European Market Coupling – Milestones in the work in progress

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ERRA EMER Committee

28 April 2023

Hungarian Energy and Public Utility Regulatory Authority

Clean energy, sustainable environment

- What is market coupling?
- Where are we and how did we get here?
- What is Flow-based Market Coupling?
- Lessons learned from Day-Ahead Core Flow-based Market Coupling

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What is market coupling?

- In very simple terms, it is the process leading to a single European power market (derivable from the Treaties).
- However, there are several markets, where electricity is traded, and in Europe, we mostly mean by this term the **integration of the spot, that is, day-ahead (DA) and intraday (ID) markets with implicit allocation and physical delivery.**
- The ongoing relevant processes can be derived from the current electricity legislation and more precisely the (EU) 2015/1222 CACM Regulation and the processes called eg. SDAC, FBMC and SIDC.
- From the above it follows that when most commonly used, this term usually does not include long term markets and the integration of balancing markets on the different balancing platforms (PICASSO, MARI, TERRE), although market integration includes these trimeframes as well.

Possible benefits

- Increased social welfare because of
  - Better competition
  - Better market liquidity
  - Non-discriminatory access to transmission infrastructure
  - Price convergence (if there is enough XB transfer capacity)
- Provides reliable reference prices (investment signal)
- Efficient dispatch
- Efficient use of available cross-zonal capacity
- Improved operational security (with flow-based)
- Reduce unscheduled transit flows (with flow-based)

Terms to familiarise with

Bidding zone

Critical Network Element with a Contingency (CNEC)

Nominated Electricity Market Operator (NEMO)

Single Day-Ahead Coupling (SDAC)

Price Coupling of Regions

remaining available margin (RAM)

Capacity calculation methdology (CCM)

remaining available margin (RAM)

Implicit/explicit allocation

Euphemia

Single Intraday Coupling (SIDC)

Flow based/ATC based

cross-zonal trade

Capacity calculation region (CCR)

Market Coupling Operator (MCO)

power transfer distribution factors

capacity allocation and congestion management (CACM)

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Where are we and how did we get there?

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2010 HUPX DAM

2013 3M MC

2014 4M MC

TMC 2006

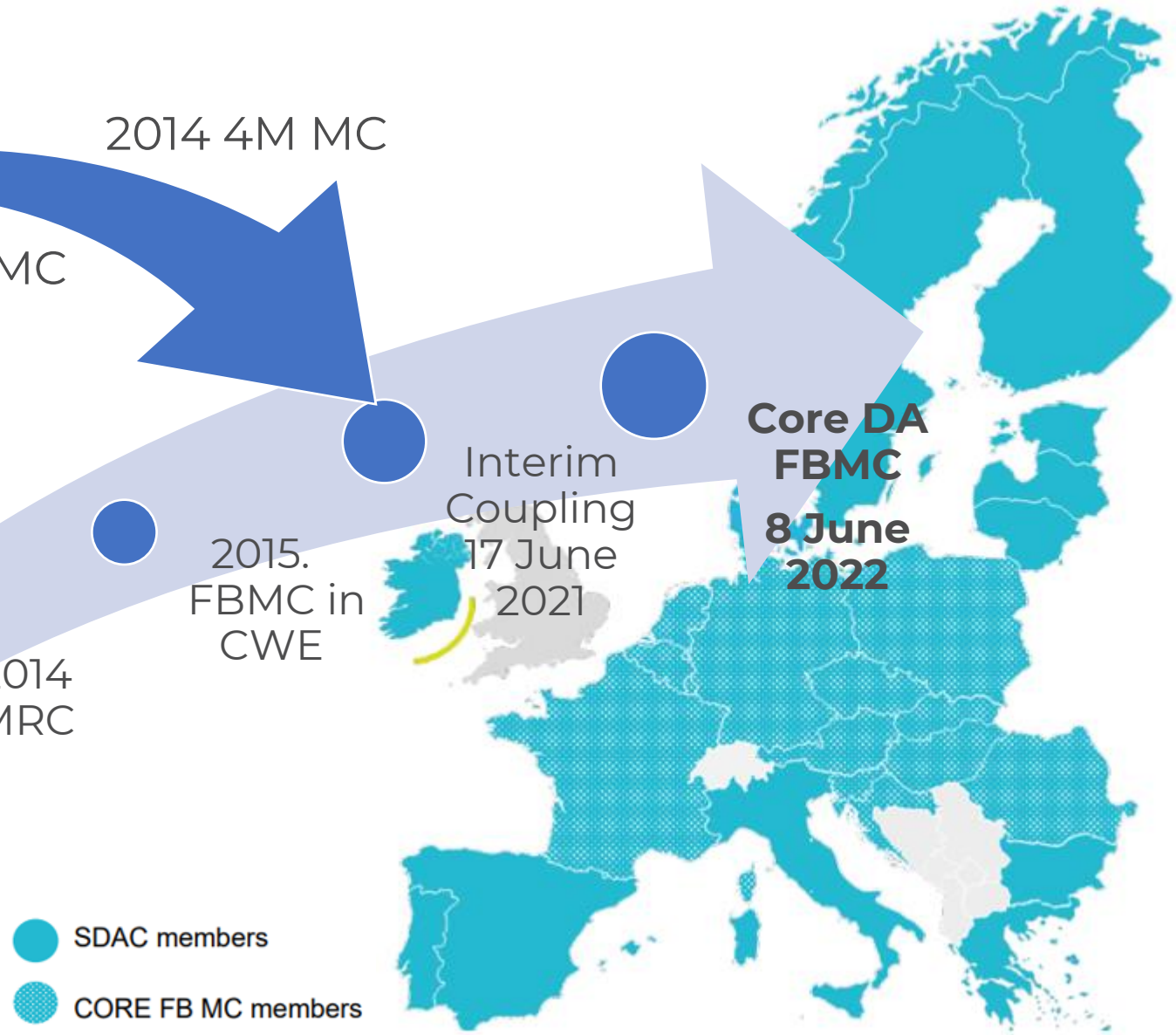
2014 MRC

2015. FBMC in CWE

Interim Coupling 17 June 2021

Core DA FBMC 8 June 2022

- ✓ 2015: CACM GL
- ✓ 2016: CWE+CEE CCRs
- ✓ 2019: Core CCM



15 years of implementation until Go-live

13 MSs, 16 TSOs and 10 NEMOs

278 citizen in the region with annual 1500 (TWh) consumption

EU flagship project (ACER)

„New Age of time”

High expectations from all sides/parties

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What is market coupling?

Where are we and how did we get here?

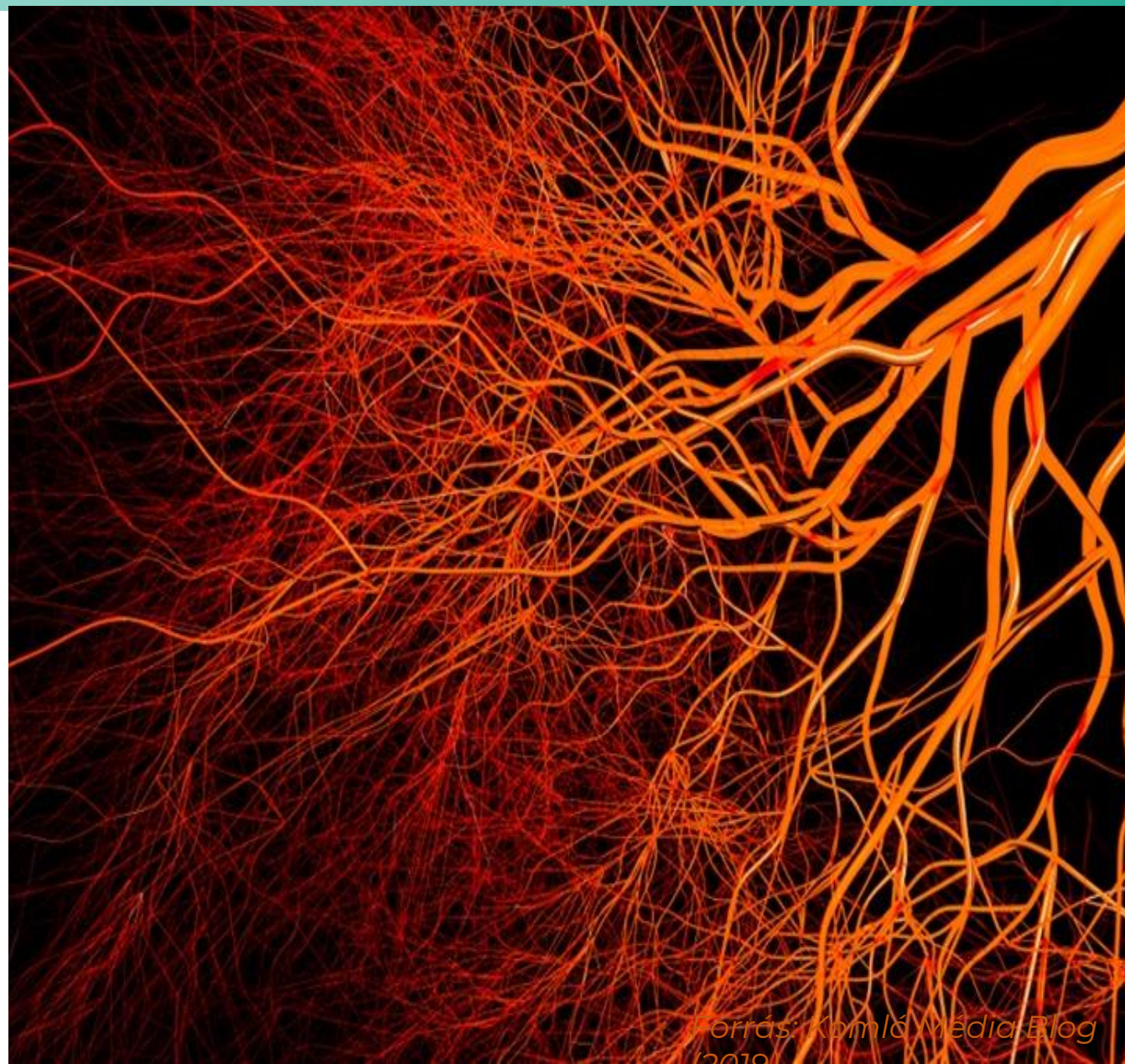
What is Flow-based Market Coupling?

Lessons learned from Day-Ahead Core Flow-based Market Coupling (Hungary)

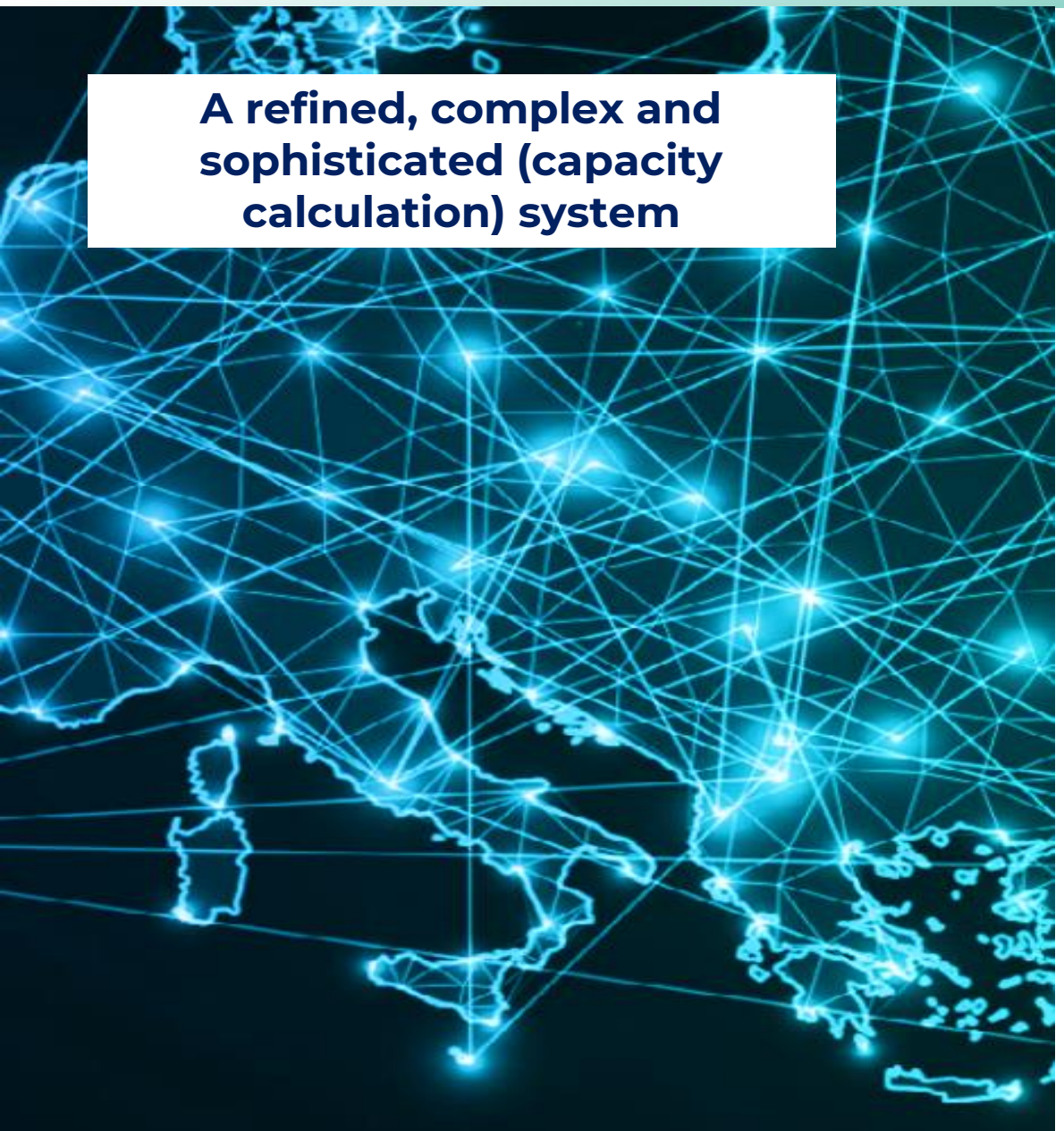
What is flow-based capacity caculation?

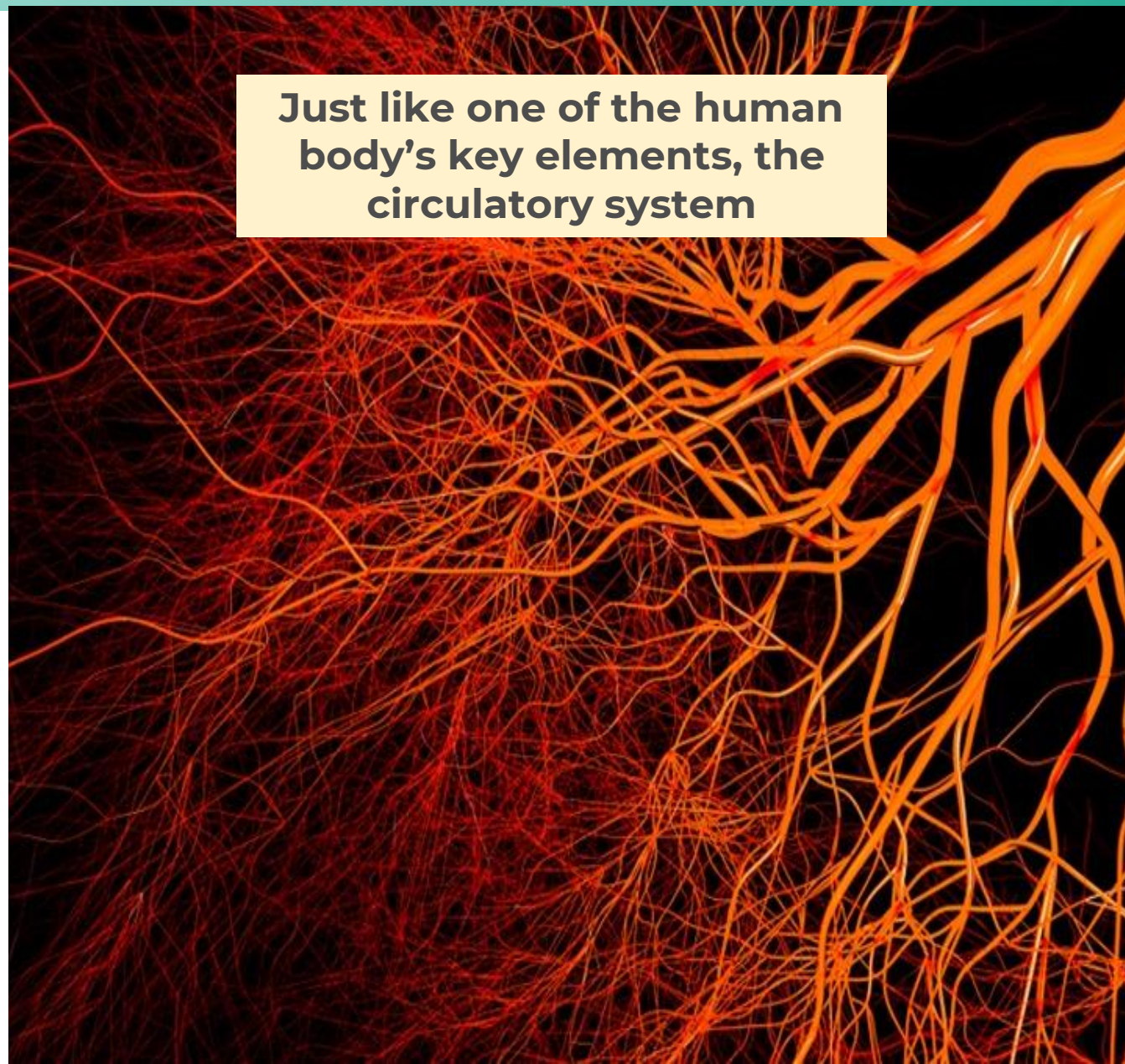
Flow-based approach means a capacity calculation method in which energy exchanges between bidding zones are limited by power transfer distribution factors and available margins on critical network elements

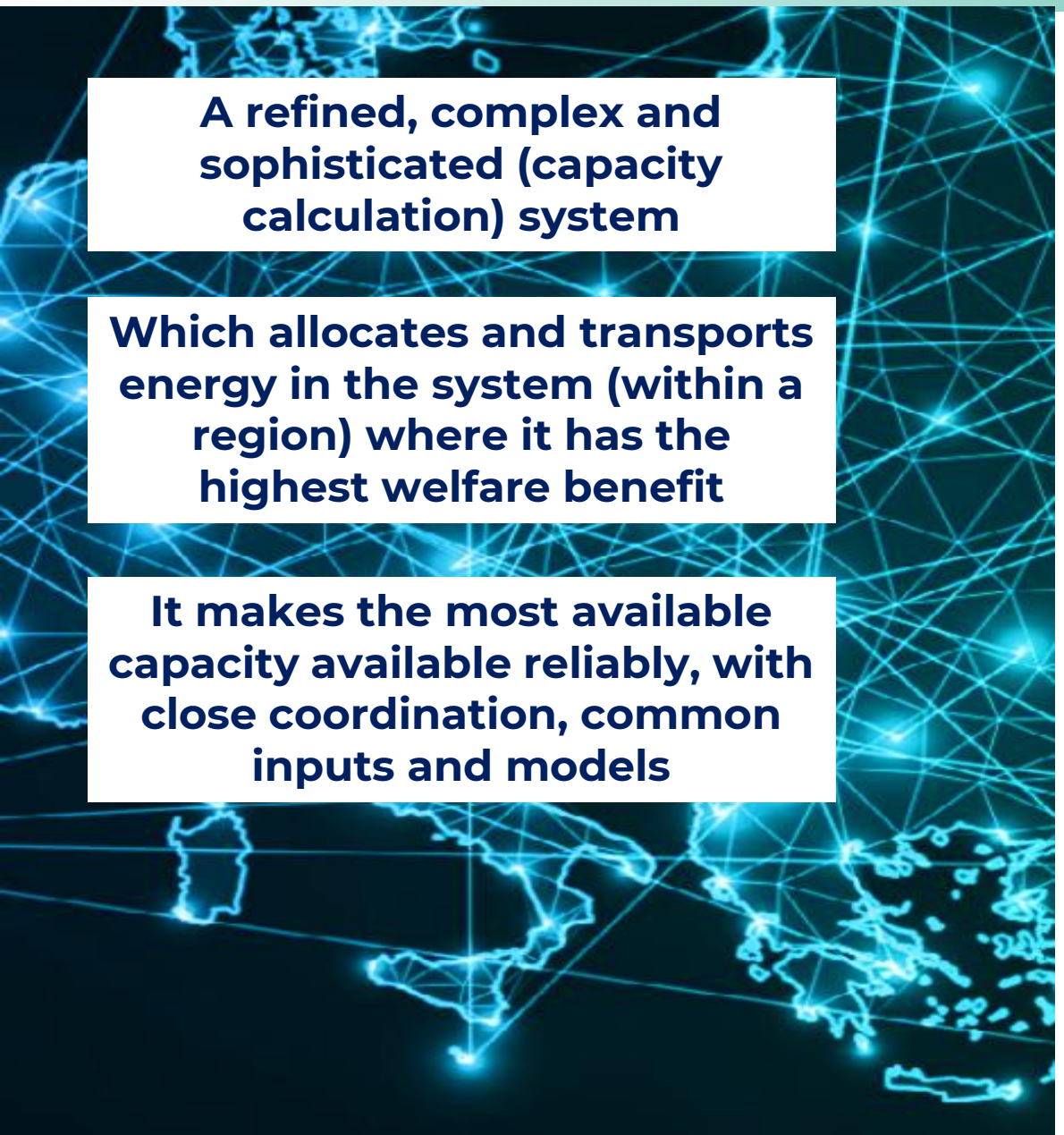
Forrás: ENTSO-E



Forrás: Komló Média Blog (2018)


A refined, complex and sophisticated (capacity calculation) system

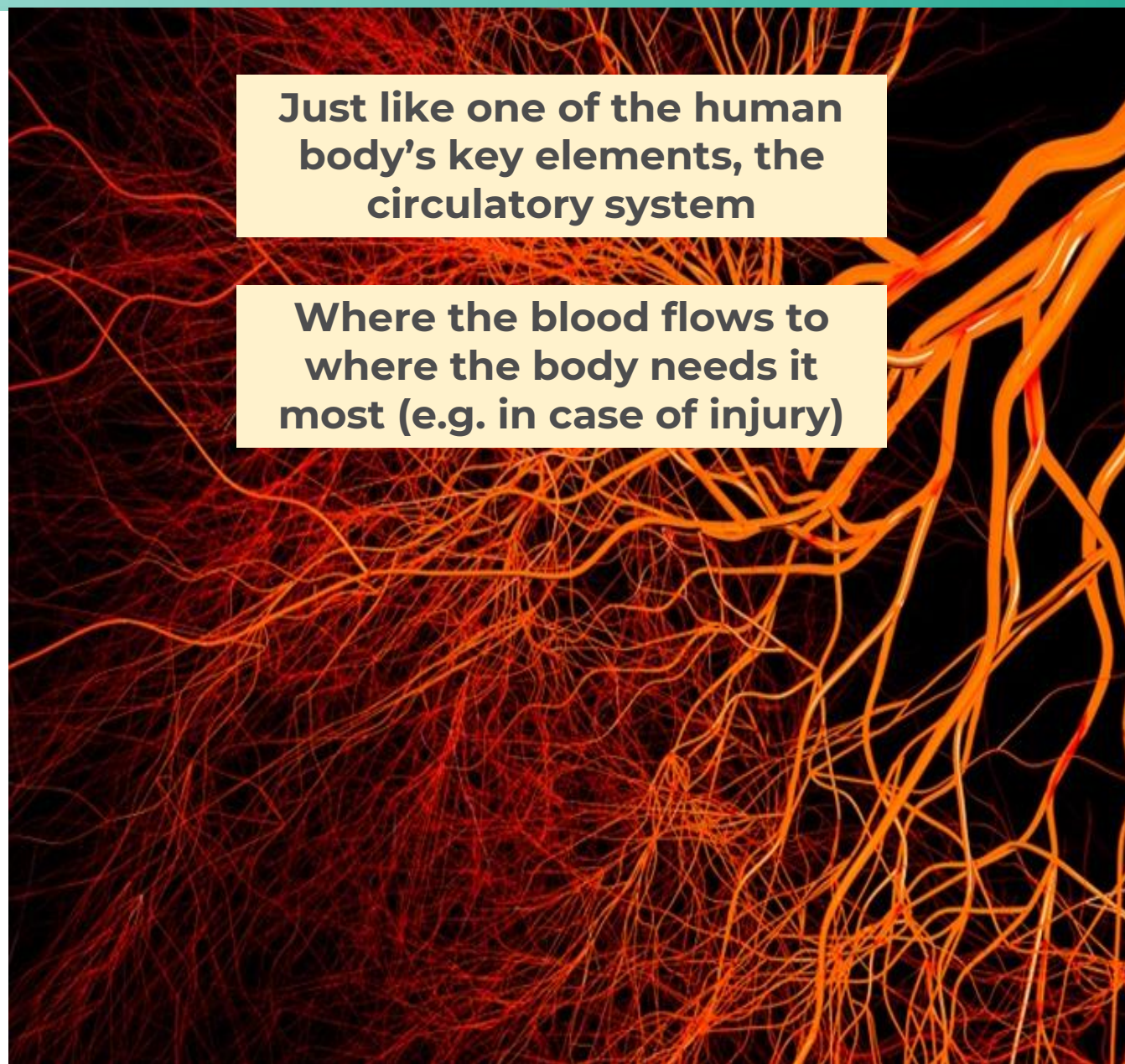

Just like one of the human body’s key elements, the circulatory system



A refined, complex and sophisticated (capacity calculation) system

Which allocates and transports energy in the system (within a region) where it has the highest welfare benefit

It makes the most available capacity available reliably, with close coordination, common inputs and models



Just like one of the human body's key elements, the circulatory system

Where the blood flows to where the body needs it most (e.g. in case of injury)

A refined, complex and sophisticated (capacity calculation) system

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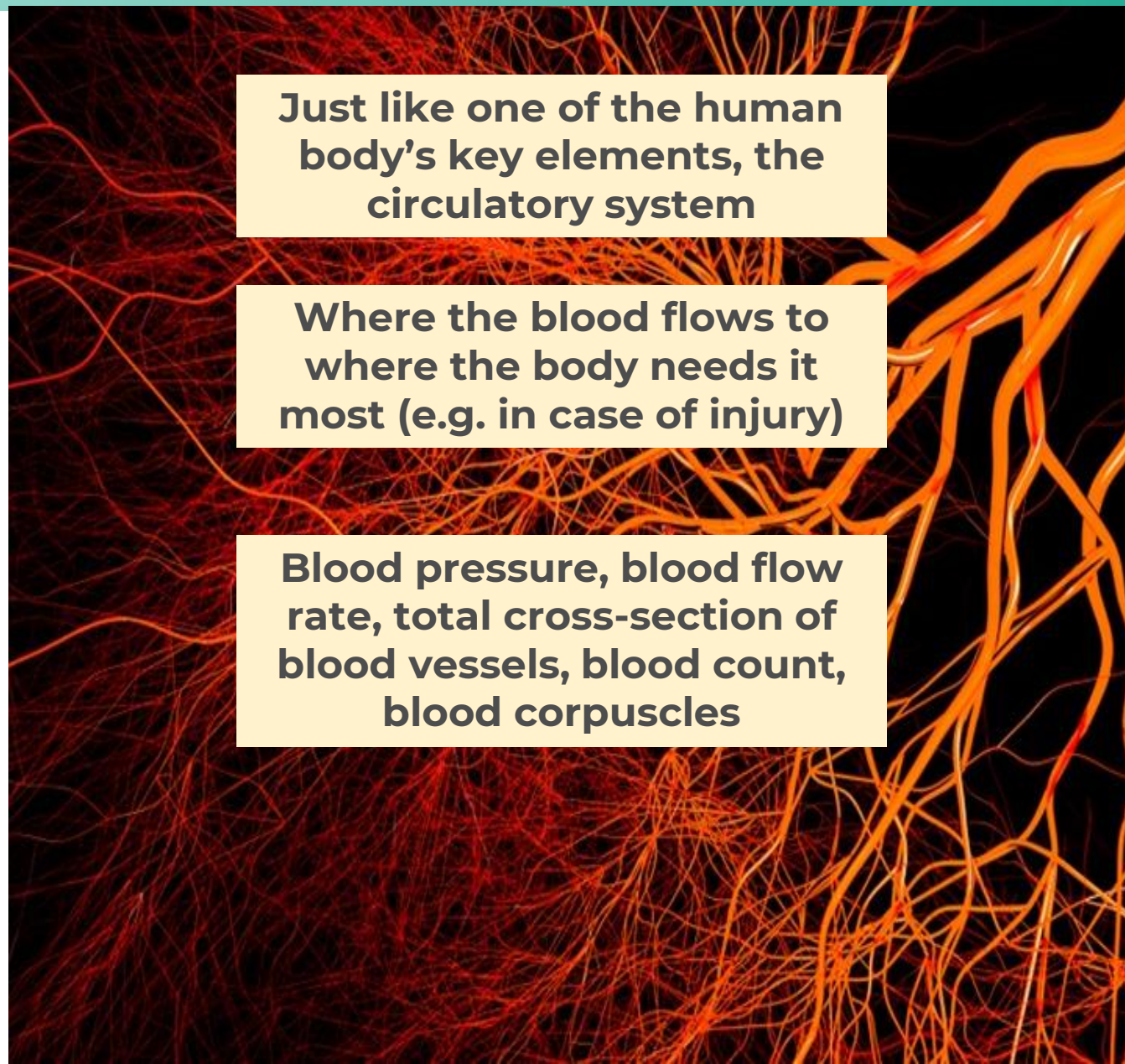
CNECs, RAMs, ptdf matrix, no NTC/cutoff values



Just like one of the human body's key elements, the circulatory system

Where the blood flows to where the body needs it most (e.g. in case of injury)

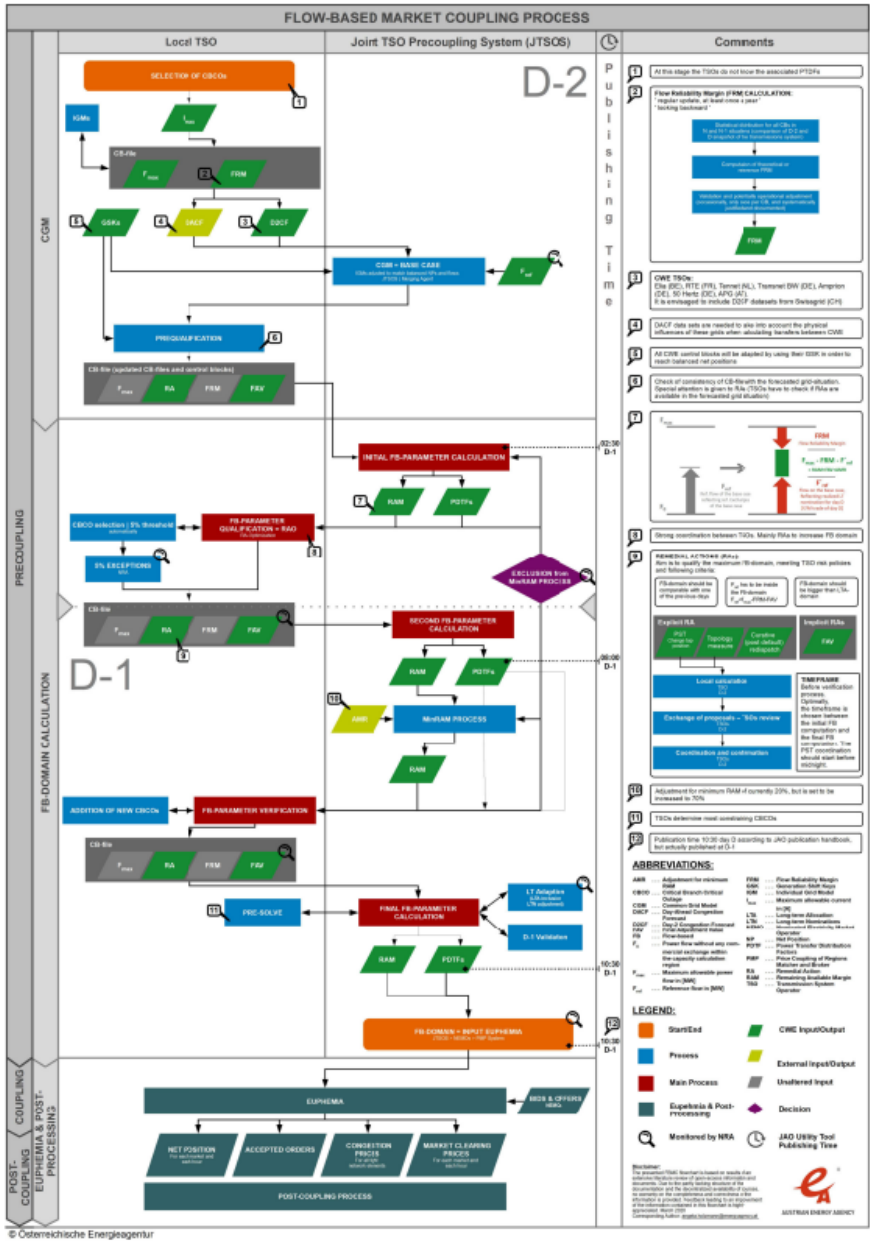
Blood pressure, blood flow rate, total cross-section of blood vessels, blood count, blood corpuscles

What happens during coupling?

Precoupling (inputs are fed in to Euphemia):
- Orders of traders on exchanges
- Transmission capacities of TSOs
- Regulatory and country-specific input

Coupling: Market coupling done by Euphemia algorithm

Results:
- Import/export balances of bidding zones
- Algorith determines European day-ahead electricity prices
- Settlement and physical shipping of net positions



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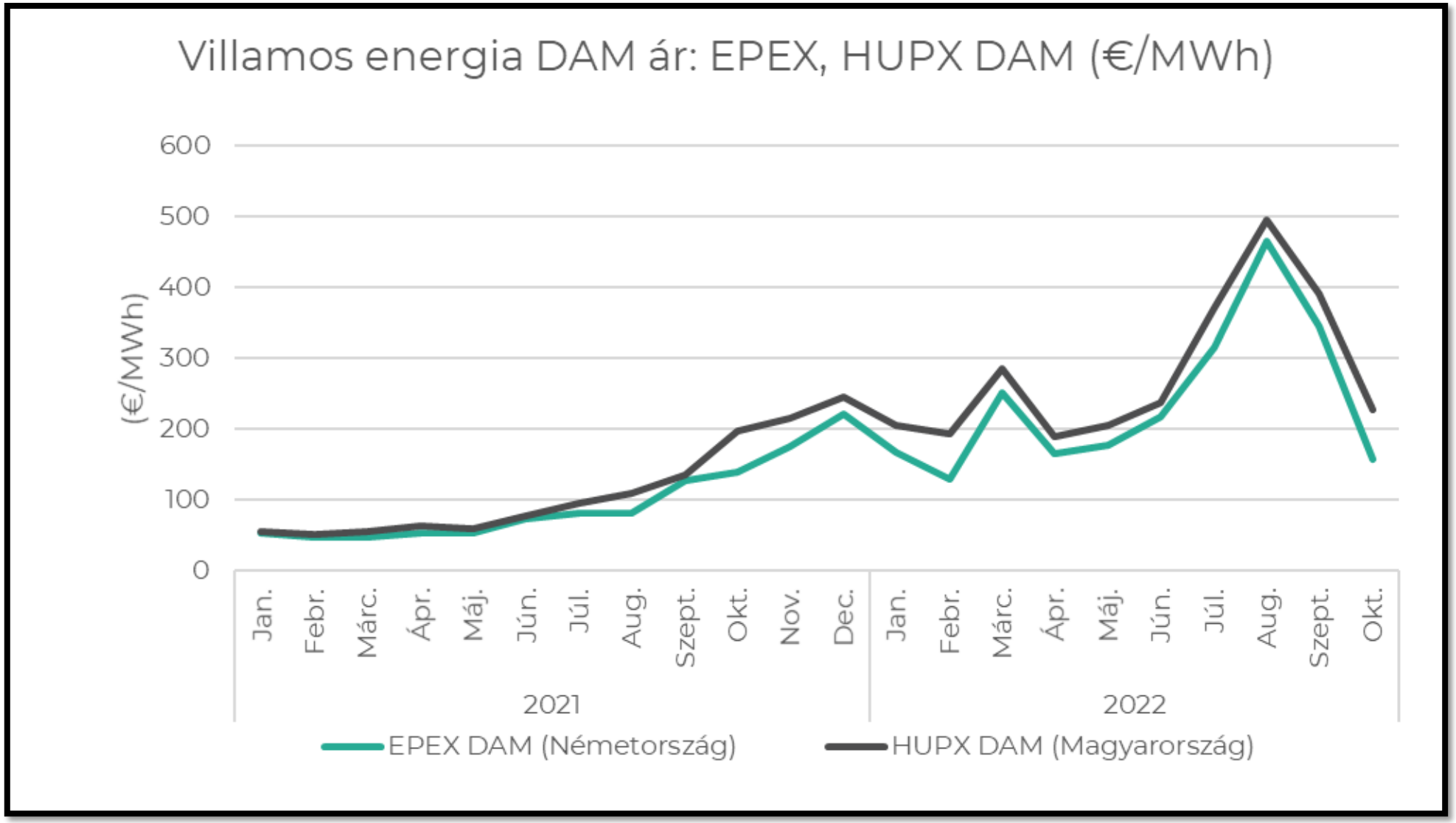
What is market coupling?

Where are we and how did we get here?

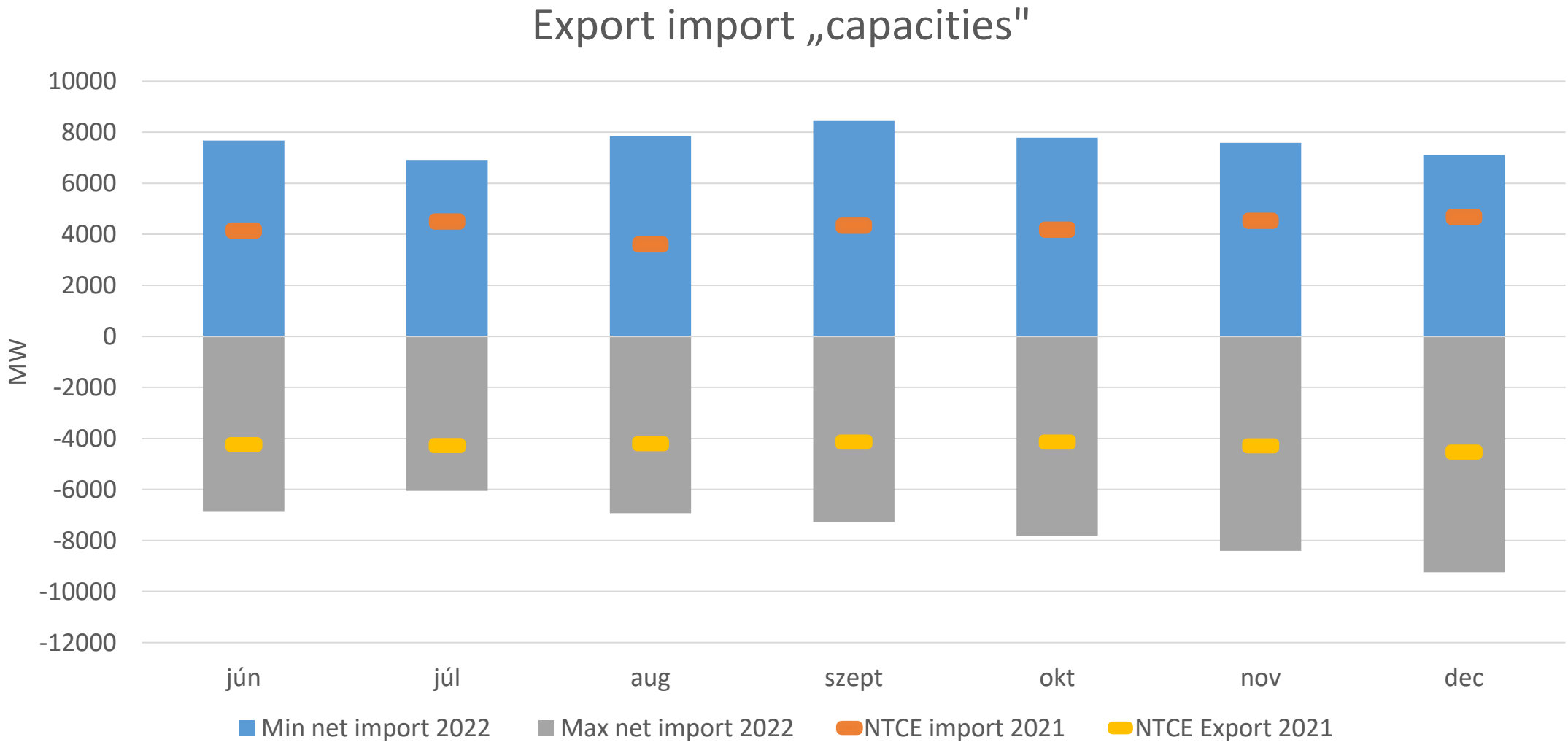
What is Flow-based Market Coupling?

Lessons learned from Day-Ahead Core Flow-based Market Coupling (Hungary)

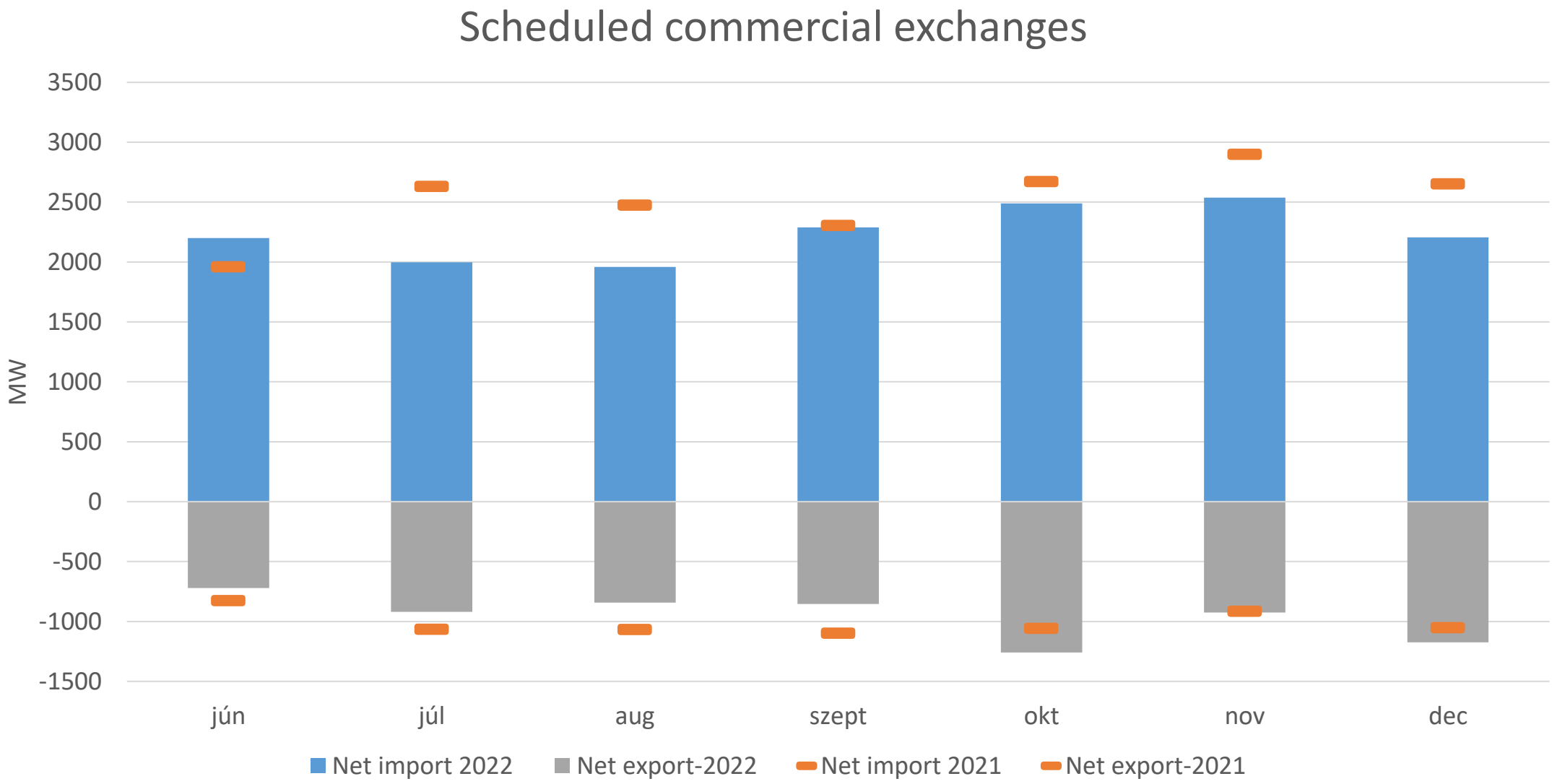
Price convergence did not improve neither decrease in HU/DE relation



Aggregated import and export „capacities” increased significantly



With regard to increased capacities scheduled commercial flows did not increase



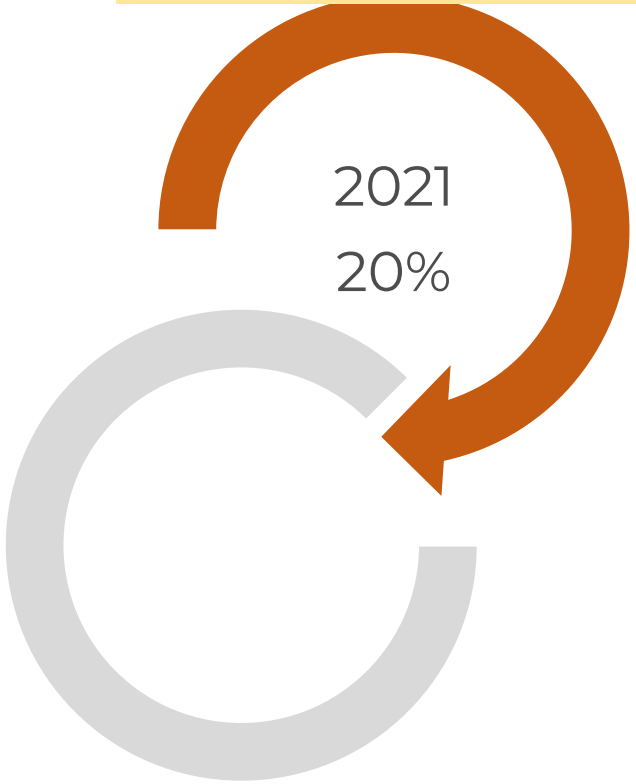
We can observe non-intuitive commercial flows as well

Flows from higher-priced to lower-priced regions at each border (October-November 2022)

	Frequency	Ratio		Frequency	Ratio
AT-HU	281	19%	HU-AT	72	5%
SK-HU	339	23%	HU-SK	0	0%
RO-HU	196	13%	HU-RO	110	8%
HR-HU	136	9%	HU-HR	321	22%
SI-HU	130	9%	HU-SI	353	24%

What improved significantly with flow based?

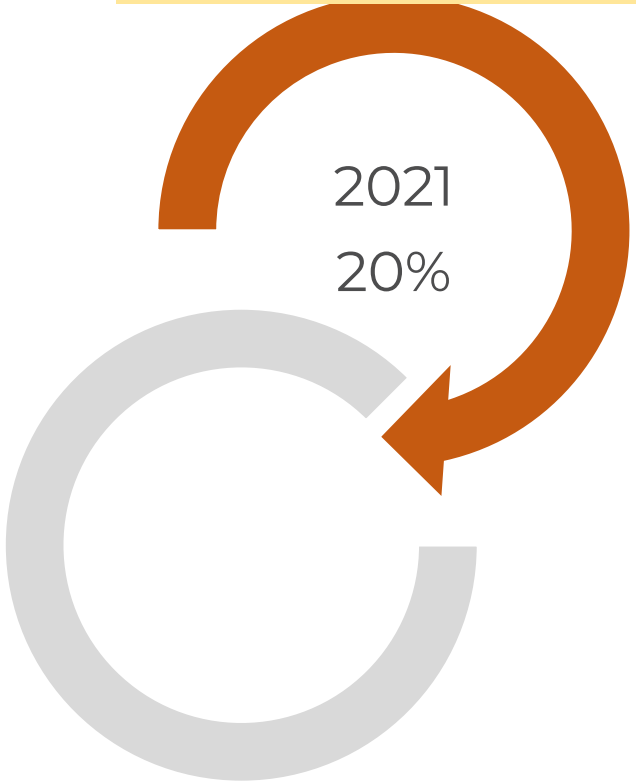
CEP 70% compliance



What improved significantly with flow based?

Graph 3: In normal times, maximising cross-zonal capacity is key

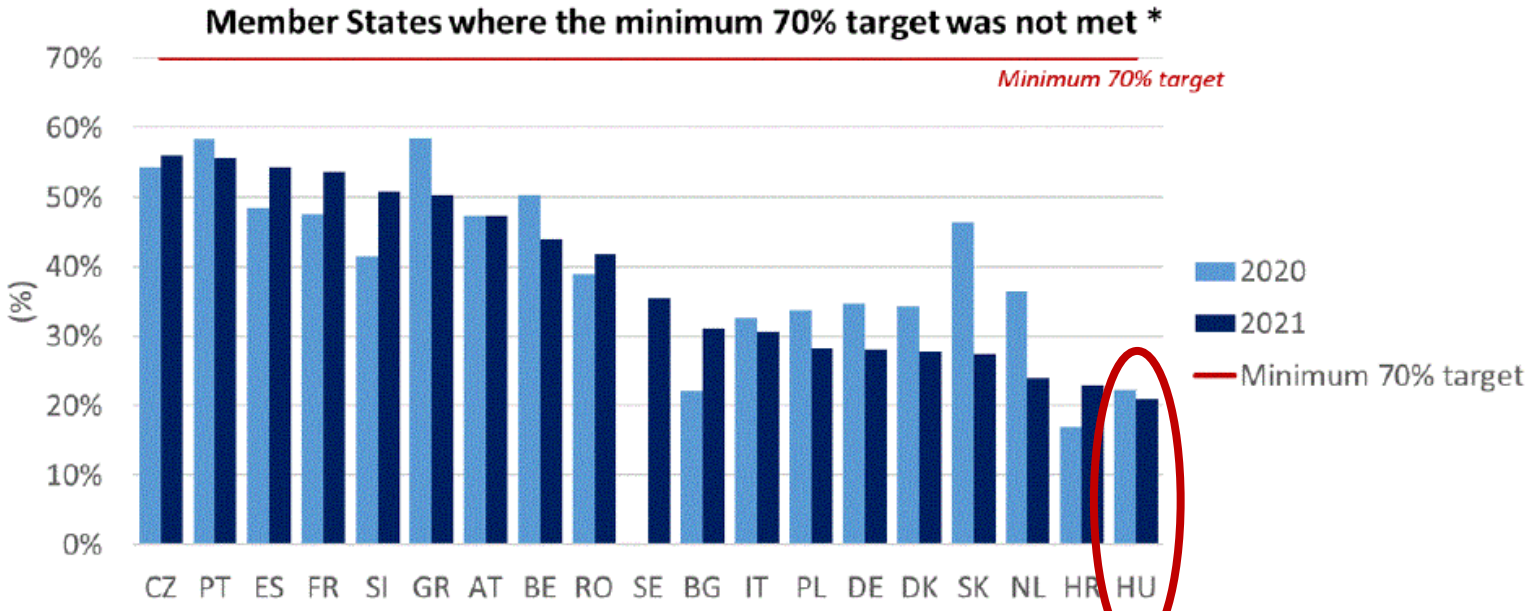
CEP 70% compliance



ACER
European Union Agency for the Cooperation of Energy Regulators

In normal times, maximising cross-zonal capacity is key

Average margin available for cross-zonal trade (MACZT)

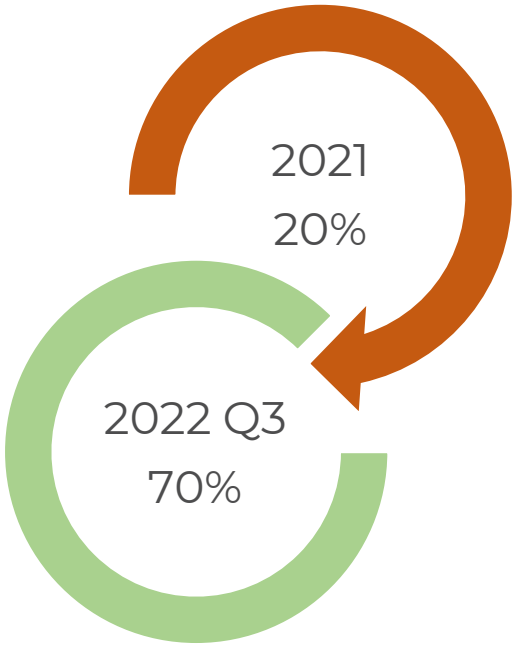


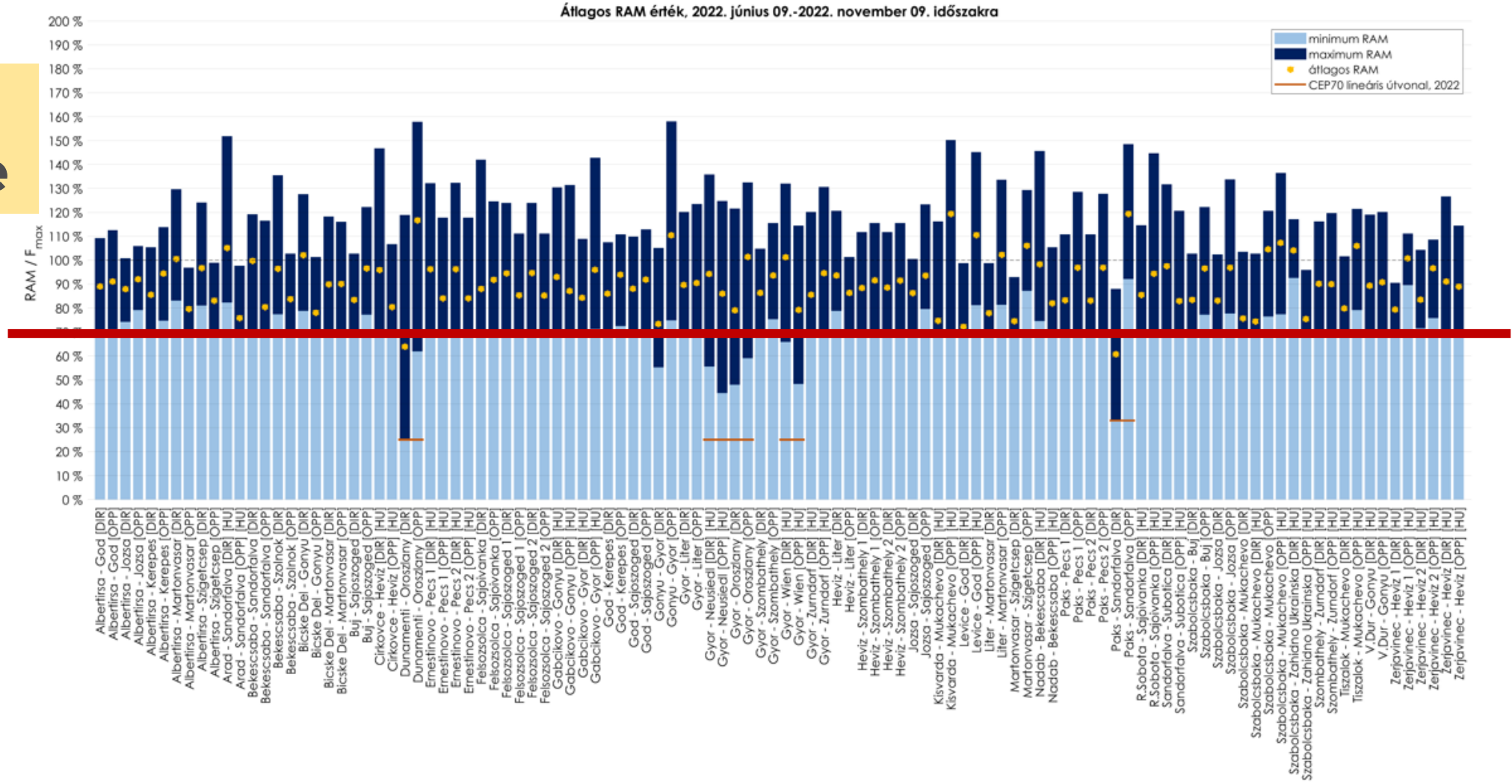
Compared to 2020, NO clear trend suggesting a relevant overall increase towards the 70% target.

Source: ACER calculation based on TSO data
** on critical network elements with contingencies. This reflects the situation before the go-live of the Core region's day-ahead flow-based market coupling (08 June 2022)*

Averane margin available for cross-zonal trade – MACZT before FB (CEP 70%)

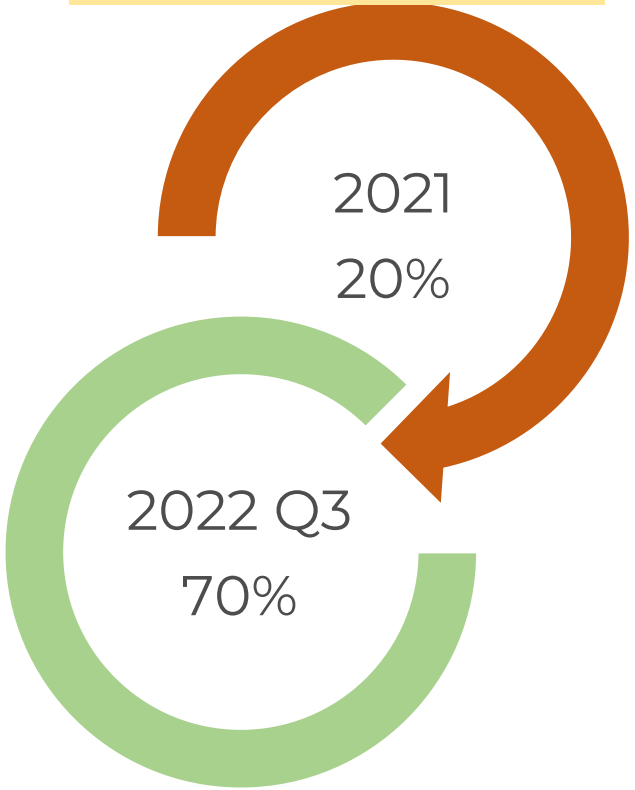
CEP 70% compliance





Averane margin available for cross-zonal trade – MACZT after FB (CEP 70%) (MAVIR)

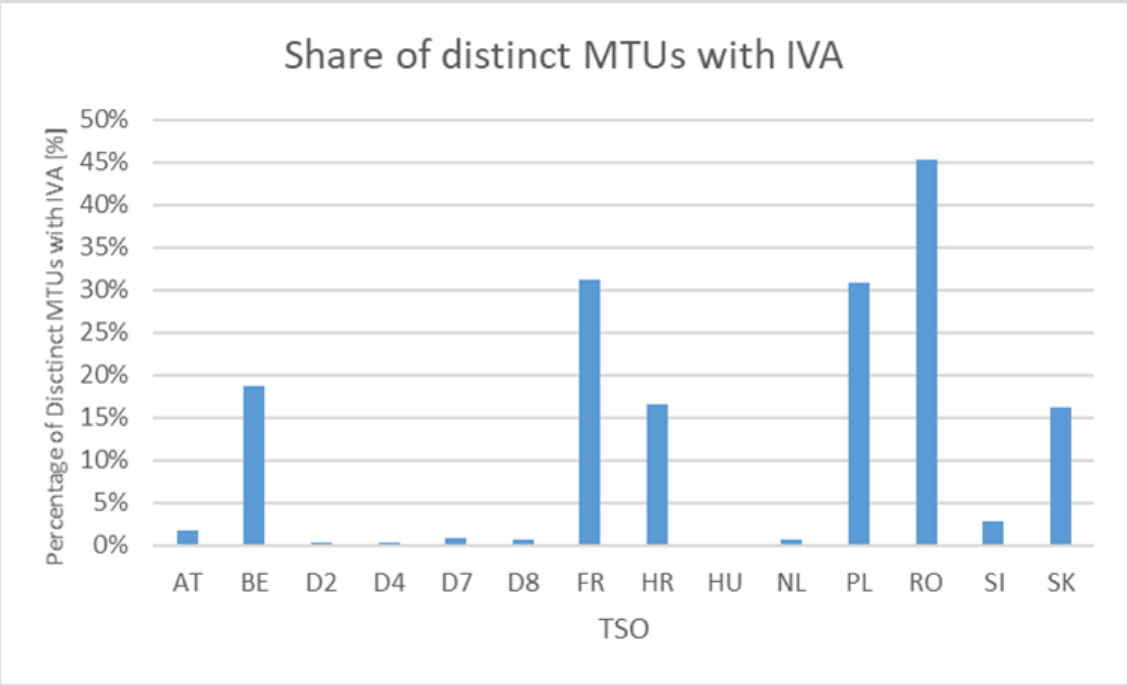
CEP 70% compliance



Source: CREG, 2022. szeptember 22.

Average margin available for cross-zonal trade – MACZT after FB (CEP 70%) (Core)

Some symptoms to remedy



IVA: During individual validation Core TSOs validate and have the right to decrease remaining available margin (RAM) for operational security reasons.

The individual validation adjustment (IVA) shall be a positive value, i.e. it can only decrease RAM (**emergency break**)

Core Operational KPI report July 2022

Is it an <u>emergency</u> break, if you pull it regularly?

Not just the preiodicity but the volume of IVA adjustment is important, their effects hit us as well

We need to improve the transparency of IVAs and further improve FB calculation

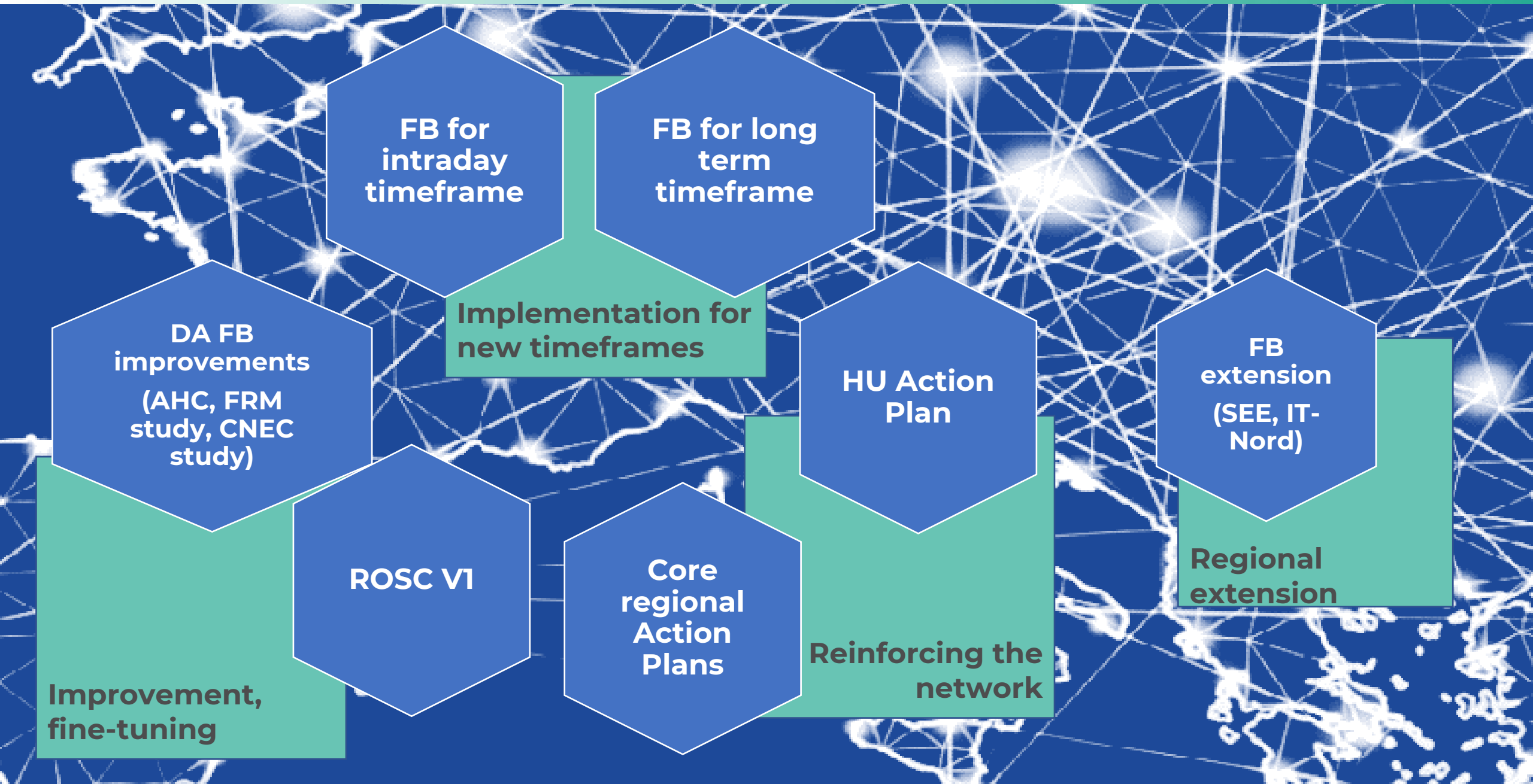
Actual benefits

- Increased social welfare because of
  - Still some way to go: for all timeframes accomplishing market coupling across EU border would bring an additional EUR1.5 billion/year welfare benefit (based on 2020 data) – However, according to ACER' estimate, based on a scenario without any cross-border trade in 2021, these benefits amount to approximately EUR 34 billion/year by enabling cross-border trade between Member States and improving Member States' resilience and security of supply
  - Some level of price convergence (if there is enough XB transfer capacity)
- Efficient dispatch
- Efficient use of available cross-zonal capacity
- Improved operational security (with flow-based)
- Reduced unscheduled transit flows (with flow-based)

Challenges

- Implement CEP 70 rule, that is, increase the transmission capacity avaibale for cross-border trade to at least 70%
- Implement FBMC, where it is efficient
- Expand market coupling to Energy Community Contracting Parties (through the implementation of Network Codes, such as CACM)
- Ensure and improve the robust operation of SDAC algorithm even against increasing complexity
- Find a good balance between various development needs of the different EU market integration projects with acceptable timelines and representing the highest added benetif/welfare

Development directions until 2025



Thank you for your attention!

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Source: ENTSO-E 2021