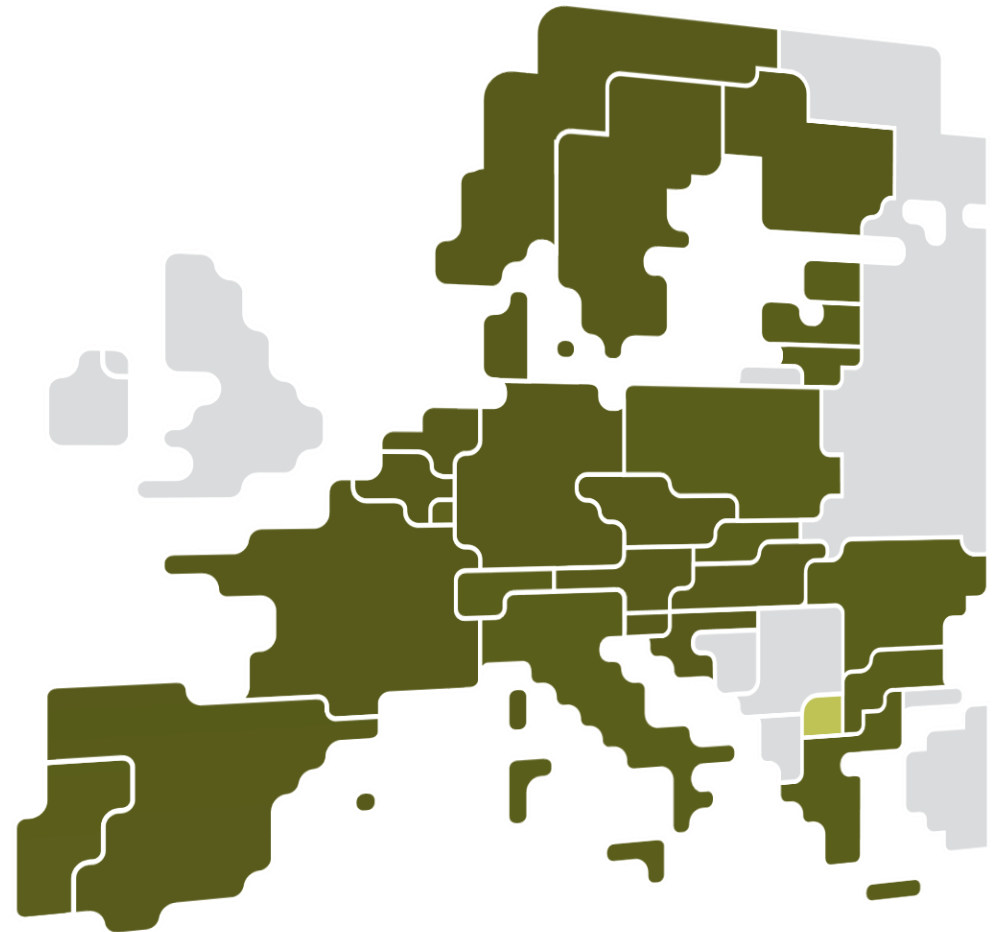




PICASSO overview

26 February 2025



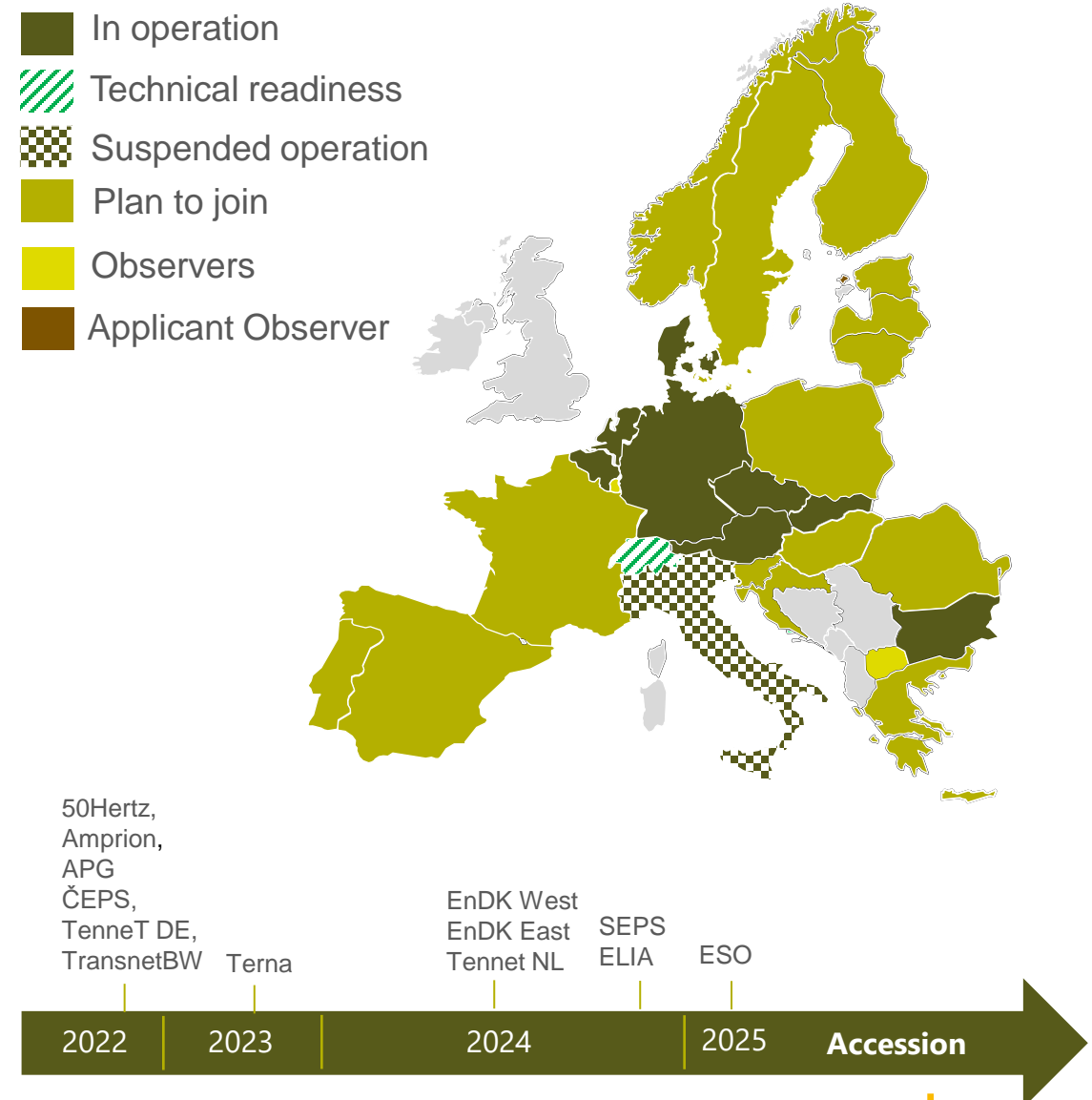


PICASSO

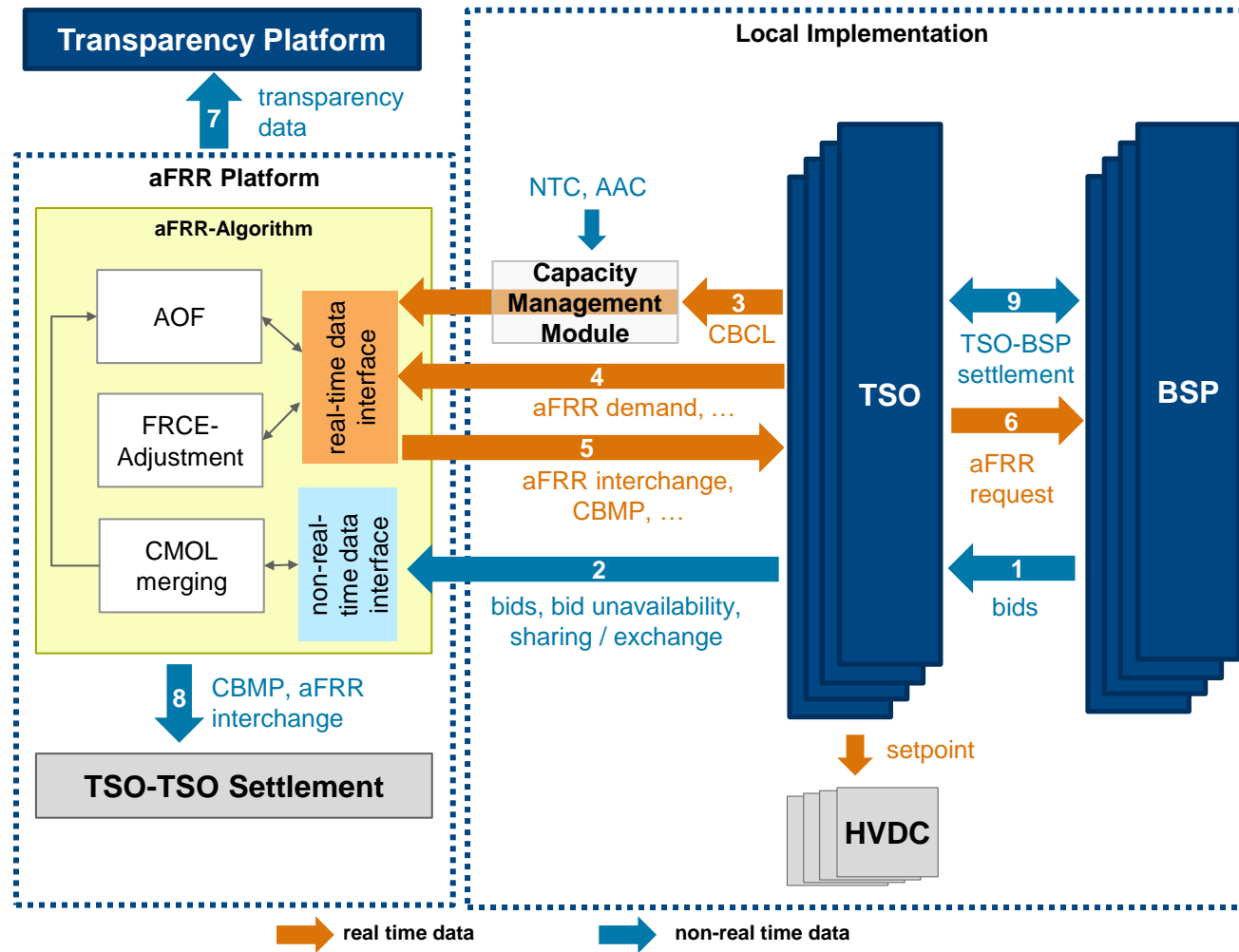
- The “Platform for the International Coordination of Automated Frequency Restoration and Stable System Operation” (PICASSO) has been endorsed by all TSOs in 2017 as implementation project for the European aFRR platform pursuant to GL EB.
- Currently, 26 TSOs from 23 countries have joined the project. 4 TSOs and ENTSO-E are observers.
- Successful go-live on June 1st, 2022 with CEPS as first operational member, earlier than required by the regulation
- First exchange of energy on June 22nd, 2022, after APG and the 4 German TSOs joined the platform, on 19th July Terna joined.
- On 15th March, Terna suspended its operation.
- In October 2024, TenneT NL and Energinet.dk joined
- In November 2024, SEPS and ELIA joined, in February 2025 ESO joined
- The remaining Member TSOs will gradually join the platform

Relevant Features

- The PICASSO Platform establishes a European domestic energy market for aFRR energy, based on a common standard product.
- PICASSO fosters operational stability by coordinating the activation of aFRR.
- Using a market time unit of 4 seconds. The PICASSO optimizer has more than 7.8 Mio. market clearings per.
- The PICASSO IT solution is also used for the International Grid Control Cooperation (IGCC), which is closely interacting with the PICASSO Optimization to maximize the economic surplus while ensuring that the netting potential of all IGCC TSOs is used.



*The technical readiness of Swissgrid has been acknowledged. The participation of Switzerland in the aFRR-Platform is regulated based on article 1.6 and 1.7 of the EB Regulation and currently the subject of litigation by Swissgrid at the Court of Justice of the European Union.



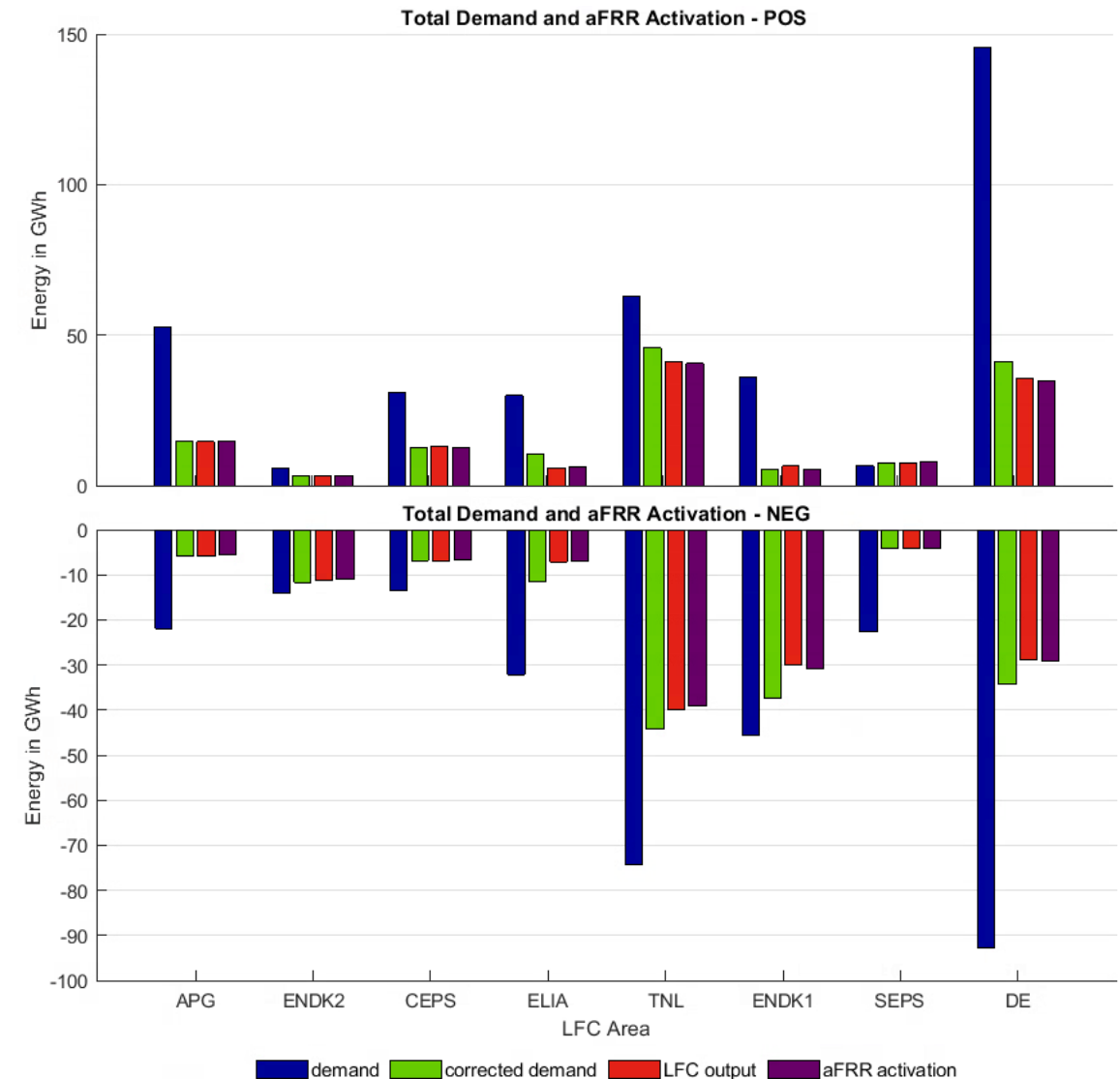
1. TSO receives bids from BSPs in their LFC area
2. TSO forwards standard aFRR balancing bids to platform
3. TSOs communicate Cross-Border Capacity Limits to Platform
4. TSOs communicate aFRR demands to platform
5. Communication of clearing results to TSO
6. Communication of aFRR request from each LFC to BSP
7. Data Publication
8. TSO-TSO settlement process and invoicing
9. TSO-BSP settlement process and invoicing

AOF	Activation Optimization Function	NTC	Net Transfer Capacity
FRCE	Frequency Restoration Control Error	AAC	Already Allocated Capacities
CMOL	Common Merit Order List	CBCL	Cross-Border Capacity Limits
CBMP	Cross-Border Marginal Price	HVDC	High Voltage Direct Current



Demand and activation

- Graph shows the aggregated energy amounts for the 6 PICASSO LFC areas and the German LFC-block covering the period from 2024/01/12 to 2024/12/31.
- The effect of the optimization steps is clearly visible:
 - The aFRR demand (blue) submitted to the platform is for most of the LFC areas much higher than the corrected demand (green) calculated by the platform (→ Netting within the PICASSO region and the IGCC)
 - There is a decrease visible between the corrected demand (output of PICASSO), the local LFC output and the activated aFRR by the BSP due to the dynamic behavior of the involved components.



Market Results for 2024

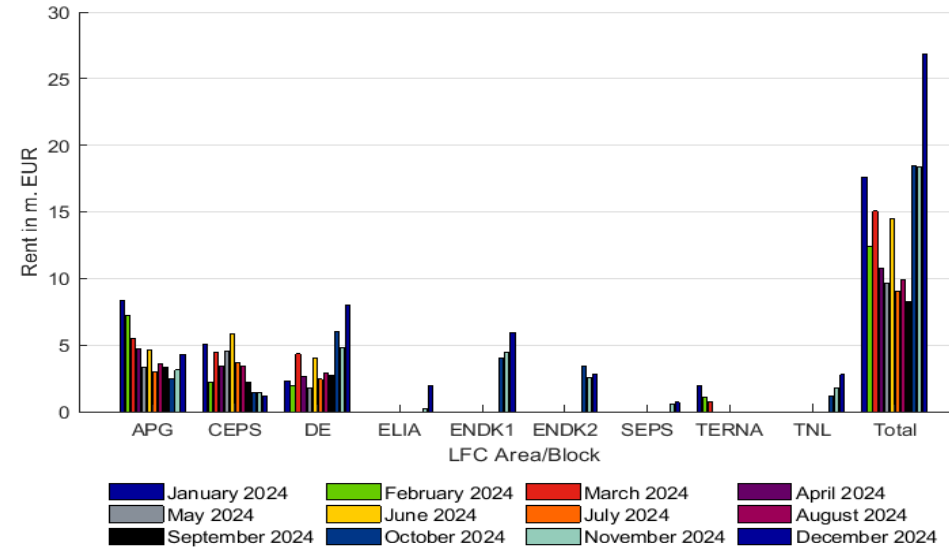
Economic surplus PICASSO

Based on operational data from 01.01.2024 to 31.12.2024

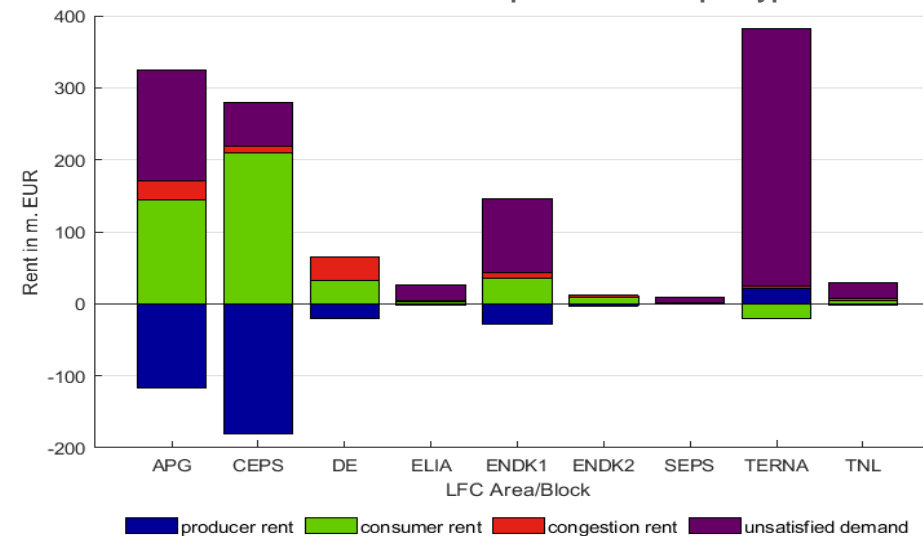


- Economic surplus is calculated by comparing the actual activation of aFRR to a reference scenario with the same bids, demands and market design, but without international interchange.
- Economic surplus in 2024 was around 170 Mio. € (without additional satisfaction of demand). See next slide for details regarding the additional demand satisfaction
- Economic surplus higher for small LFC areas, that get access to a much larger market via PICASSO

Economic surplus PICASSO per month



Economic surplus PICASSO per type



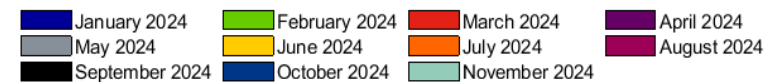
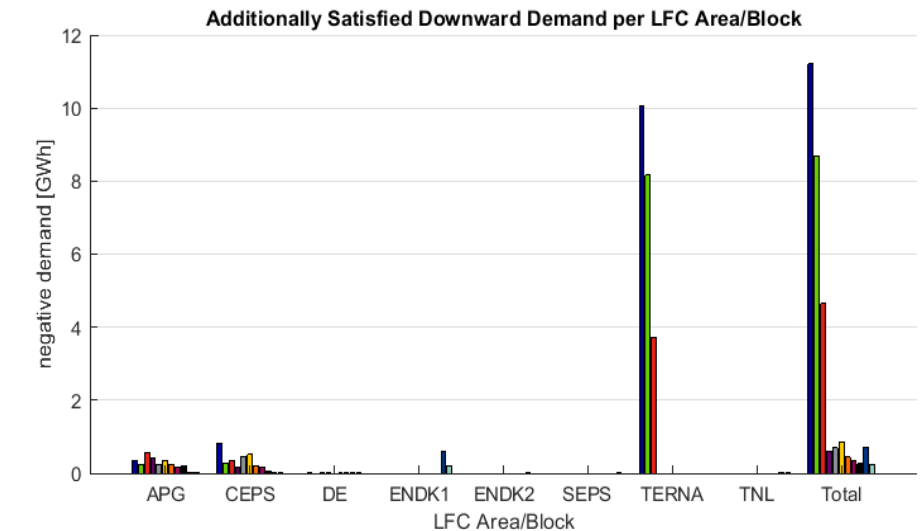
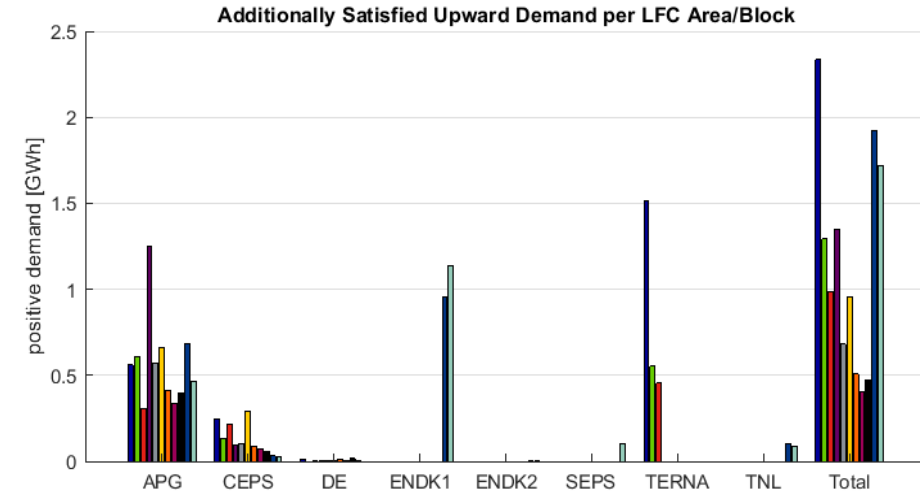
Market Results for 2024

Additional demand satisfaction

Based on operational data from 01.01.2024 to 30.11.2024



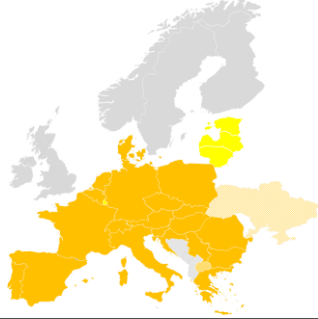
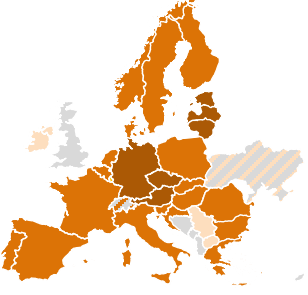
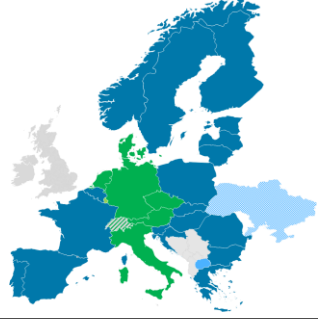
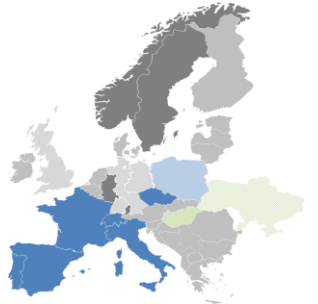
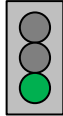
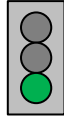
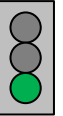
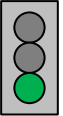
- Since the PICASSO allow TSOs to access more aFRR balancing energy reserves than they've locally procured, it can lead to additional demand satisfaction through aFRR than would locally possible. Furthermore, it allows to activate more aFRR in relation to other products, which can benefit FRCE quality. Therefore, PICASSO improve the frequency quality, while decreasing system imbalances (FRCE) and contributing to the security of supply.
- The monetary value of the additionally satisfied demand has not been included in the economic surplus gains but is shown as explicit contribution to the security of supply in terms of energy.
- Each TSO is responsible for maintaining balance in his LFC area and has to take measures to resolve insufficient satisfaction of FRR demand in his LFC areas to secure stable operation. Therefore, exchanges via PICASSO and IGCC platform cannot be considered as guaranteed.





Summary

Overview on current status of European Balancing Platforms

	IGCC	MARI	PICASSO	TERRE
Balancing service	IN	mFRR	aFRR	RR
Participants				
Target area	Continental Europe	Europe	≥ Continental Europe	≥ RR TSOs
Go-live	24/06/2021 & operational since 01/10/2011	05/10/2022*	22/06/2022*	29/09/2020*
Status				
Highlights	Economic surplus of around 666 Mio. € in Q1 – Q3/24	Economic surplus of 3.5 Mio. € until end of August 2024	Economic surplus of more than 170 Mio. € in 2024	Economic surplus of nearly 410 Mio € until October 2024

* Date as of when cross-border exchanges were possible due to neighboring TSO joining. Technical go-live of platform was earlier.

- » European domestic market (at least) for balancing energy has been established in 2022.
- » European market design has significantly changed the local procurement rules.

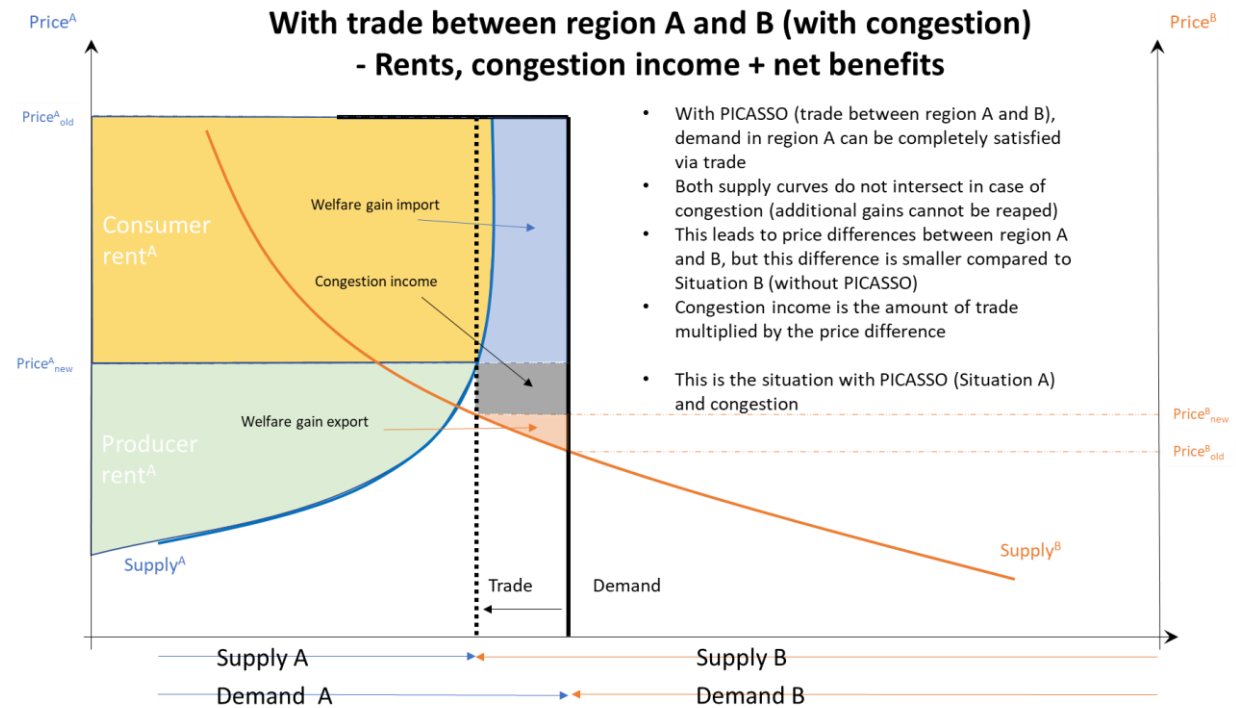


ANY QUESTIONS?



Backup: Economic surplus calculation

- Based on the decoupled scenario simulation, the “old” price of region A and B is calculated.
- Graph on the right shows the different components of the total economic surplus. For this example, the demand of area A is higher than the available volume provided in area A.
- The consumer rent for area A is equal to the reduction of the producer rent of area A compared to the decoupled scenario.
- If there is a congestion, there is a congestion income and an additional welfare gain based on the export.
- The value of the welfare gain based on the import (blue area), is based on the price that is used to calculate this amount.
 - Method 1: no price
 - Method 2: price cap
 - Method 3:





Backup: List of the acronyms

Acronym	Meaning	Acronym	Meaning
AAC	Already Allocated Capacities	FRCE	Frequency Restoration Control Error
ACER	European Agency for the Cooperation of Energy Regulators	FRR	Frequency Restoration Reserve
aFRR	Automated Frequency Restoration Reserve	HVDC	High-Voltage, Direct Current
AOF	Activation Optimisation Function	IF	Implementation Framework
ATC	Available Transmission Capacity	IGCC	International Grid Control Cooperation
BSP	Balancing Service Provider	LFC	Load-Frequency Control
CBCL	Cross Border Capacity Limit	LMOL	Local Merit Order List
CBMP	Cross Border Marginal Price	MP	Marginal Price
CMOL	Common Merit Order List	NTC	Net Transfer Capacity
CZC	Cross Zonal Capacity	PICASSO	Platform for the International Coordination of Automated Frequency Restoration and Stable System Operation
EBGL	Electricity Balancing Guideline	SCADA	Supervisory Control and Data Acquisition