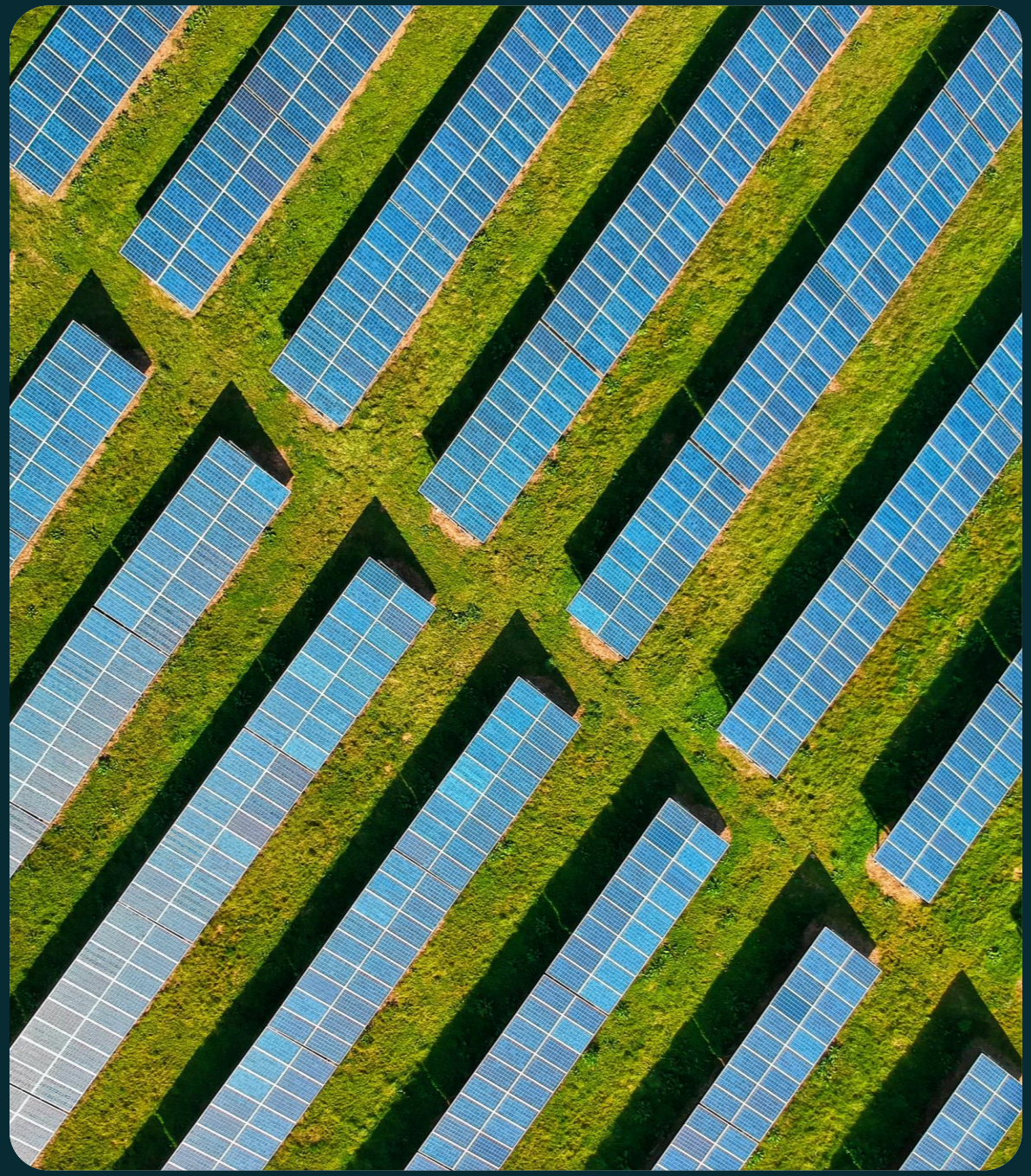
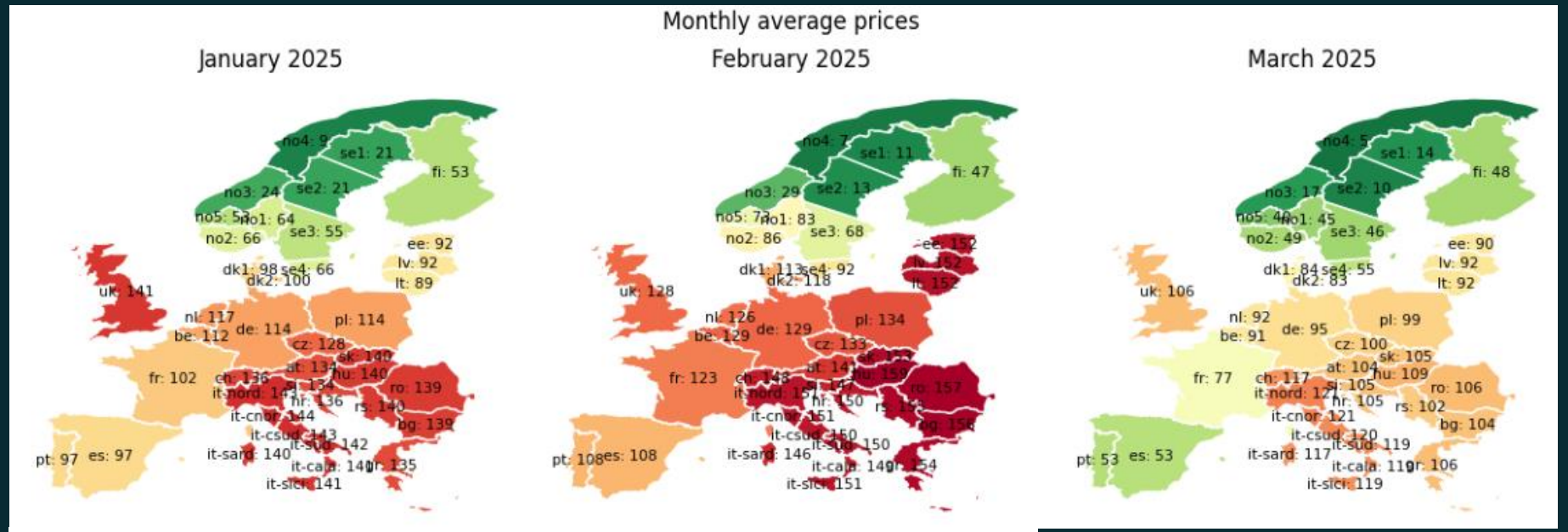
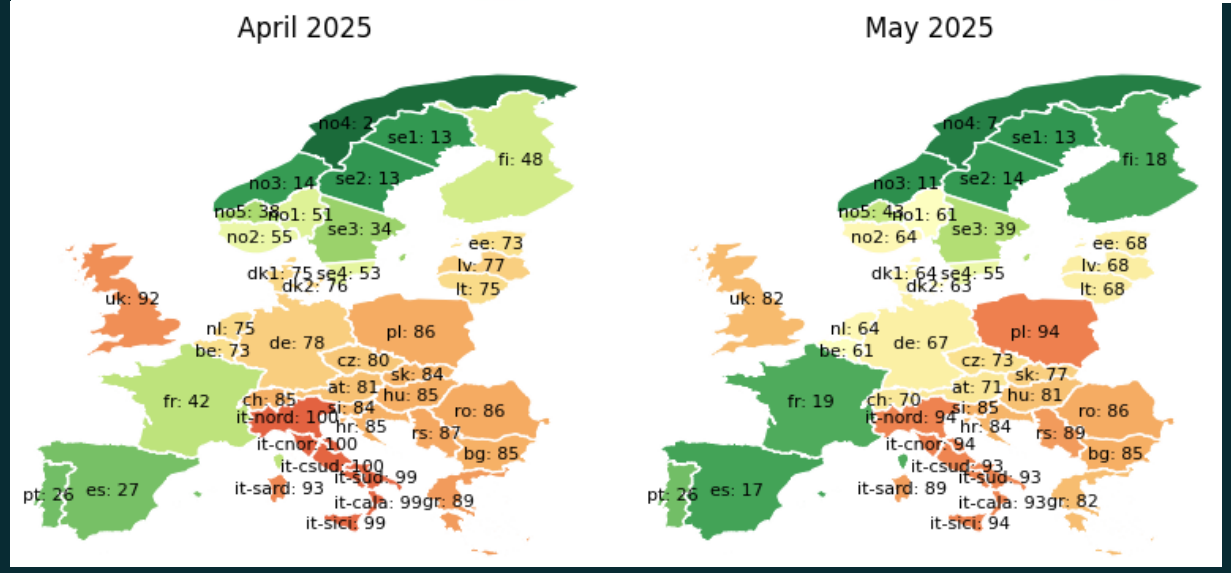
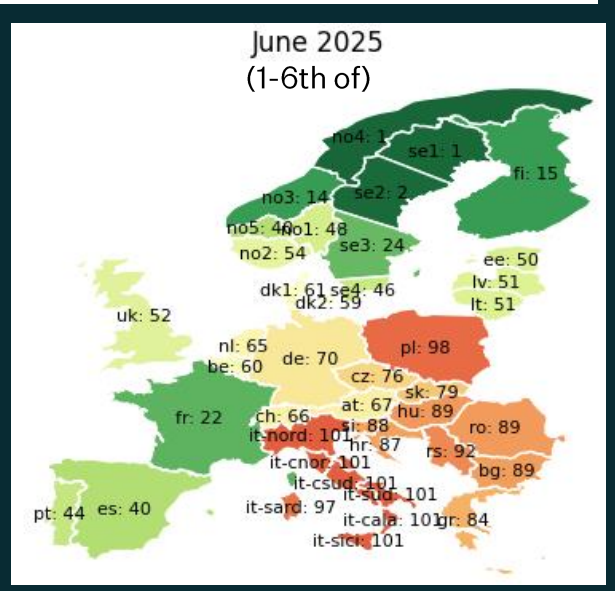


2025 so far - prices and XB spreads







Nordics well below the rest

The East, mainly SEE, close to Italy

Iberia clearly the cheapest in Continental Europe

In Q2 XB spreads

East-West have widened

Germany and Benelux closer to the East: large spread between France/Iberia and the rest.

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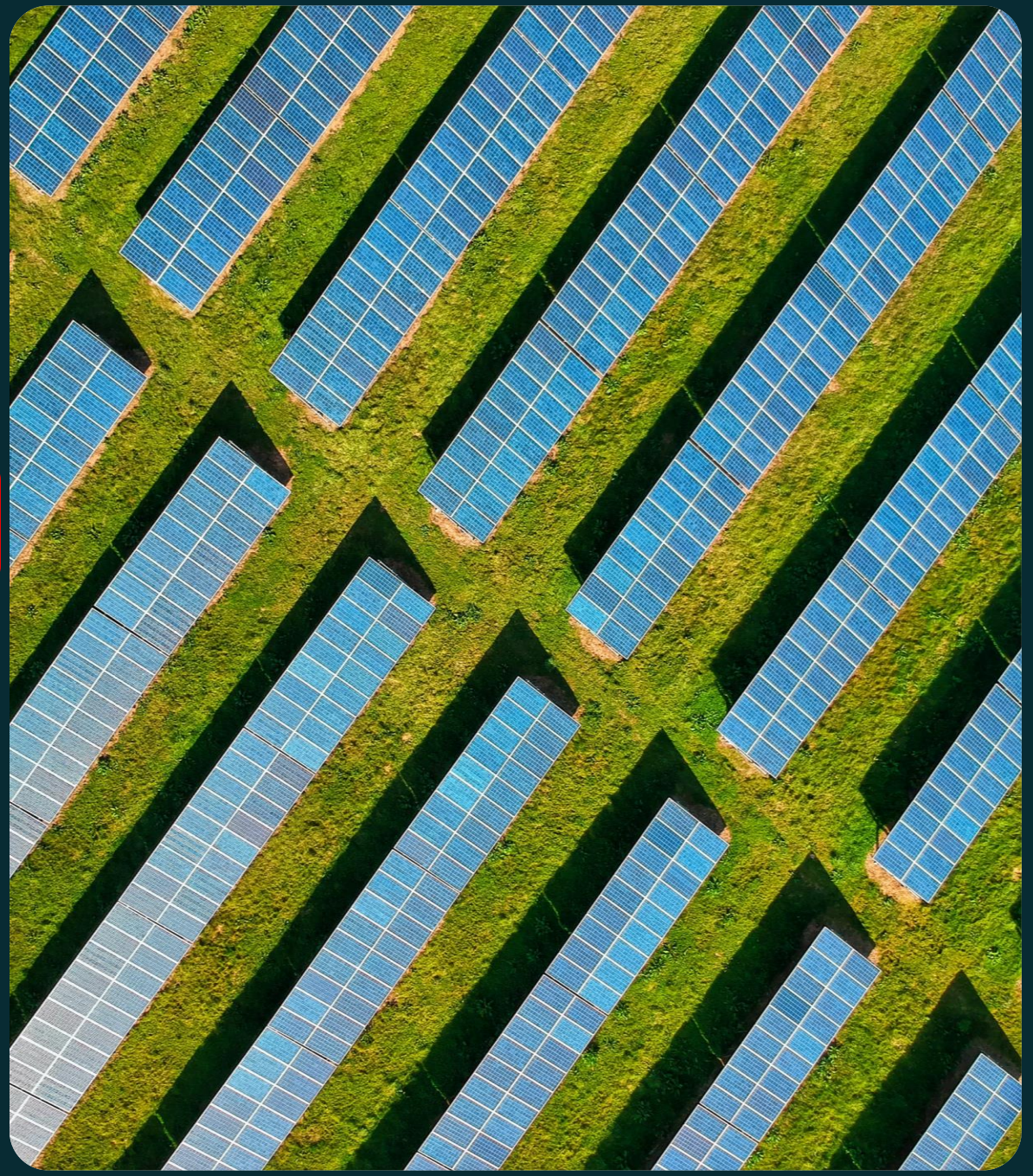

About FBMC

It is a methodology for XB optimzation aiming to get closer to the reality of the grid compared with NTC

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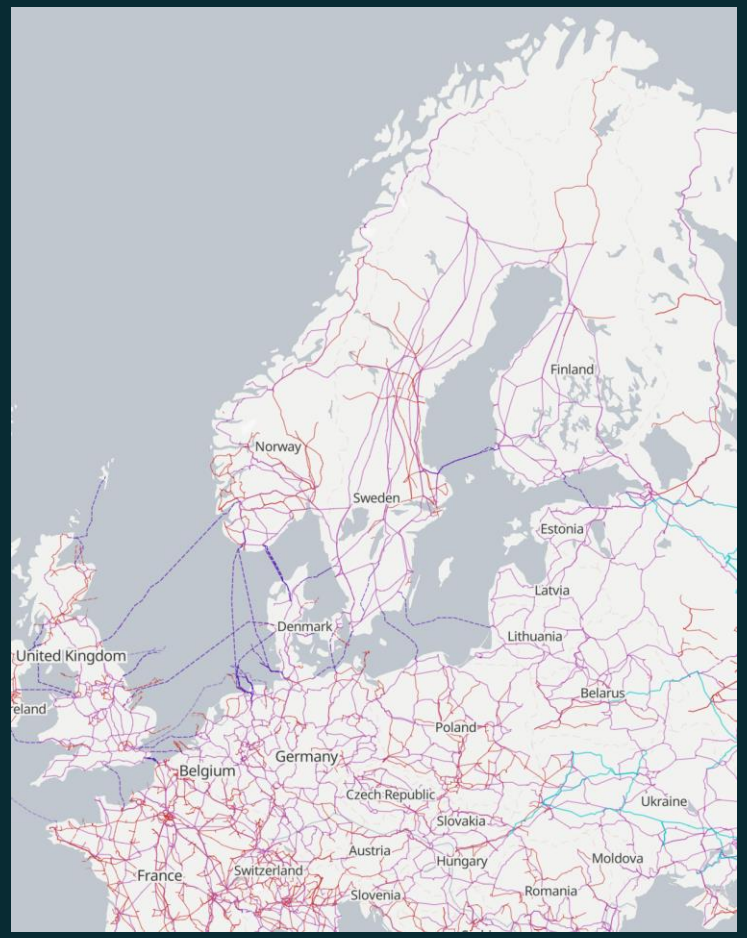
Complex physical grid

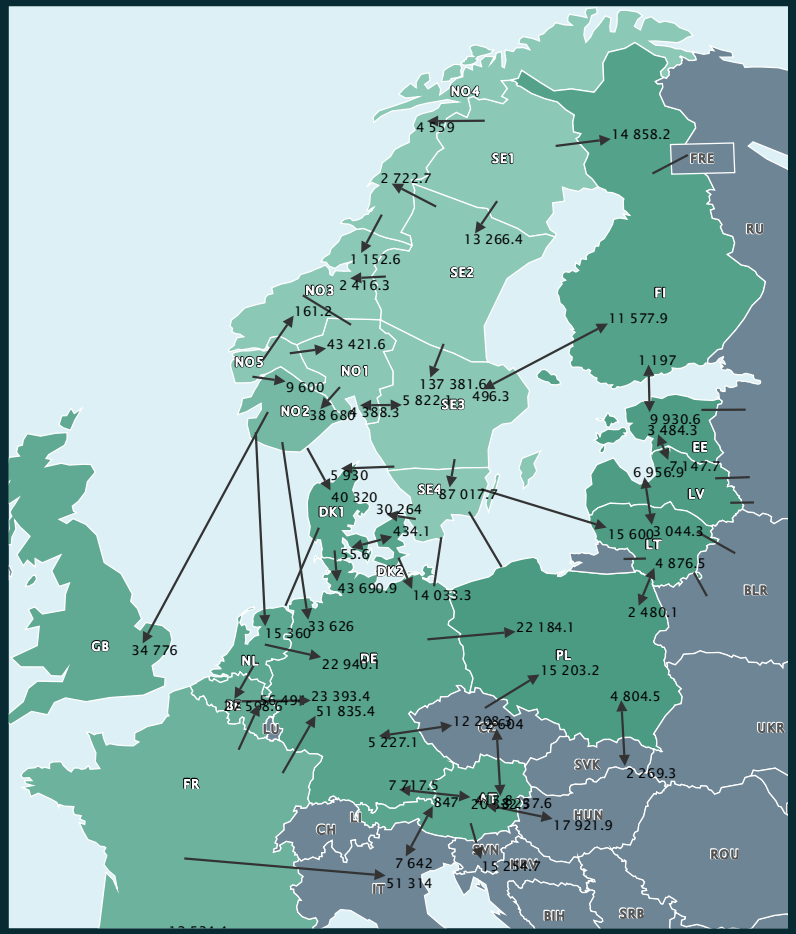


Adapted from Nordic RCC stakeholder presentations Images from Open Infrastructure Map and Nordpool

Nodal model → FBMC → NTC

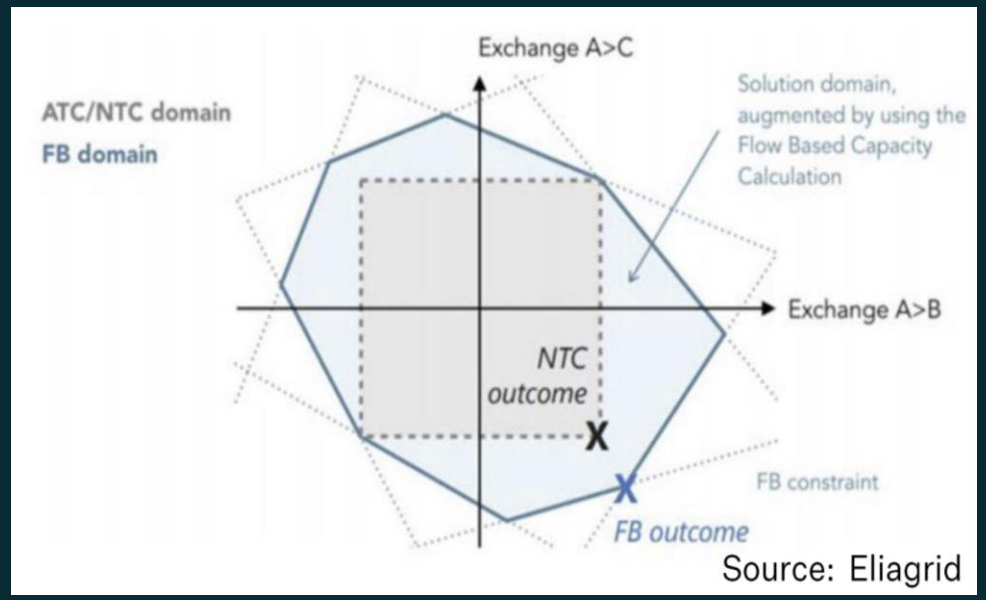
Process to translate the complex physical grid into a simplified form that can be processed by the power exchange optimization's tool

Simplified zonal market



Some key concepts in FBMC

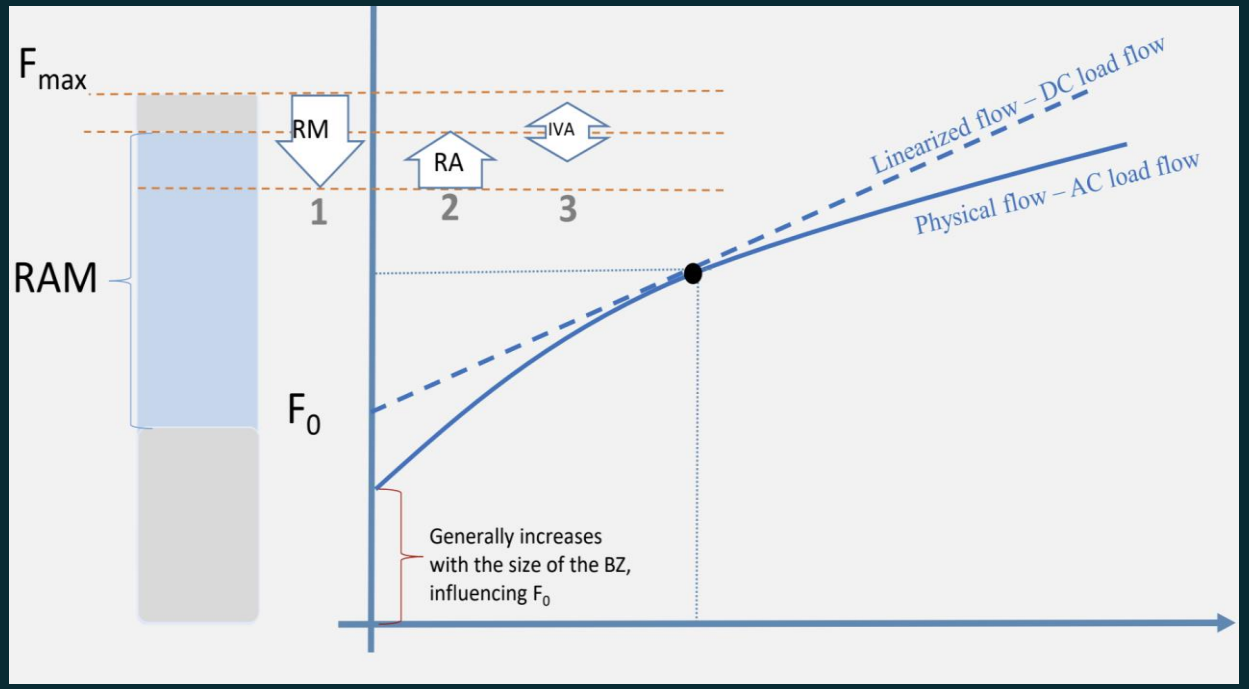
Understanding prices and XB spreads is possible only by diving-in the data of FBMC published by JAO



- The limitations of bilateral exchanges between different bidding zones are described by a set of inequalities which is translated in a matrix called Power Transfer Distribution Factors (PTDF).
- Critical Network Elements (CNEs) represent the lines that are significantly impacted bx XB exchanges.
- Remaining Available Margin (RAM): number of MW that are available in the day-ahead optimization for XB trades on a specific CNE.

What is the RAM?

The results out of EUPHEMIA must respect the following inequalities for each CNEC of the PTDF



Source: FB methodology pedagogical walkthrough
Nordic CCM Stakeholder Meeting 2022-03-17
Ulirk Moller ENERGINET

$$\sum (NEX\ hub * PTDF\ hub) < RAM$$

$$PTDF * NP \leq F_{max} + RA - RM - IVA - F_0$$

RAM – Remaining Available Margin

PTDF – Power Transfer Distribution Factors

NP – Net Positions (NEX)

Fmax – max allowable power flow per CNEC in MW

RA – Remedial Actions

RM – Remaining Margin

IVA – Individual Value Adjustment

F0all- flow per CNEC in a situation with no XB flows on Continental Europe (adding zones of other synchronous areas)

Main FBMC indicators

reasons for the XB spreads must be found in fundamentals and grid restrictions.

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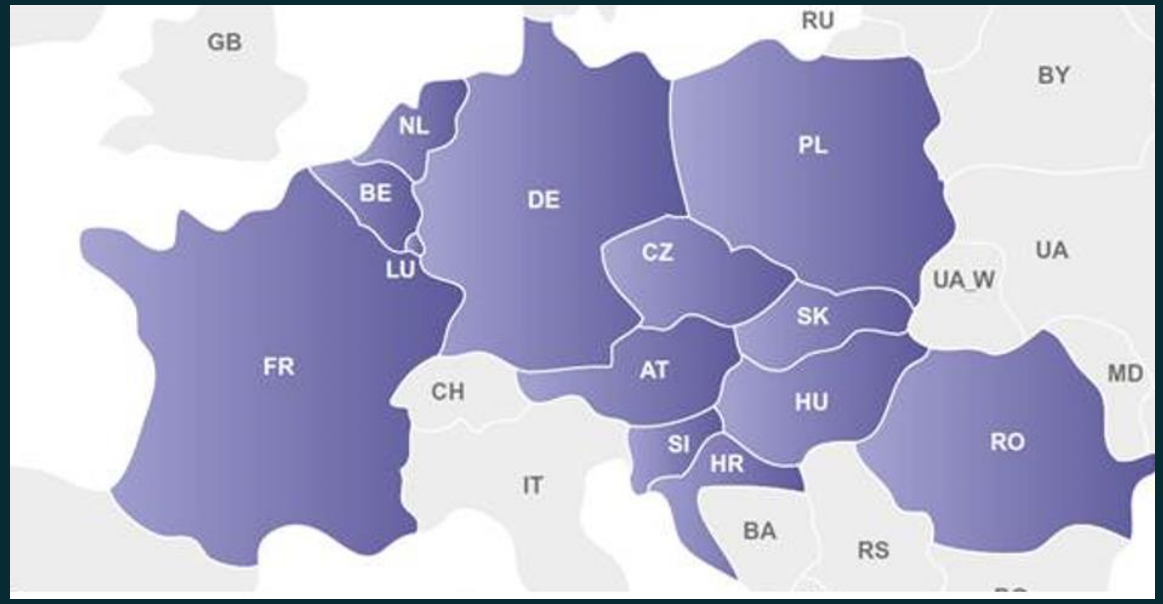
JAO publishes all data necessary to understand the market. In the next slides we will be looking at some main indicators:

Min- max NEX > the max import/ export total net position of a bidding zone versus the rest of CORE
Min- max BEX > the max flow on a border between two adjacent or not-adjacent bidding zones
Shadow Prices > represent the effect on the social welfare of a marginal increase (1 MW) of the RAM.
IVA> Individual Value Adjustment
RAM> Remaining Available Margin
RAM/Fmax >% that describes how much of the max allowable flow is left in the spot exchange.

Useful doc/ link :Core_PublicationTool_Handbook_v2.2.pdf
https://publicationtool.jao.eu/core/



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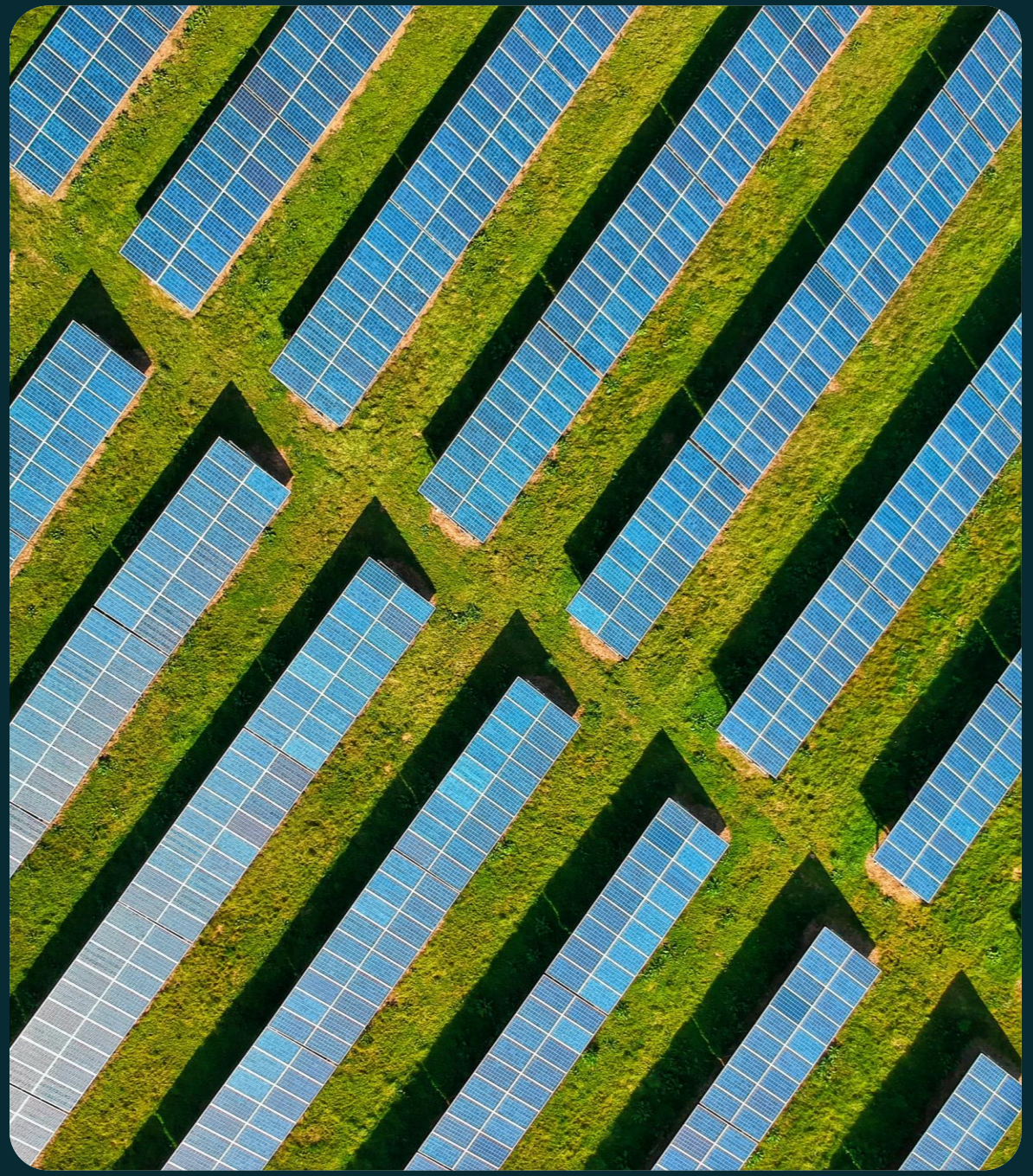
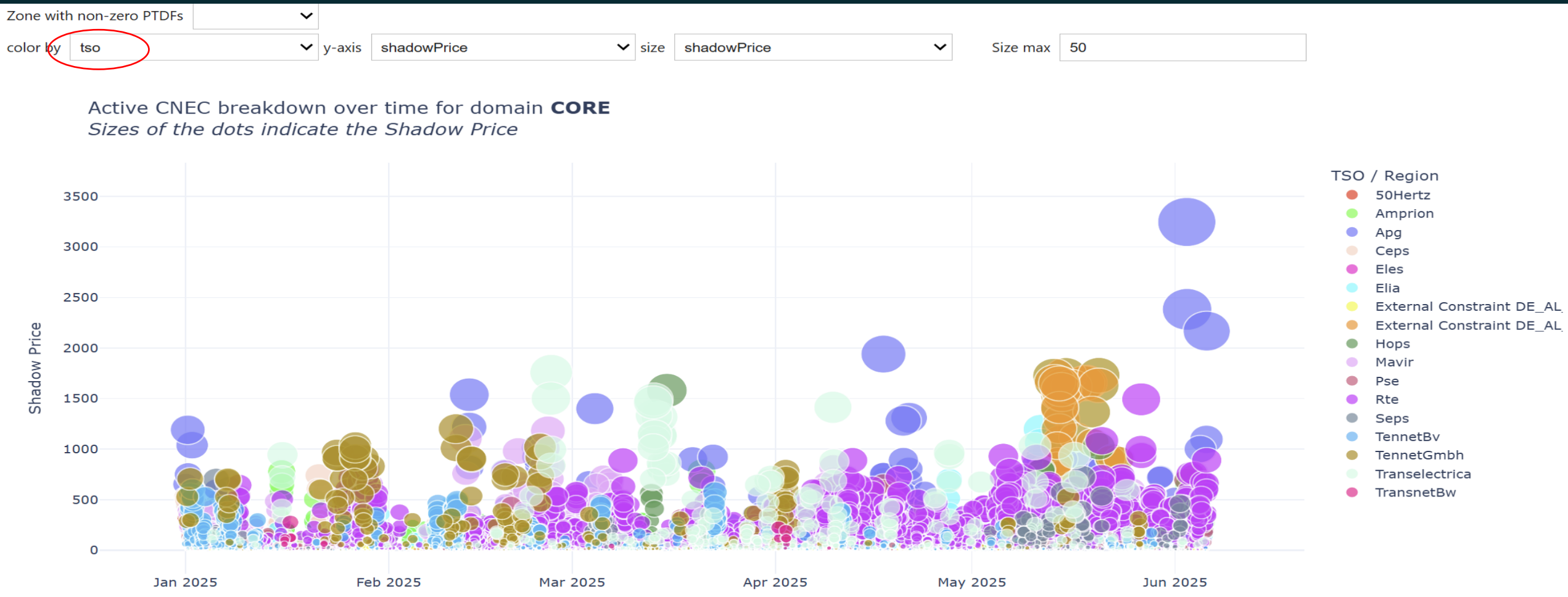


CORE shadow prices 2025 per TSO

Data from JAO – VOLUE

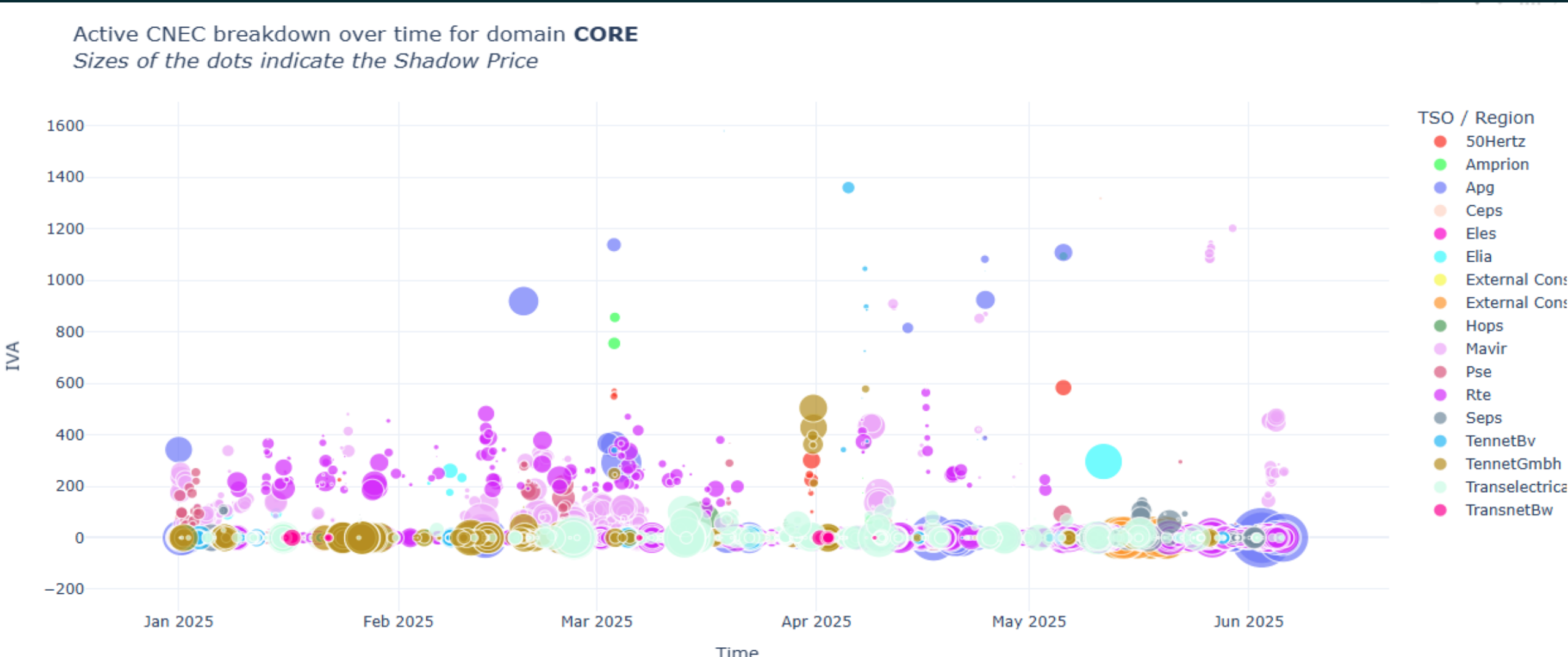
‚Shadow prices in the FBMC represent the effect on the social welfare of a marginal increase (1 MW) of the RAM. In a FB model, the price differences among bidding zones are the result of shadow prices on all congested CNECs - i.e., active FB constraints.'



CORE CNECs – IVA 2025 per TSO

Data from JAO - VOLUE

‘Individual Value Adjustment resulting from individual TSO validation process in MW ‘



CORE CNECs – RAM/Fmax 2025 per TSO

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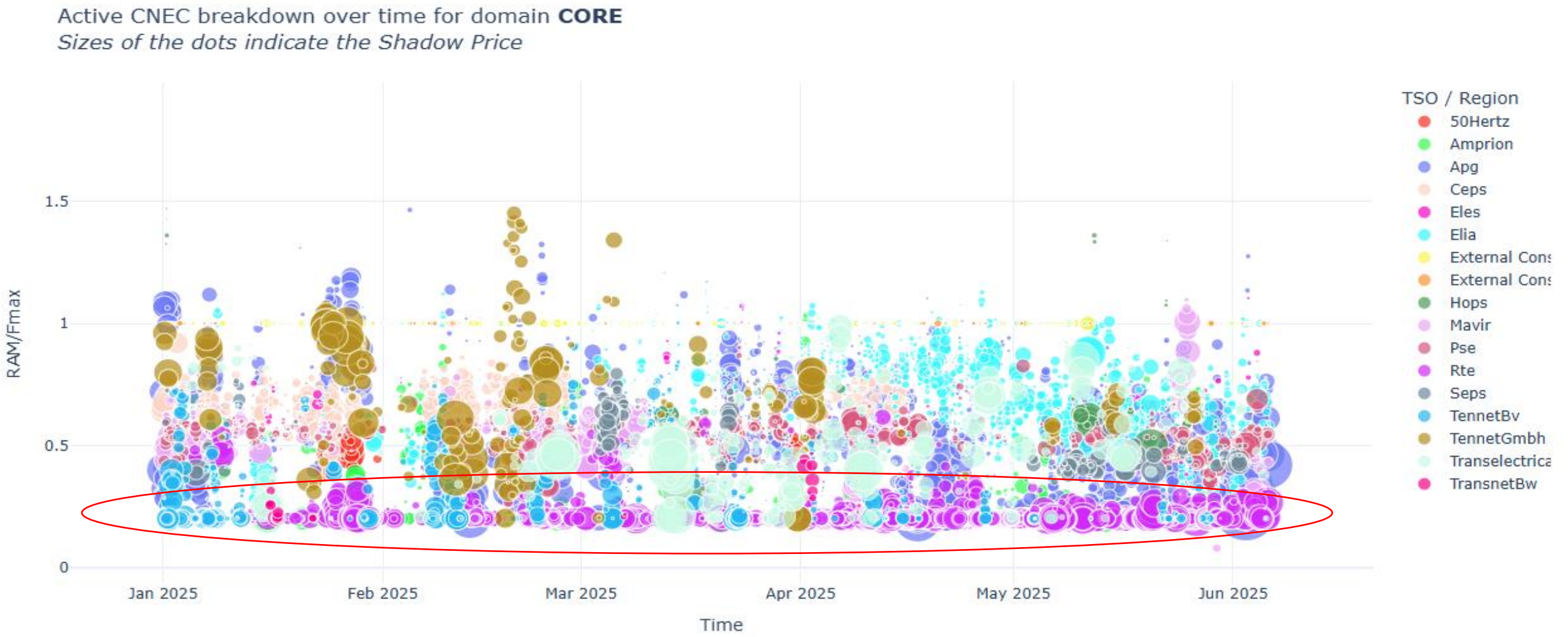
Data from JAO - VOLUE

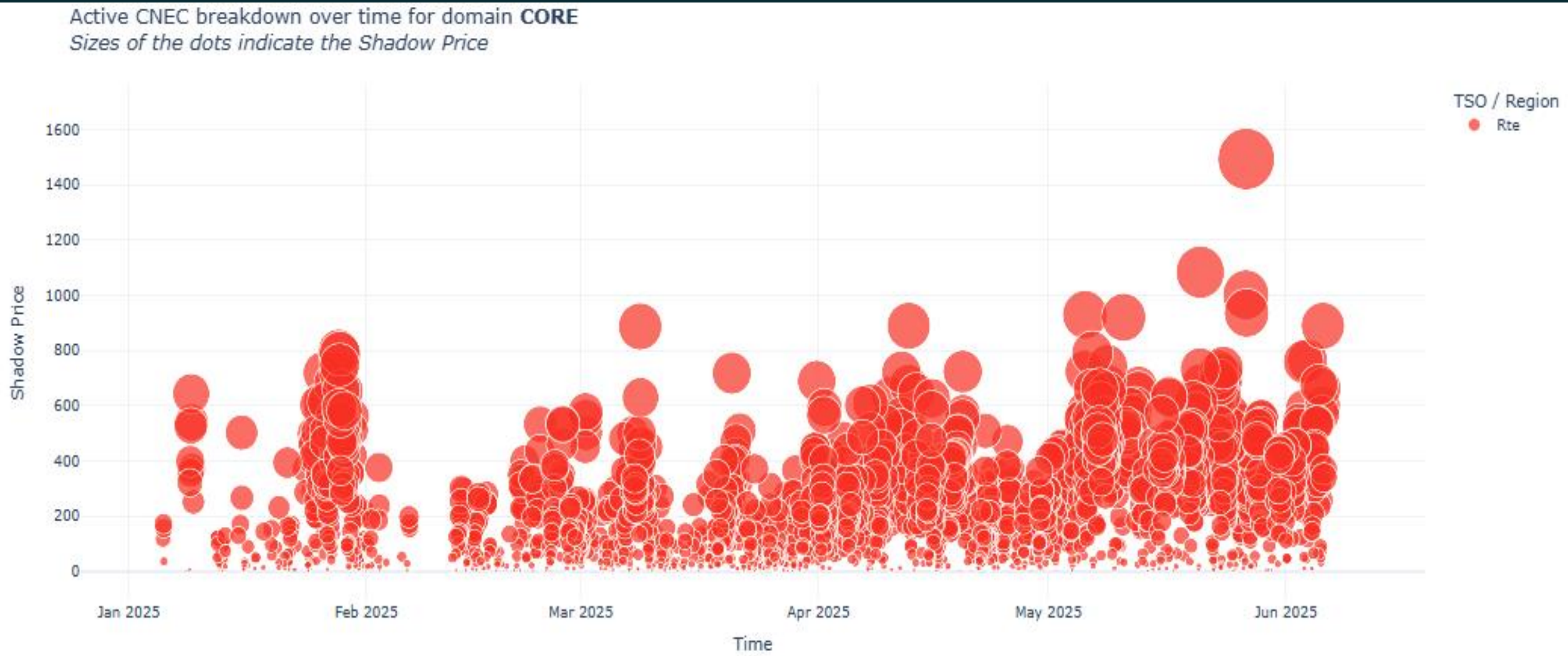
RAM/FMax is the ratio between Remaining Available Margin and the max allowable power flow for a CNE: a large amount is close to 0.2 – 0.3.



Shadow Prices – France

Data from JAO - VOLUE

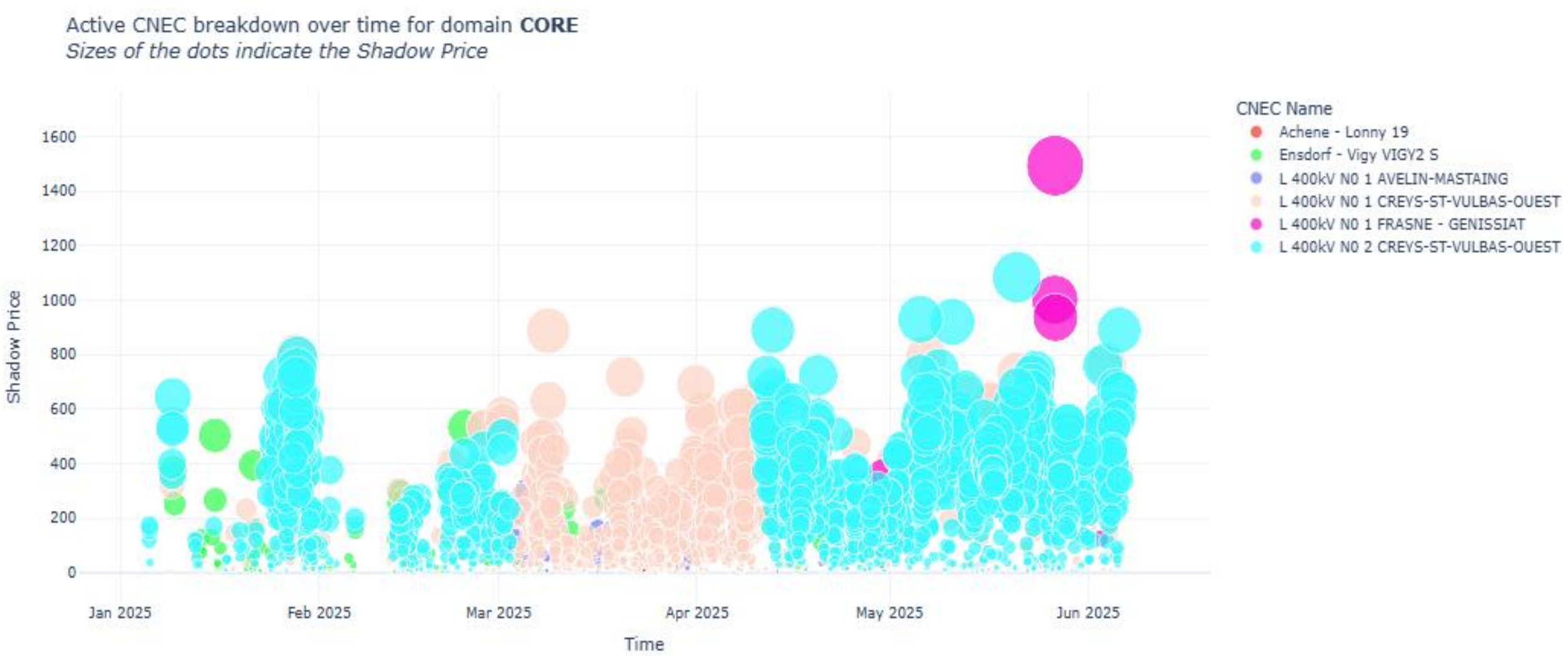
Shadow prices over time for France pointing to increasing congestions.



Shadow Prices – France per CNE

Data from JAO - VOLUE

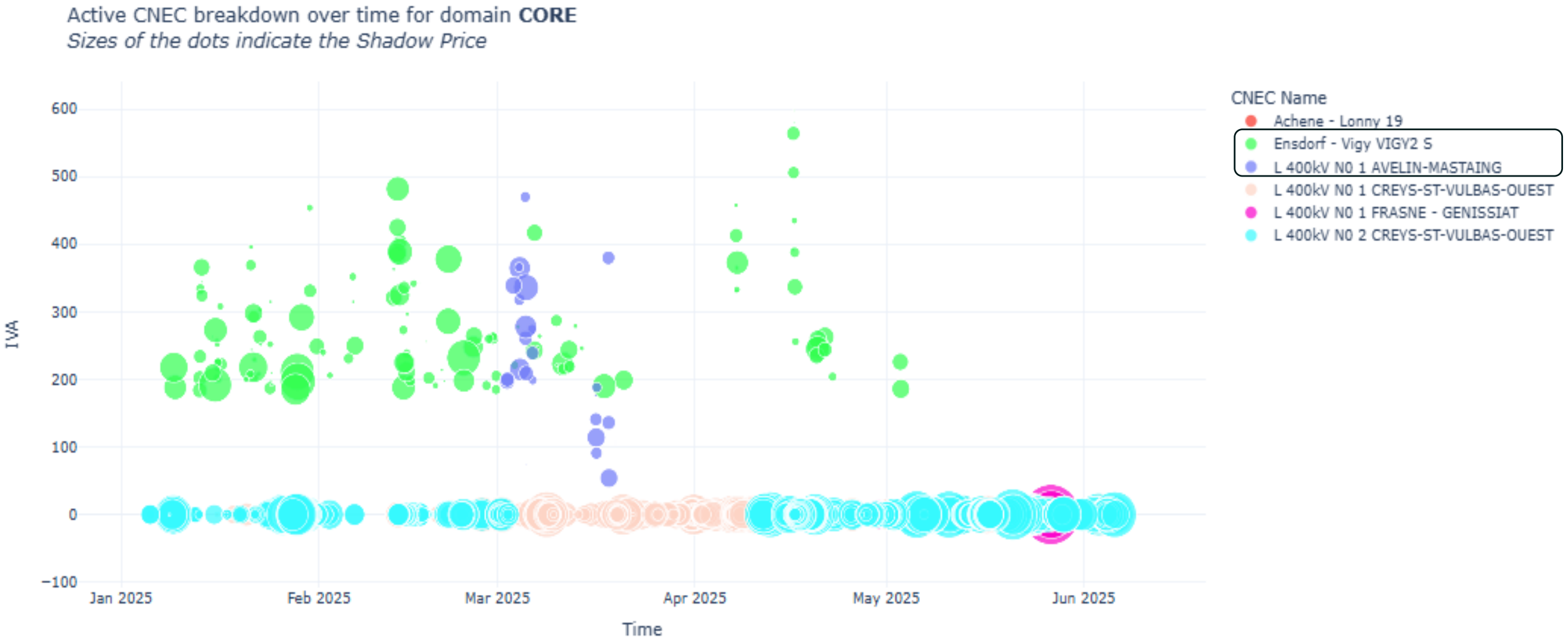
Shadow price per CNE over time



IVA– France

Data from JAO - VOLUE

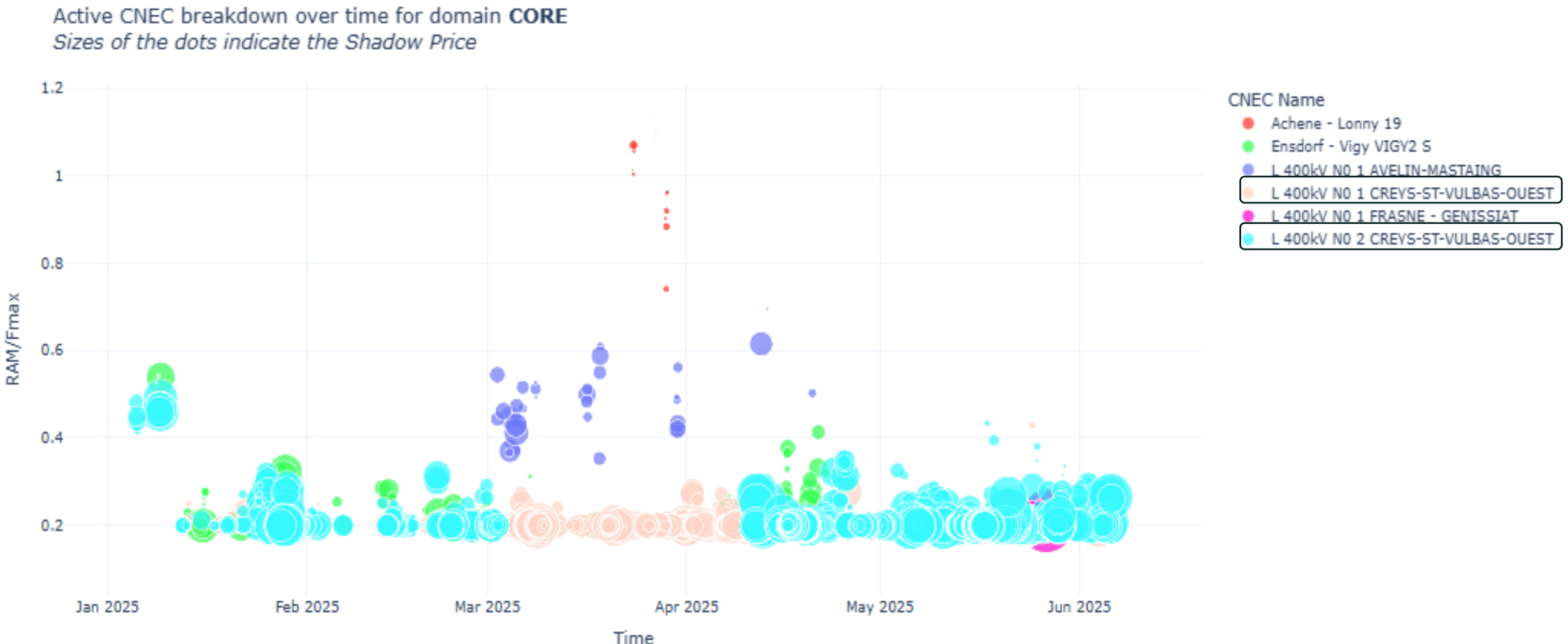
Individual Validation Adjustments mainly present (up to 500-600 MW) only for two CNEs



RAM/Fmax– France

Data from JAO - VOLUE

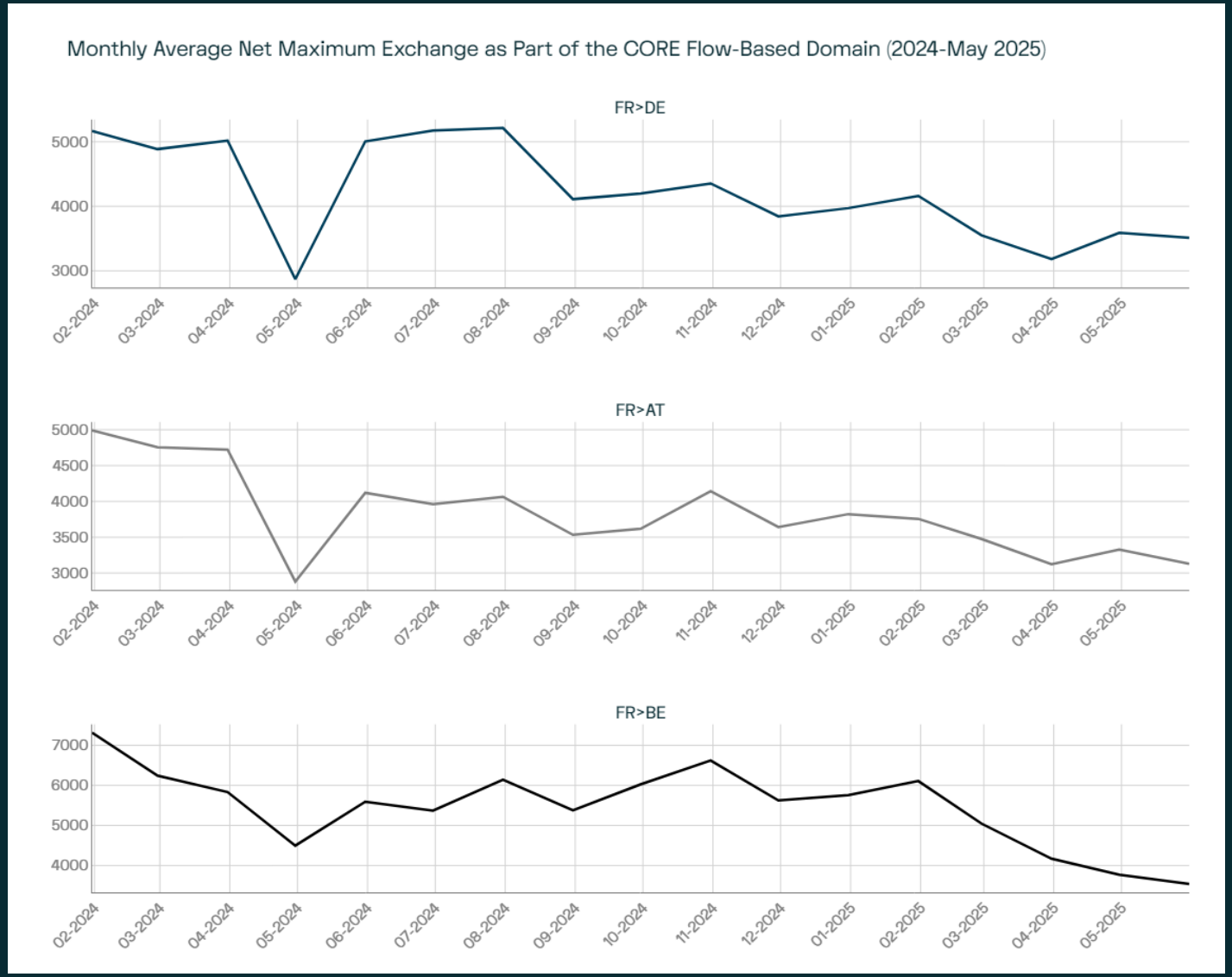
RAM/Fmax very limited for two main CNEs



Max BEX - France

Data from JAO - VOLUE

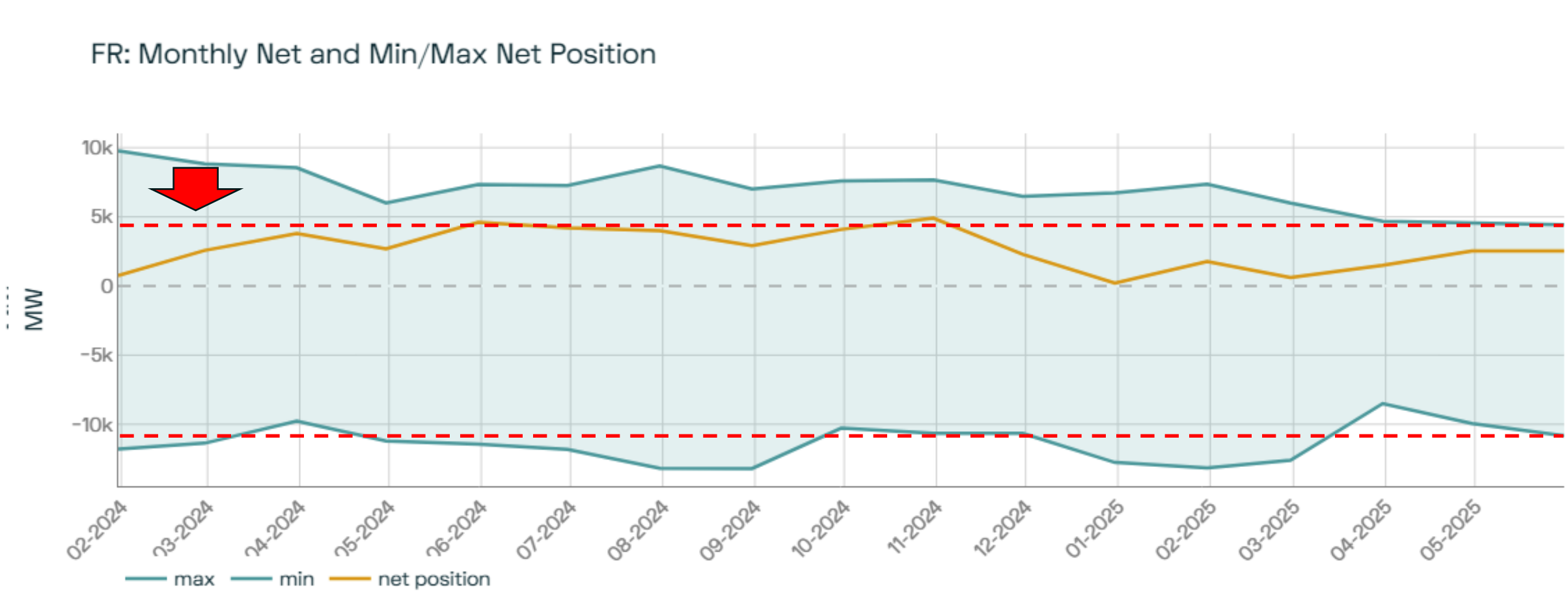
Some of the Maximum Bilateral Exchanges per border are indicating a lower XB availability on FR>DE, FR>BE, FR>AT.



Min-Max Net Position - France

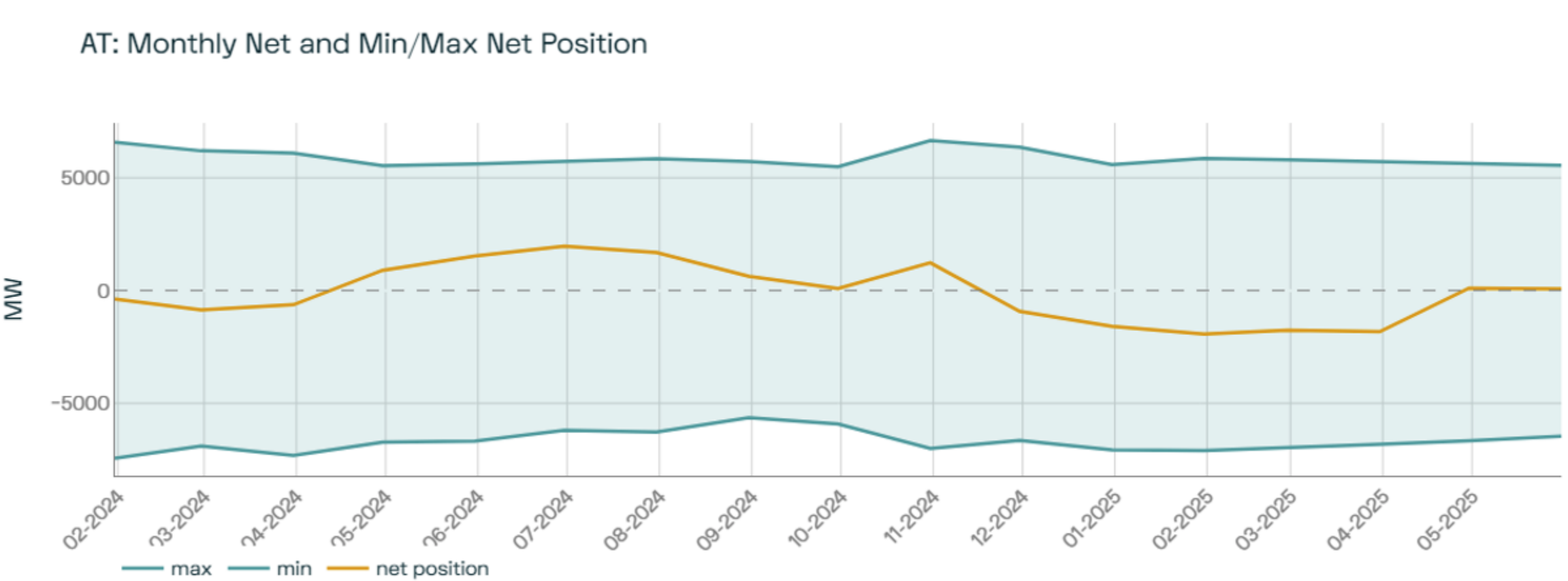
Data from JAO - VOLUE

The Max NEX of France is now less than 5 GW, it was 10 GW at the beginning of 2024.



Min-Max Net Position Austria

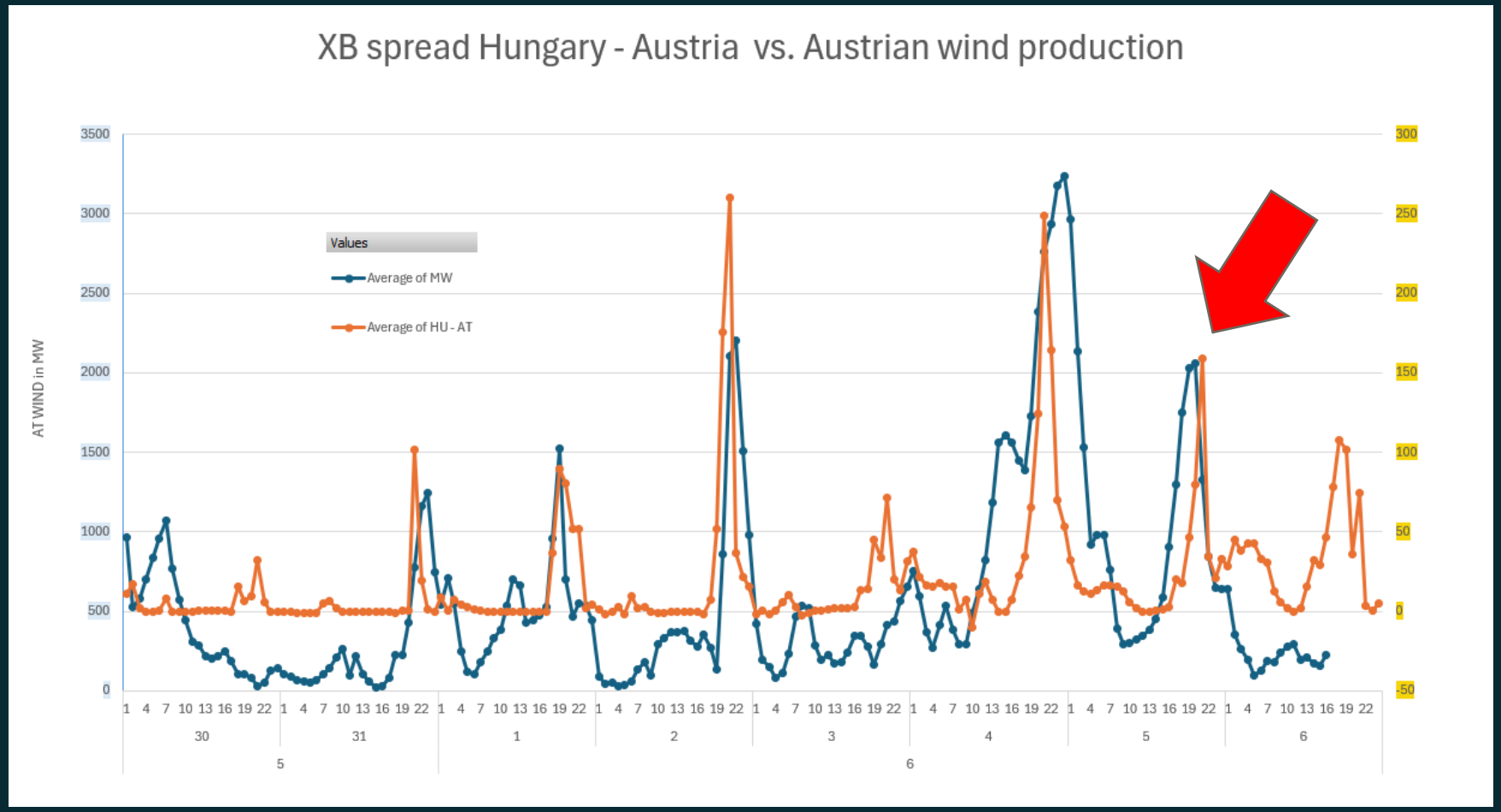
Data from JAO - VOLUE



Focus on Austria

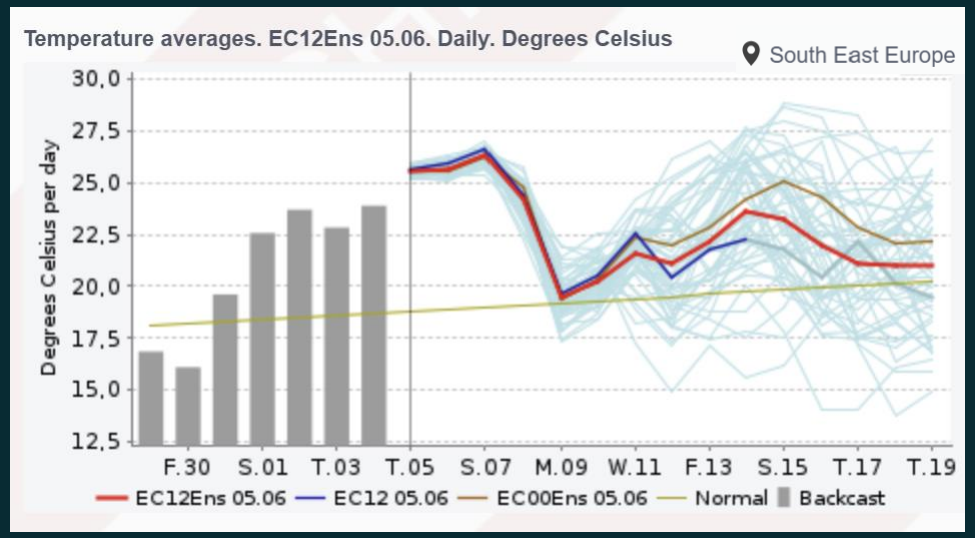
Correlation between wind and grid's bottle-necks: focus on the XB spread Hungary- Austria.

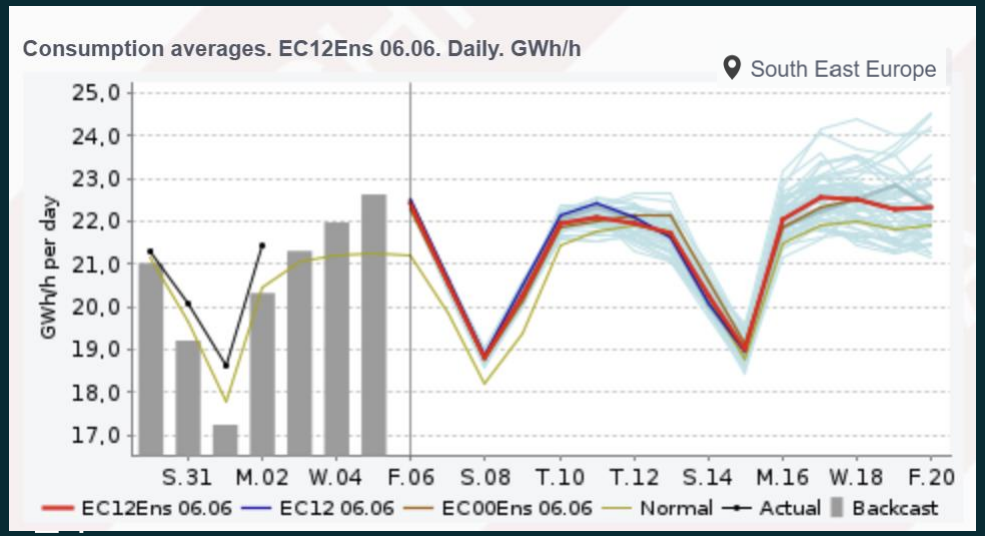
Analyse of the period 30th of May – 6th of of June 2025; zoom in the 5th .

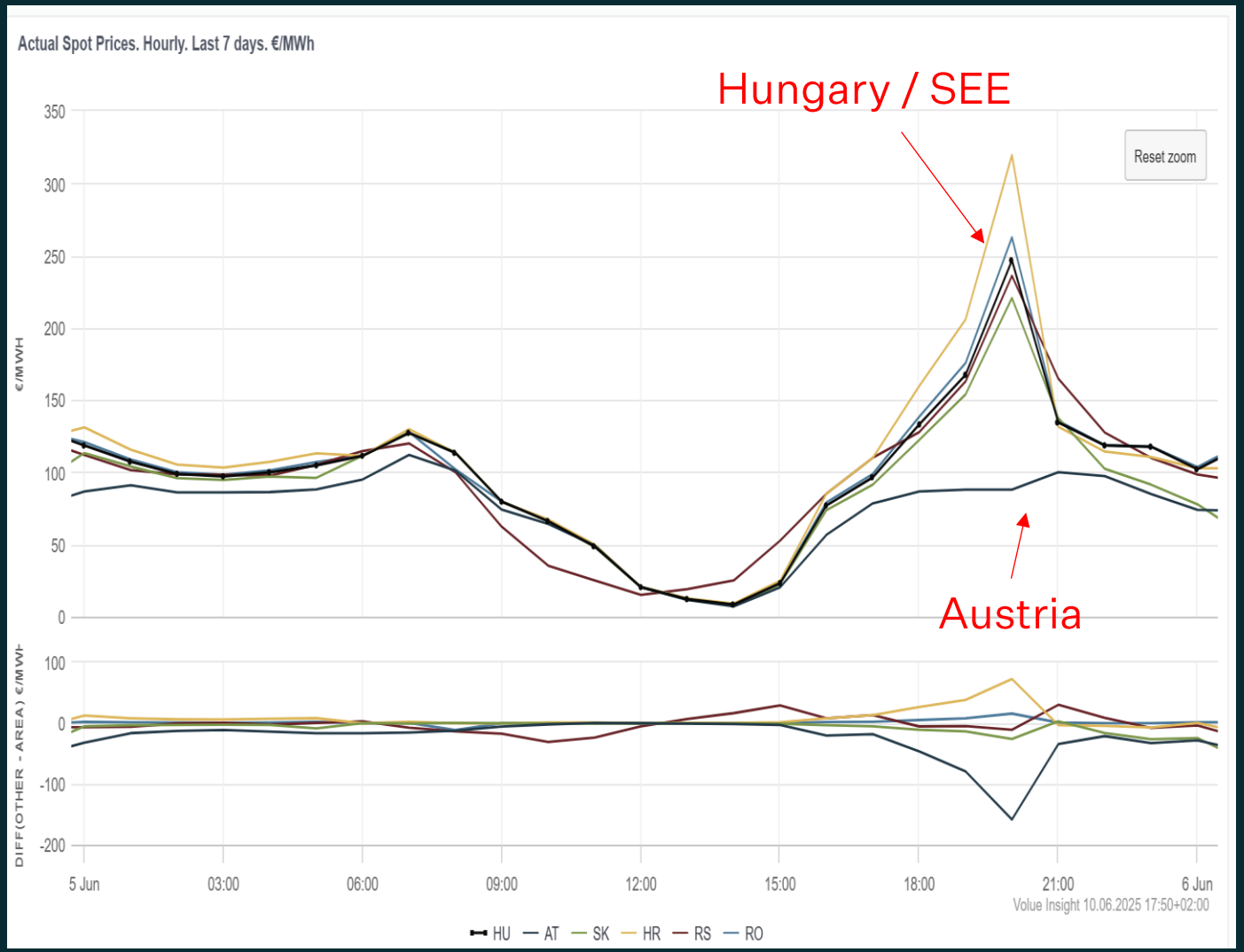


Focus on Austria: the 5th of June in delivery

Tight fundamentals in SEE together with the constrains on the grid determined the high XB spreads HU (SEE) – AT: the shadow price tells how much one extra MW of available RAM on a specific CNEC would have increased the welfare

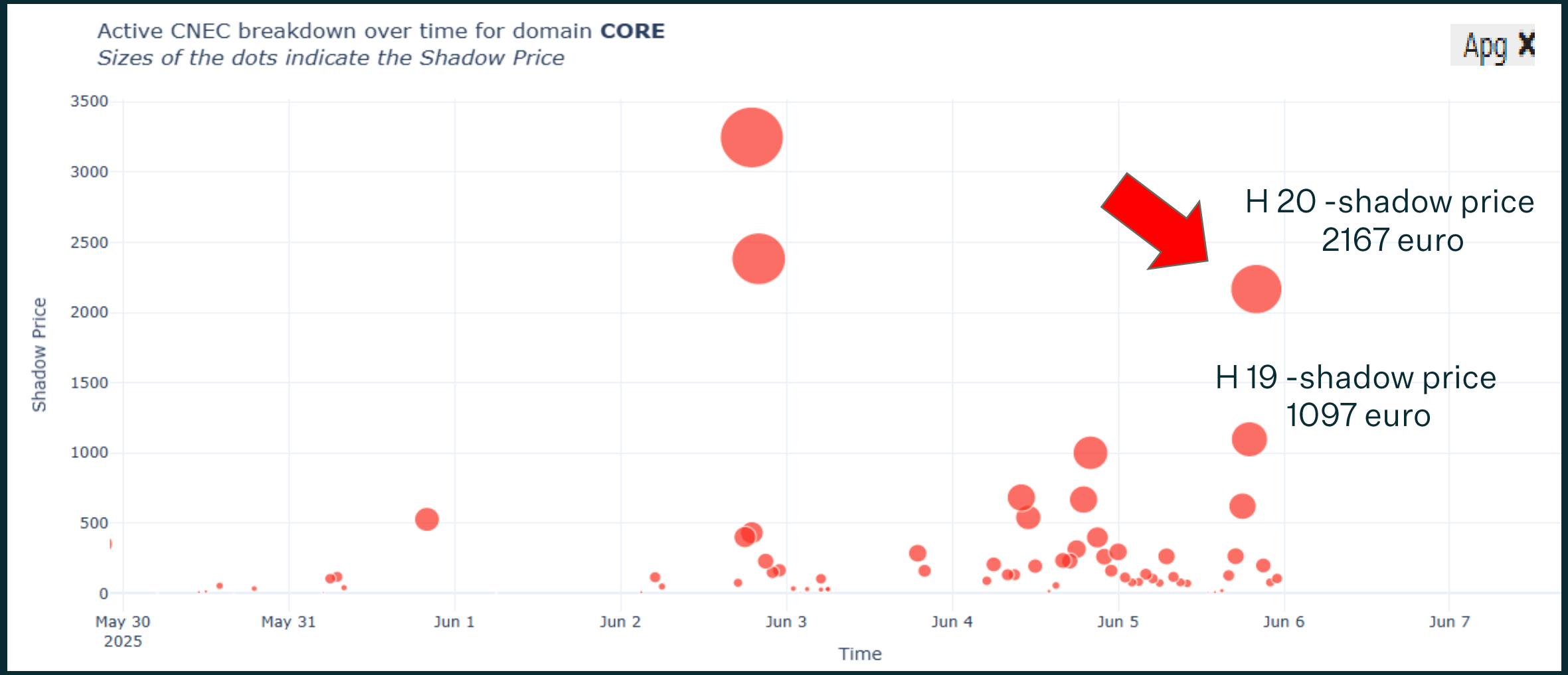






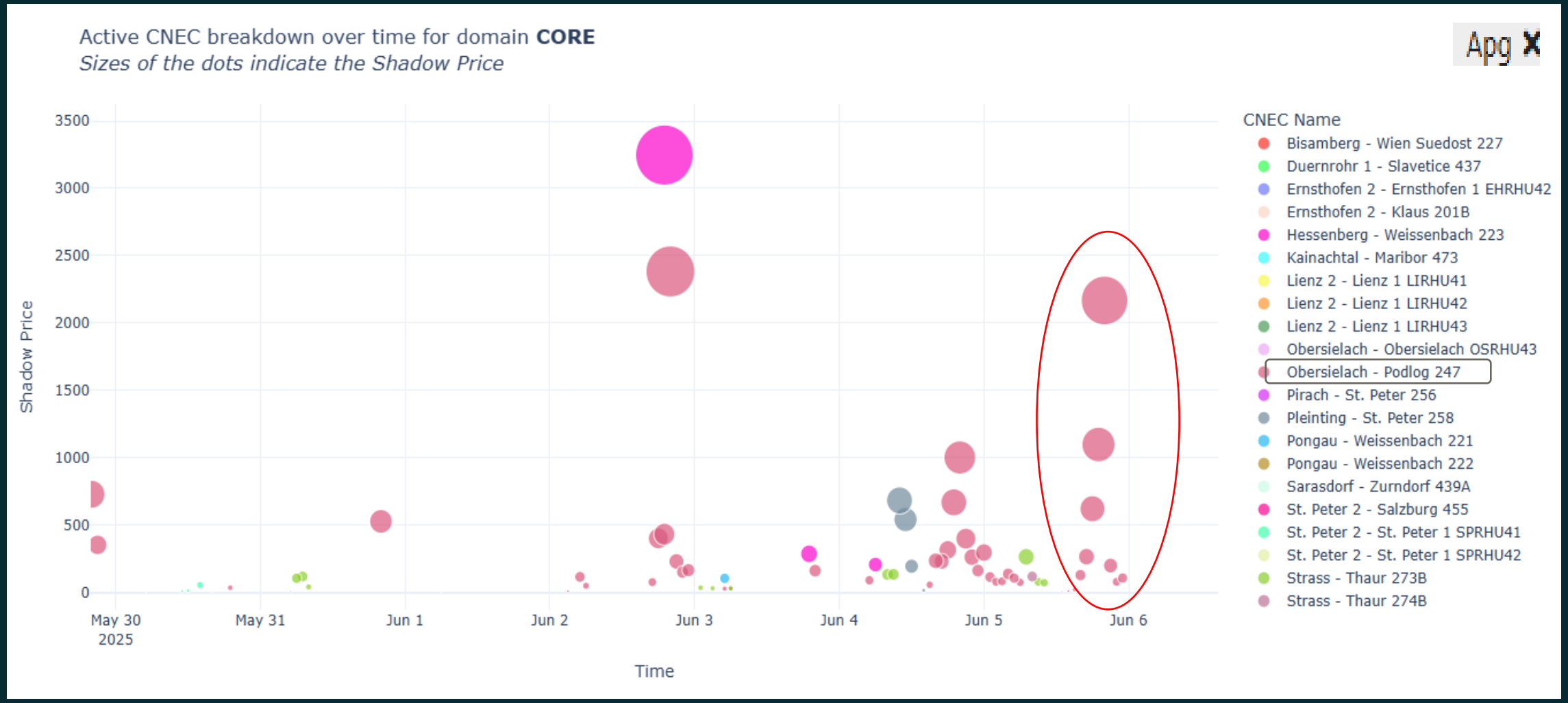
Shado Prices in APG

In JAO we find the shadow prices of the mostly constrained CNECs: on the 5th of June in hour 20 and 21 strong congestions during the evening, when the wind picks-up.



Shadow Prices in APG per CNEC

Most of the strong congestions on the 5th of June pointing to the CNE Obersielach – Podlog 247



Zoom-in JAO

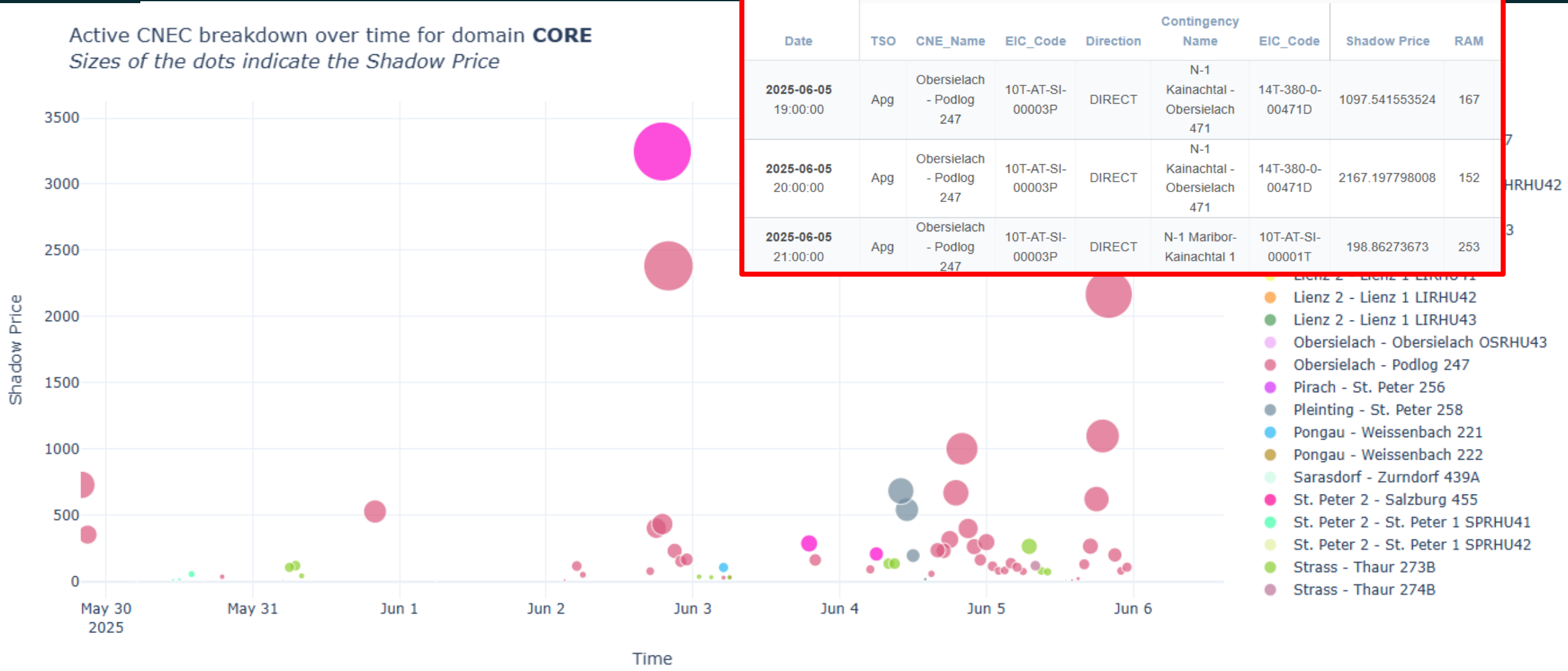
Active FB constraints

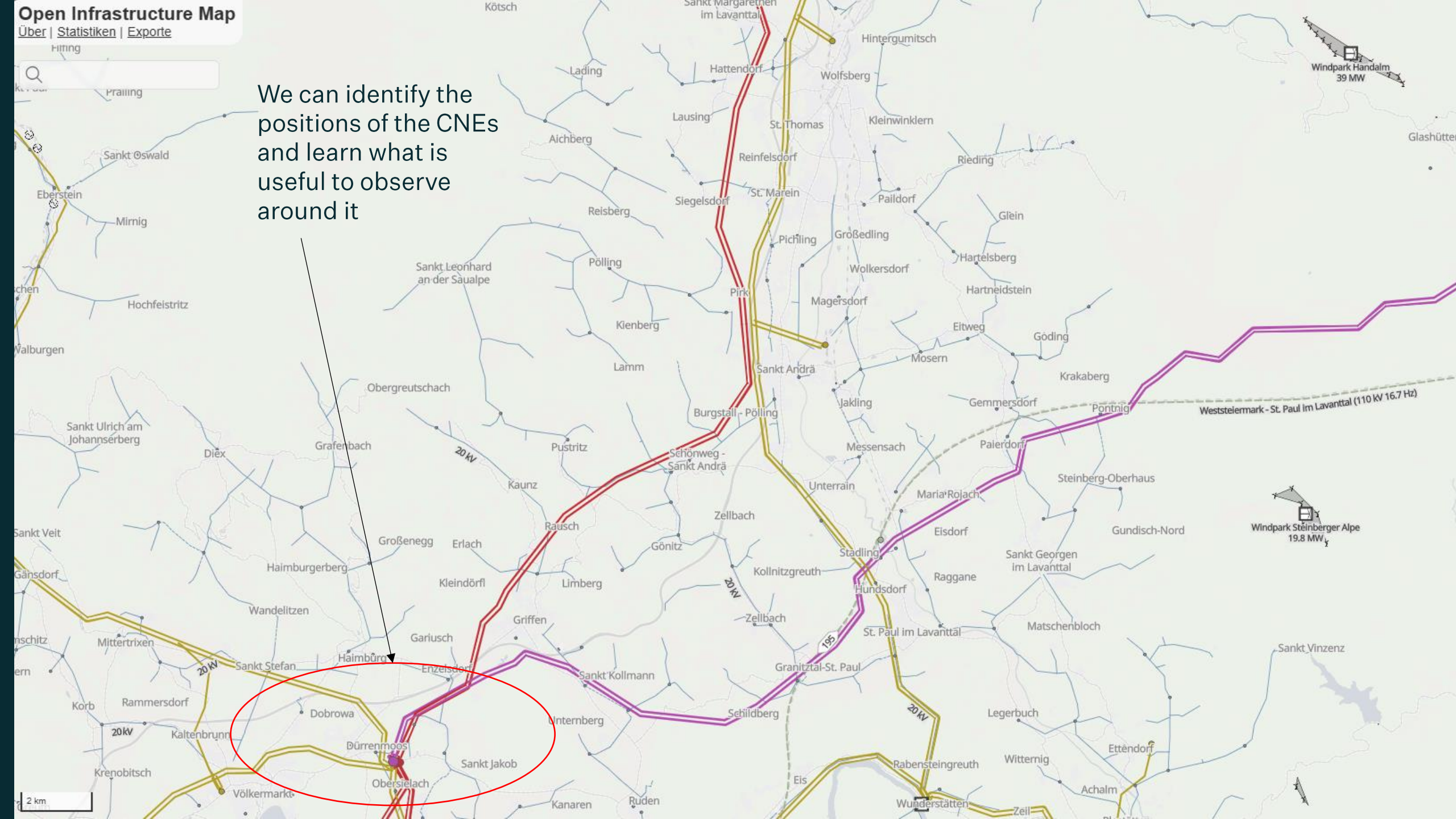
GE_SEARCH

Obersielach - Podlog 247

TOTAL ROWS WITHOUT FILTER: 13
TOTAL ROWS WITH FILTER: 3
DISPLAYED ROWS: 3

Date	TSO	CNE_Name	EIC_Code	Direction	Contingency Name	EIC_Code	Shadow Price	RAM
2025-06-05 19:00:00	Apg	Obersielach - Podlog 247	10T-AT-SI-00003P	DIRECT	N-1 Kainachtal - Obersielach 471	14T-380-0-00471D	1097.541553524	167
2025-06-05 20:00:00	Apg	Obersielach - Podlog 247	10T-AT-SI-00003P	DIRECT	N-1 Kainachtal - Obersielach 471	14T-380-0-00471D	2167.197798008	152
2025-06-05 21:00:00	Apg	Obersielach - Podlog 247	10T-AT-SI-00003P	DIRECT	N-1 Maribor-Kainachtal 1	10T-AT-SI-00001T	198.86273673	253




Open Infrastructure Map
Über | Statistiken | Exporte
We can identify the positions of the CNEs and learn what is useful to observe around it
Windpark Handalm
39 MW
Windpark Steinberger Alpe
19.8 MW
Weststeiermark - St. Paul im Lavanttal (110 kV 16.7 Hz)
20 kV
195
2 km

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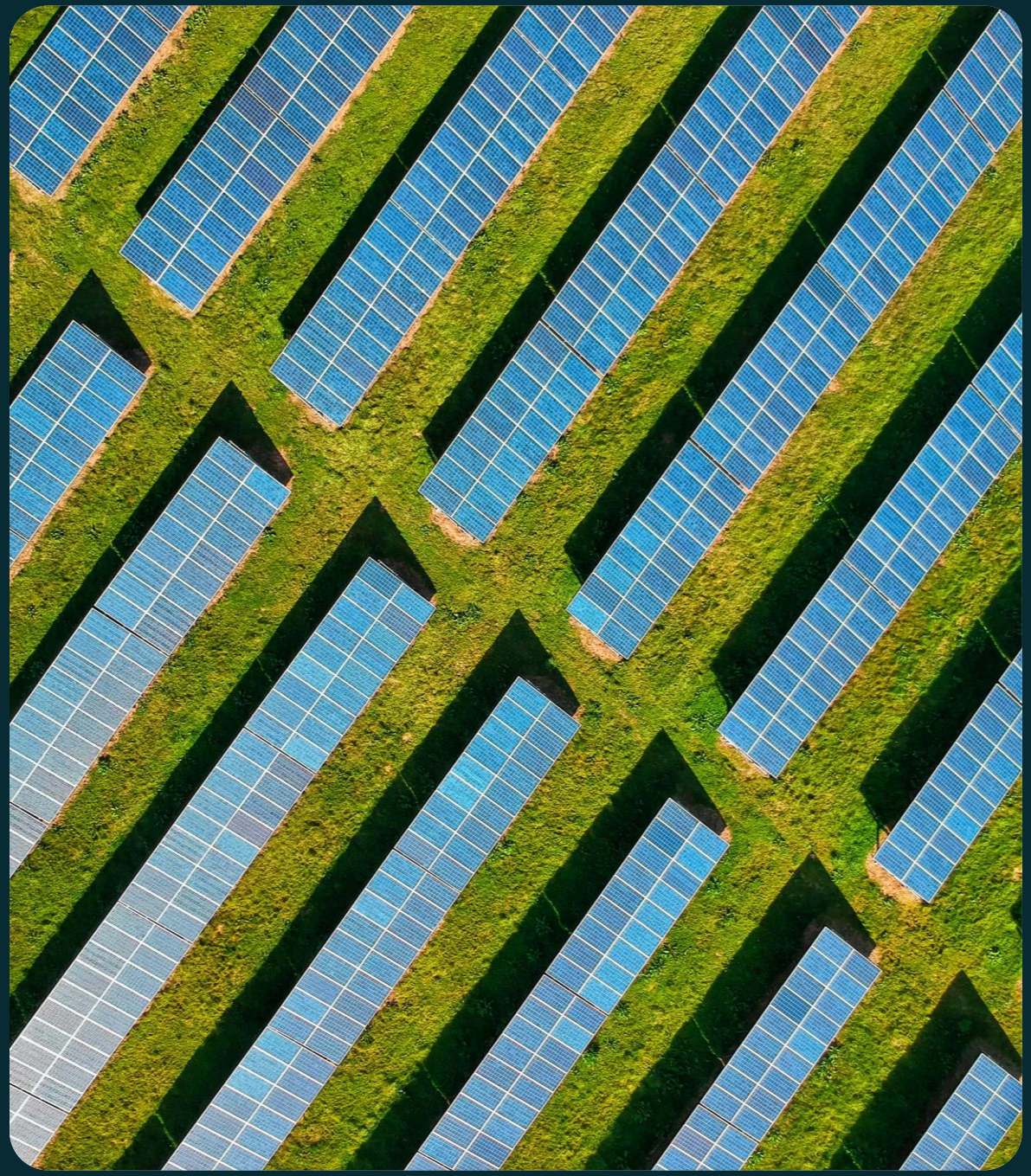

Conclusions

Fundamentals, the load-flow calculations and bottle-necks of the grid are crucial elements to evaluate and anticipate prices and XB spreads.

A deep understanding of the grid dynamics and a good forecast are key for assets/portfolios optimizations.

Wind can be highly correlated with reductions of the RAM.

TSOs data publications on JAO have been impressively increasing quality over the past decade.

In VOLUE we produce forecasts for FBMC for CORE and Nordics, used them in our in-house short-term model and we offer ad-hoc analysis and seminars on this topics.

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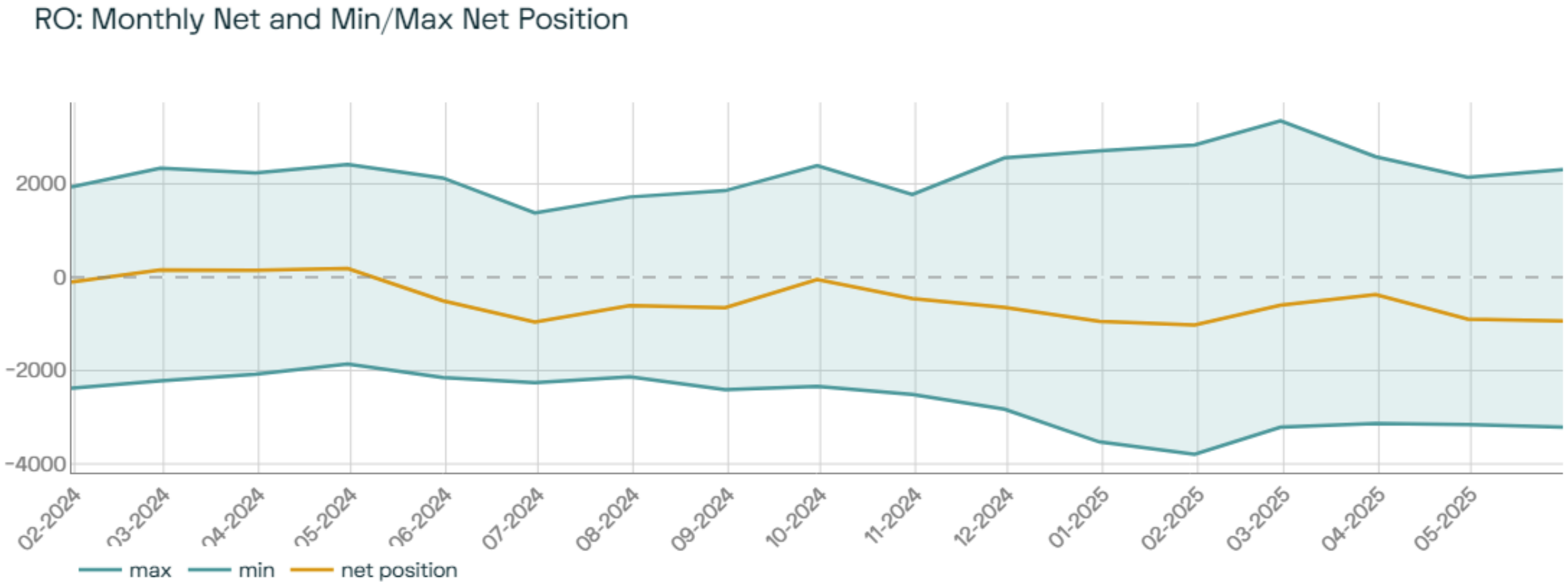
Let’s Talk

Min-Max Net Position Romania

Data from JAO - VOLUE



Min-Max net Position Hungary

Data from JAO - VOLUE

Min-Max Net Position Germany

Data from JAO - VOLUE