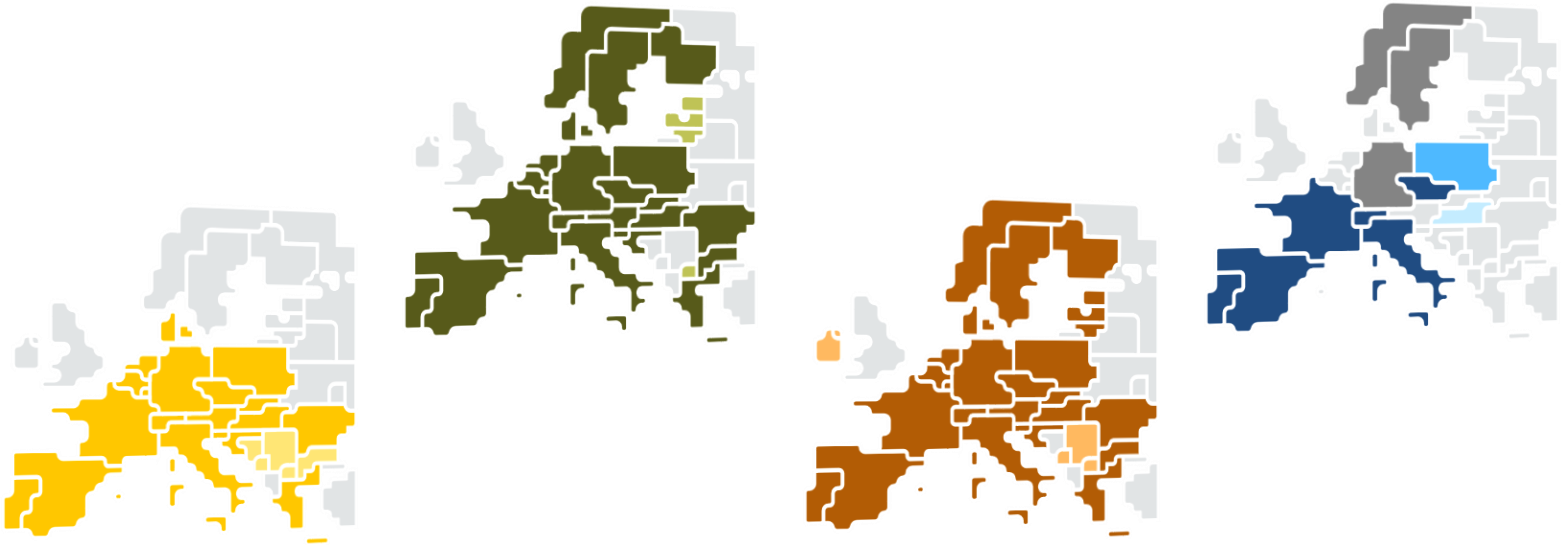
Update on Balancing Platforms

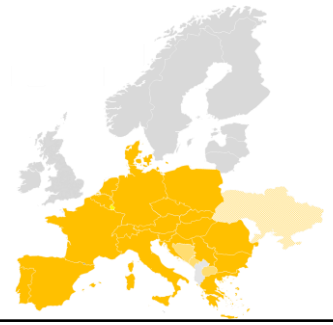
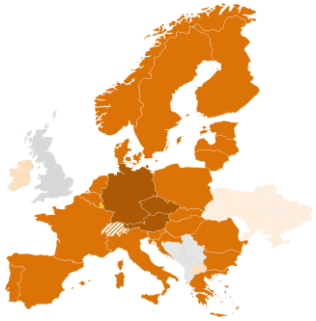
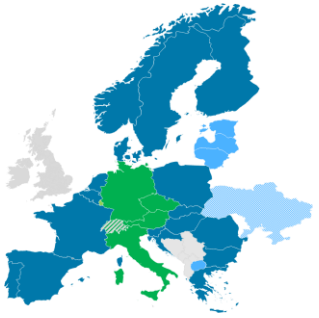
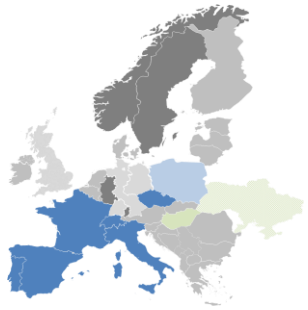
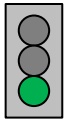
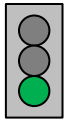
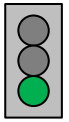
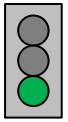
April 17th, 2024

Electricity Balancing SG meeting



Introduction

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 210 Mio. € in Q1/24	Economic surplus of 1.6 Mio. € in Q1/24	Economic surplus of more than 45 Mio. € in Q1/24 Terna suspended operation on 15th. March	Economic surplus of more than 49 Mio € in Q1/24

* 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.

Open points from last EBCG

Updates

26 October EBSG action items were:

ENTSO-E to provide an operational update on the Capacity Management IT Solution in the April 2024 EBSG meeting.

Included in this slide deck

ENTSO-E to clarify the MARI unsatisfied demand calculations and theoretical assumptions behind.

Included in this slide deck for the operational reporting

ENTSO-E to clarify when the aFRR activation of TERNA is published.

Clarified for the operational reporting.

ENTSO-E to clarify the TERRE KPI for September for accuracy (with regard to demand volumes).

There was an error in the presented data, correction was done.

ENTSO-E to send an update email to EBSG members once the Cross Border Marginal Prices data is published on the Transparency Platform.

Done

Recent developments and updates

Updates

Implementation of High-Price Measurements at platform level

Background: In order to provide a “as short as possible” implementation phase, the PICASSO platform has already started to prepare the necessary implementation changes:

- Change of temporary price limit can be performed rather quick (configuration change)
- Change in the CBMP formation is at the moment developed on prototype-level.
- Changes for the inelastic demands are developed on two levels: Development of the AOF and development of the necessary signals (local implementation task)

After approval, the changes will be evaluated and then implemented in production

Security incident at PSI Germany

Background: On 15.2. there was a cyberattack at PSI (one of the suppliers of the PICASSO IT solution). PSI took several measures and started forensic investigation support by a third parties. Attack focused on the business IT, up to our knowledge no operational or development systems were affected.

CSP of PICASSO closed all direct communication with PSI and took several security measurements. In case of operational issues a 24/7 on call service is established. All development activities are stopped at PSI (development systems are still down). PSI has to prove a "clean system" before we restart activities. Potential impact on the ongoing developments (e. g. HPMM, Fingrid accession) is monitored closely and mitigation actions are evaluated.

Recent developments and updates

Updates

Connection of REN to the IGCC

Background: on 8th of January, both real-time connections of REN to the IGCC stopped operation, REN was disconnected to the IGCC. REN uses as one of a few TSOs private carrier lines to connect to the IGCC.

- Root cause were contractual issues internally at the provider of the private carrier line
- The reestablish the connection, a new line had to be built up (including new hardware).
- There were also problems that delayed REN's connection, the channels were ready:
  - ICCP converter in Wendlingen failure
  - REN was disconnected from the central system – reconnection in cooperation with CSP necessary
- Reconnection of REN took place on 26th February.

Unplanned Disconnection of APG to MARI

APG had to disconnect from MARI between 11th March and 3rd April

- Reasons:
  - Direct Activation Optimization run aborted by MARI (resolved acc. to IT-Provider)
    - led to unsatisfied demand of APG (GER and CZ not affected) and disconnection of APG
  - Instable real-time signals from MARI (root cause still being investigated)
    - APG decided to reconnect after 1 week of stabile incoming signals despite cause is still unclear

Recent developments and updates

Suspension of TERNA

Suspension of TERNA

Background: on 1st of March, ARERA published a note (no. 60/2024) requesting TERNA to suspend their operational participation to PICASSO latest at 15th March

- Publication on ARERA webpage is only available in Italian.
- TERNA and the Platform developed a technical concept to perform the suspension.
- Suspension of TERNA took place on 15th March, 8:00 UTC (9:00 CET) and was announced on TERNA and project webpage and was published using the operational publication on ENTSO-E Transparency platform.

Regarding MARI: Regarding the connection from TERNA to MARI it is not clear in which timeframe (or under which conditions) TERNA can or will join MARI.

As there is no communication from ARERA available in English, PICASSO and MARI project would be quite interested in a detail explanation of ARERA.

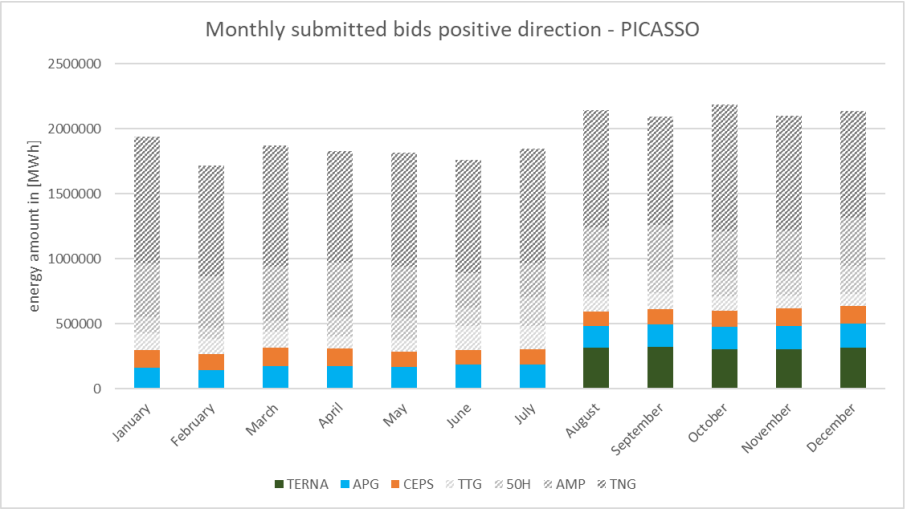
Recent developments and updates

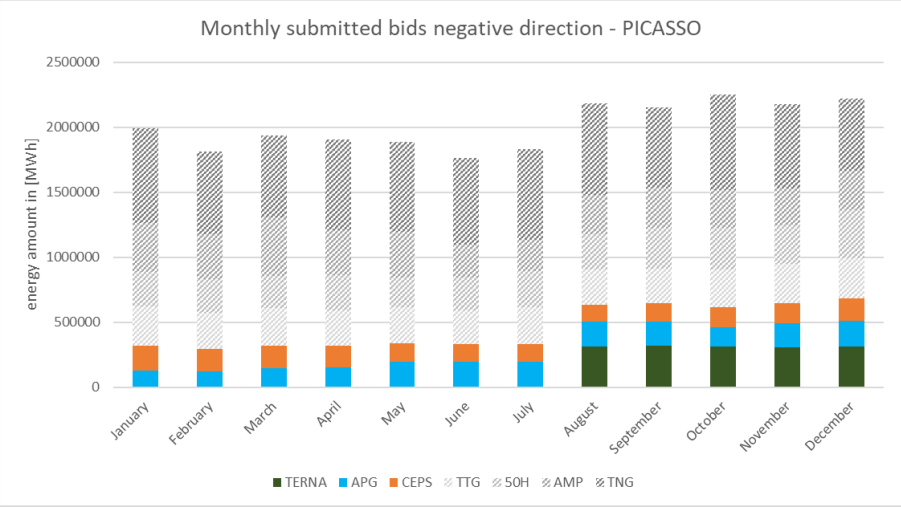
Suspension of TERNA

Review of the operational phase of TERNA

Monthly submitted bids to PICASSO

Based on the values of 2023, TERNA submitted a monthly value of bids in the range of ~ 310 GWh in both directions.



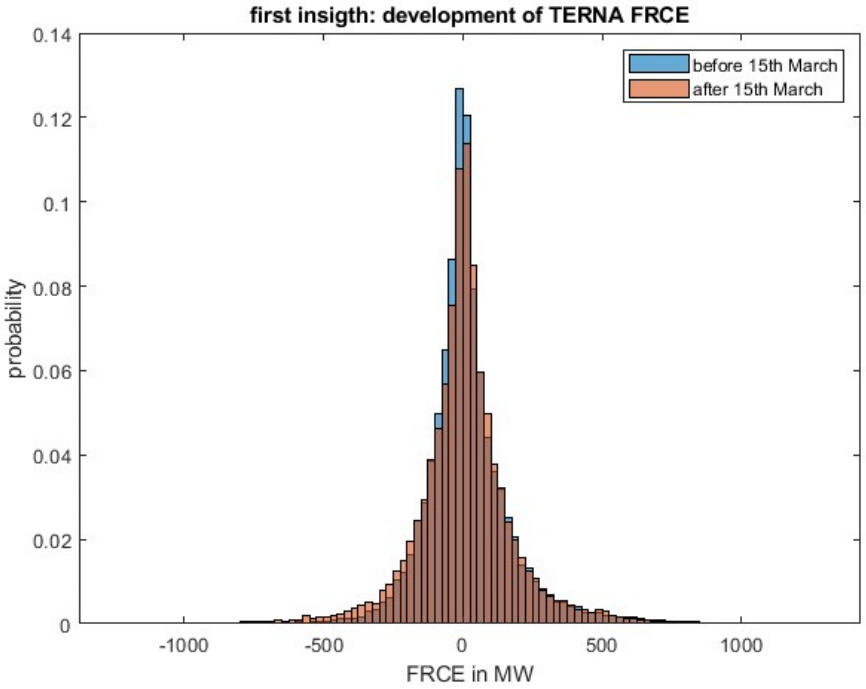


Review of the operational phase of TERNA

Influence on FRCE in March

From operational perspective, the amount of data is limited, only data for March 2024 are available.

Nevertheless, a comparison of the FRCE of TERNA from 1st March – 14th March and 15th March – 31st March shows, that the FRCE quality (especially in negative direction) was lower after the suspension of operation.



Recent developments and updates

Suspension of TERNA

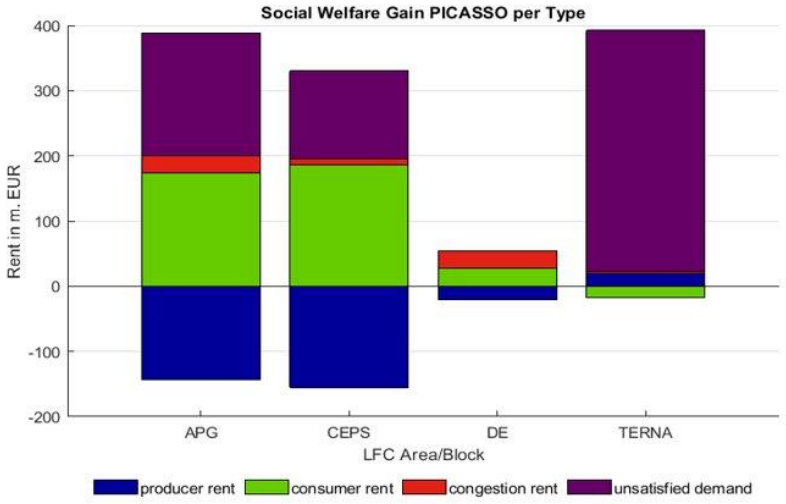
Review of the operational phase of TERNA

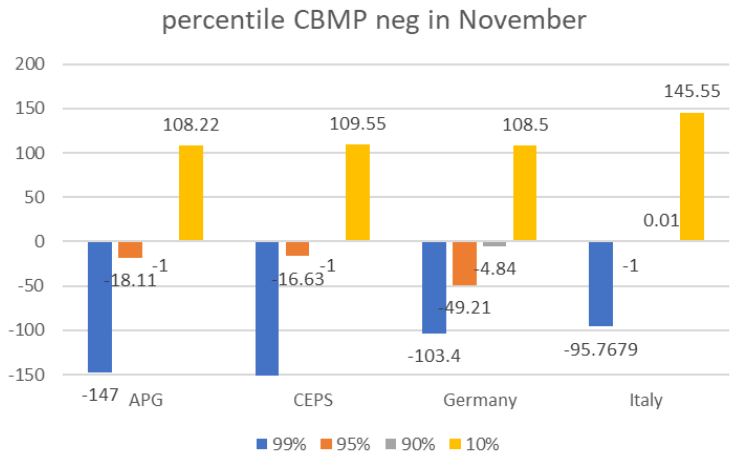
Overview of the economical surplus of Italy

Considering the economic surplus, it is quite interesting to see that TERNA is the only country with a positive economic surplus for the BSPs in 2023.

Due to the fact, that no negative bids with negative price were included in the LMOL, the effect on the consumer rent was negative.

Considering the amount of negative CBMP in negative direction, the (exemplary) analysis of November 2023 shows, that the number of MTUs with negative CBMP was the lowest in the PICASSO region with less than 10 %. Only 1% of all MTUs with below -1 €/MWh.

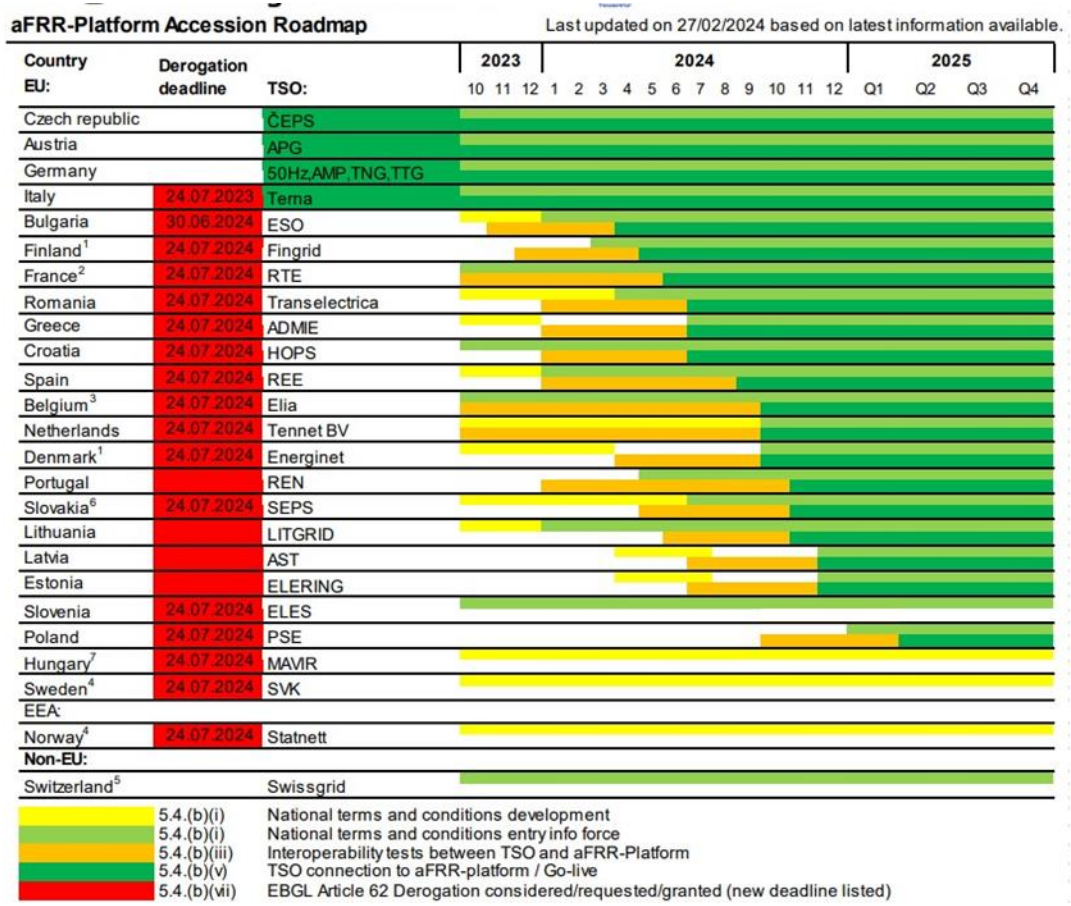




Recent developments and updates

Update of the accession roadmaps

Background: As announced in the last EBCG, the projects decided to publish an updated version of the accession roadmap already end of February to reflect the already visible changes in the go-live planning of the individual local implementations.



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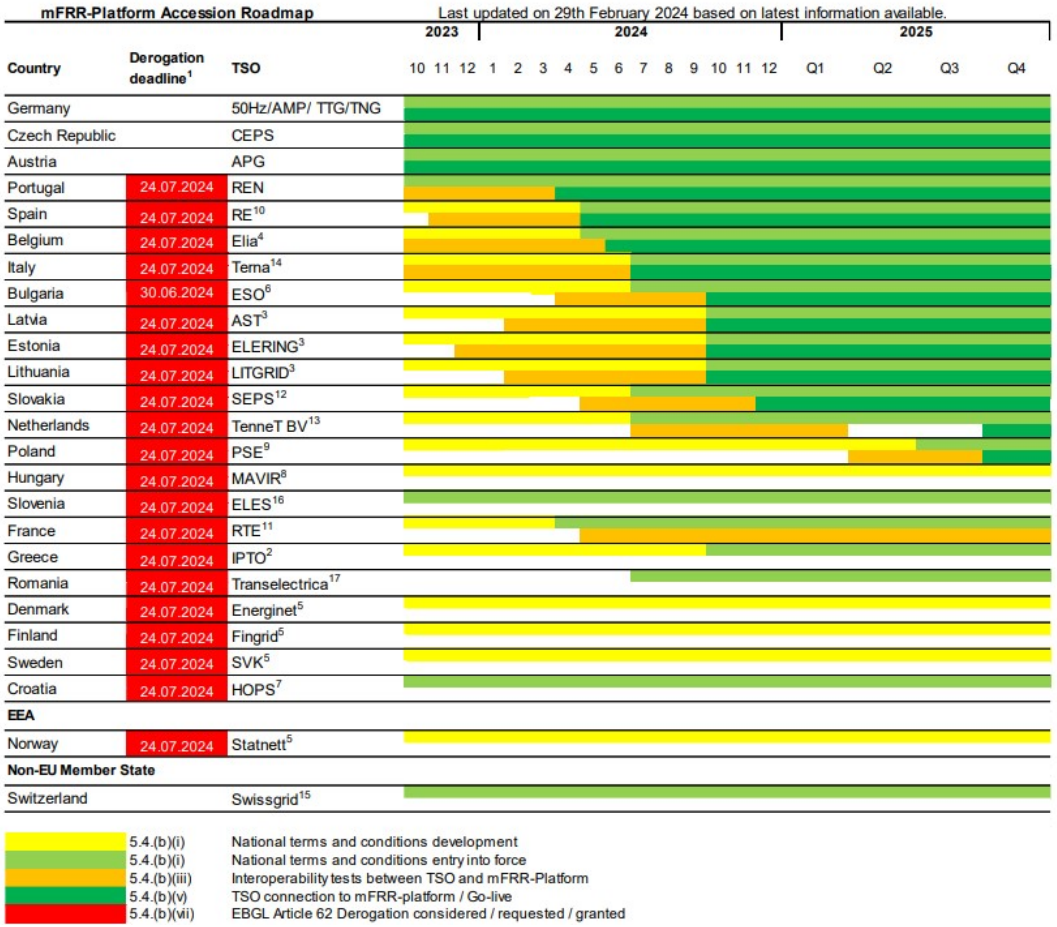


Evolution of price incidents

PICASSO

In Q1/2024 PICASSO registered 325 (Q4: 580 | Q3: 275) price incidents

Compared to Q4 there are several observations:

- No price incidents concerned the whole PICASSO area (IT,AT,CZ,DE) (Q4: 0 | Q3: 2)
- 144 (Q4: 168 | Q3: 150) price incidents included Austria – thereof 37 (Q4: 38 |Q3: 59) with only Austria as uncongested area
- 79 (Q4: 112 | Q3: 77) price incidents included Italy – no incident with only Italy as uncongested area
- 221 (Q4: 464 | Q3: 132) price incidents included Czech Republic – thereof 171 (Q4: 398 | Q3: 89) with only CZ as uncongested area
- 28 (Q4: 26 | Q3: 40) price incidents included Germany - thereof 7 (Q4: 10 | Q3: 22) with only Germany as uncongested area

- Mean duration of all price incidents was 107 s (Q4: 114 s) | min 4 s (54 (Q4: 107) incidents) | max 900 s (4 (Q4: 2) incidents)
- 274 (Q4: 344) price incidents (65 % (Q4: 60%)) lasted less than 60 s

- Interesting fact: 72 incidents occurred in the last week of March (high PV-infeed and low load)

MARI

One Price incident occurred in Q1/2024 (2024/01/09).

- Positive direction, price of 15,000 €/MWh in DE due to high DA demand in one MTU and congested borders towards Germany

CMM go-live

MARI project successfully launched CMM platform on 24th October 2023

Background:

The CMM platform-initiated support for balancing services and cross-zonal capacity limits on the 24th of October.

The CMM project, in collaboration with involved parties, is actively testing the design and functionalities of the platform.

First Operational Experience:

A successful simultaneous launch was achieved across all balancing platforms, accommodating diverse configurations for the participating parties (RR and IN process for Swissgrid, mFRR and aFRR/IN for CEPS).

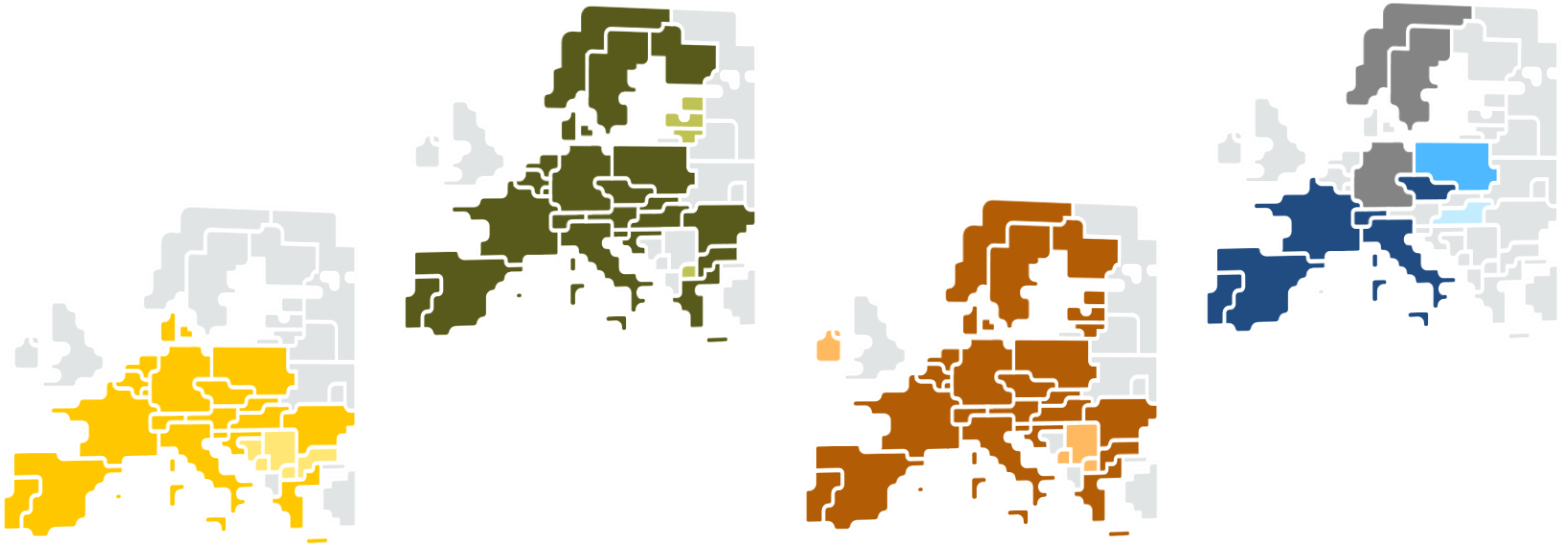
The project is currently focused on assessing the platform's availability and robustness, refining operational processes for enhanced performance.

Challenges Overcome:

Despite encountering a few malfunctions affecting individual borders, swift and effective mitigation measures were implemented, minimizing any significant impact on the TSO common market.

Additional disclaimer: this slide is for information and without prejudice of current litigation about CMM/CMF

Operational Results



Manually Activated Reserves Initiative (MARI)

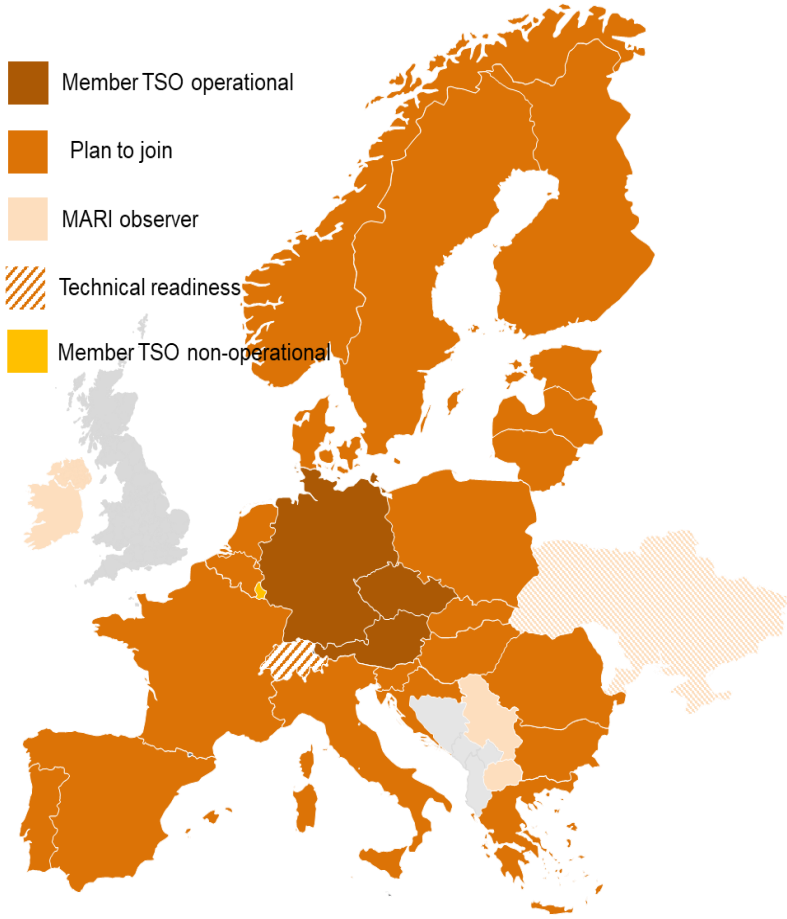
Overview

- Project “Manually Activated Reserves Initiative” (MARI) has been set up already in 2017 to provide the basis for a European mFRR platform.
  - Currently, 29 TSOs from 26 countries have joined the project (Creos as non-operational member only).
- Start of dry-run (CEPS) on 2022/07/18
- Technical go-live on 2022/09/15
- First TSOs (CEPS and German TSOs) joined on 2022/10/05.

Relevant Features

- Counter activation of mFRR balancing energy for economic optimization
- mFRR balancing energy bids can be activated either for balancing or (locally) for system constraints purposes
- Direct and scheduled activation
- 100 % availability since go-live

» Road to individual TSOs go-live will also continue in 2024.

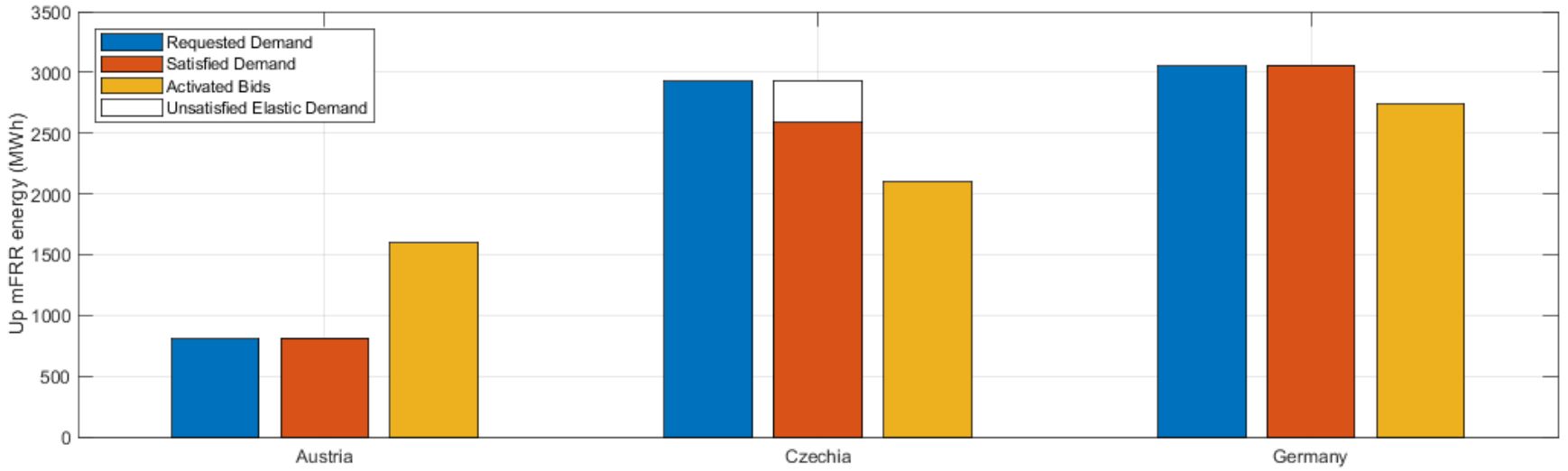


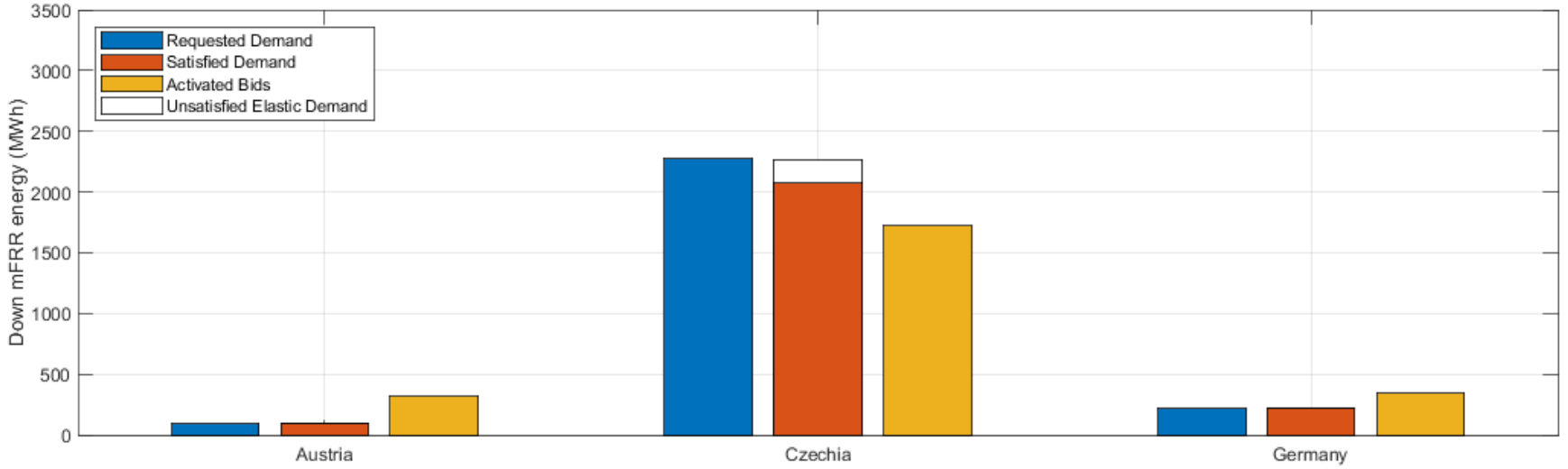
* based on the current accession roadmap which includes additional information and risks on the planning

Operational Platform Reporting

mFRR requested and activated via MARI

Based on operational data from Q1/2024



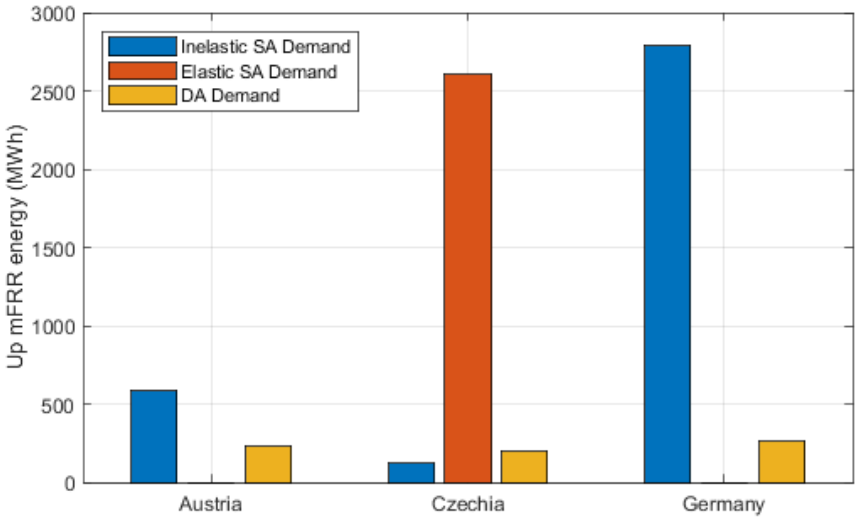


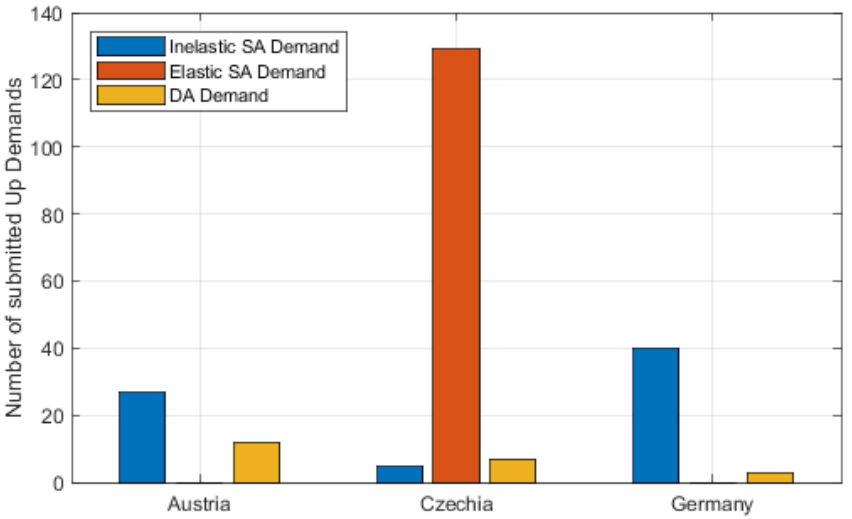
- Price elastic demand is applied by CEPS.
- All countries activated more upward mFRR than downward mFRR.

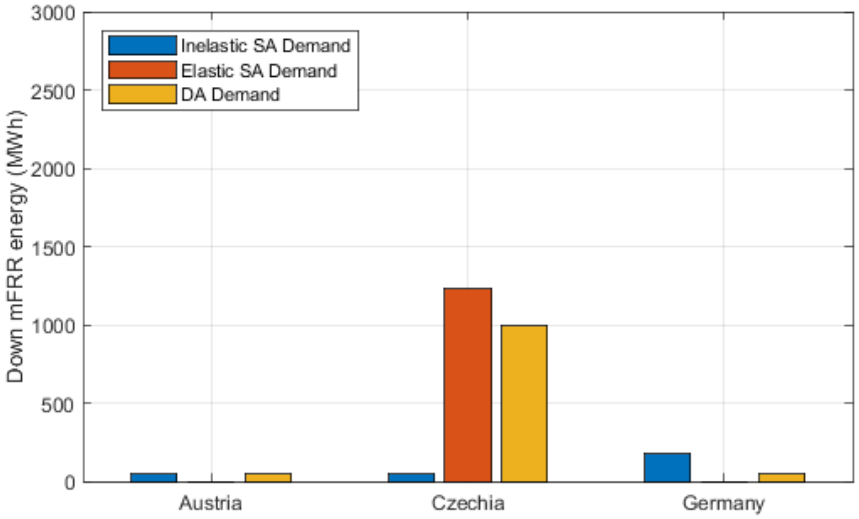
Operational Platform Reporting

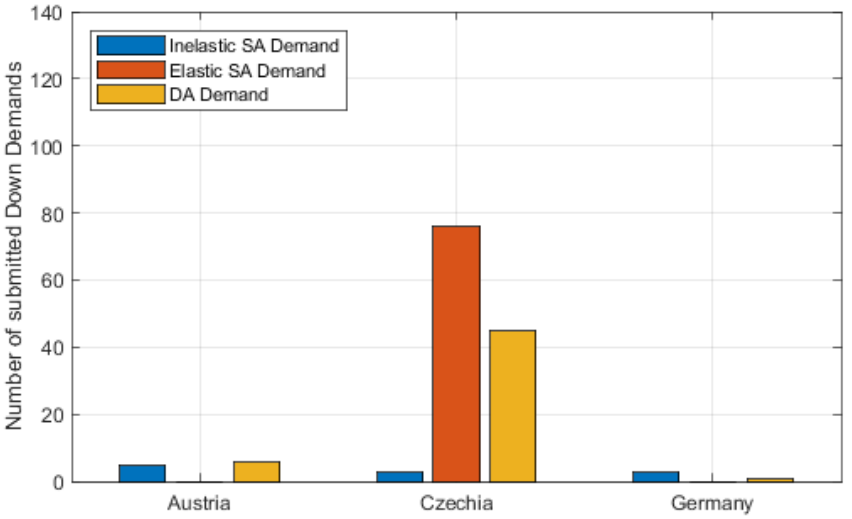
mFRR Demand

Based on operational data from Q1/2024





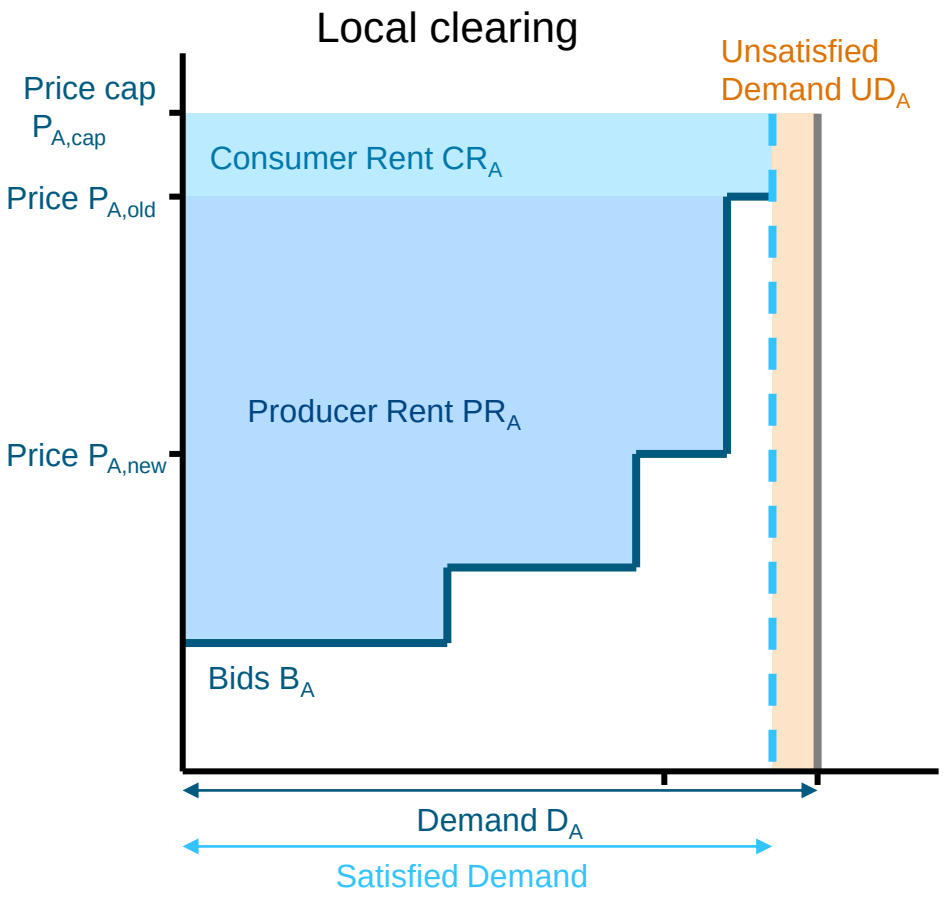


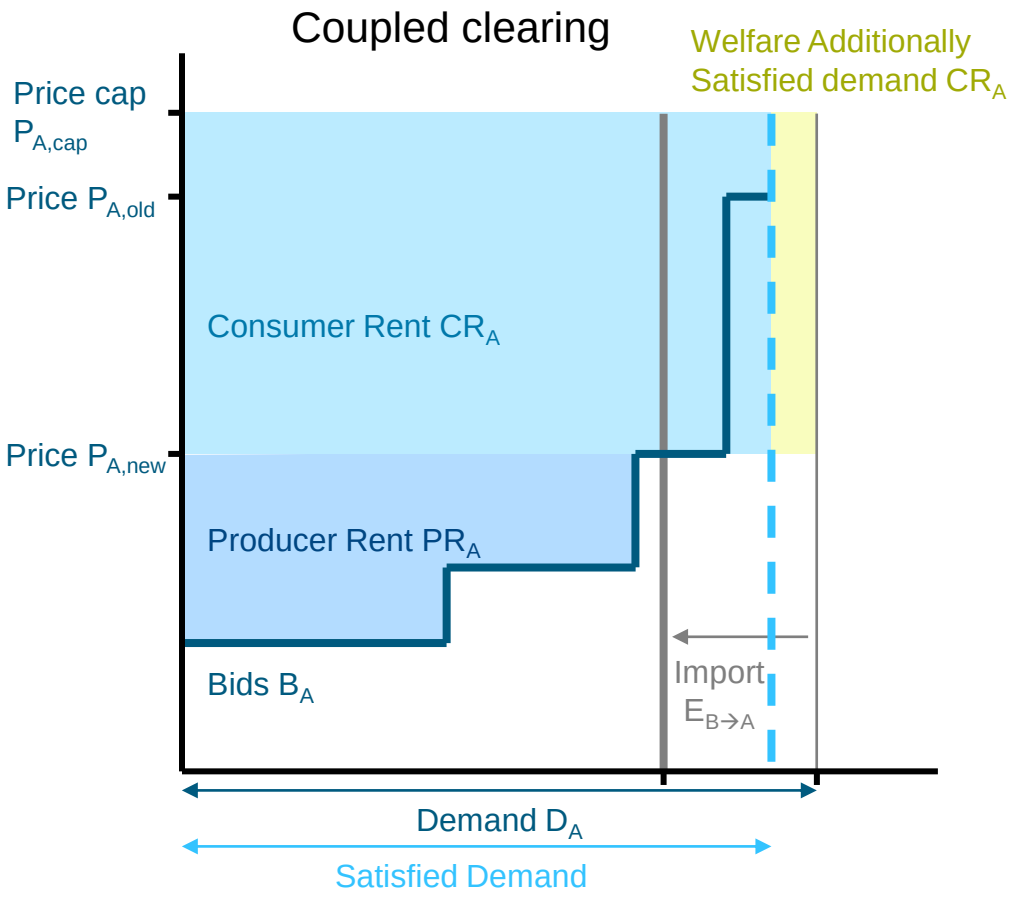


- Quite small amounts of activation in average compared to CMOL volume
- The probability of occurrence of high prices can be assumed as low – only one price incident in Q1

Details on additionally satisfied demand economic surplus calculation

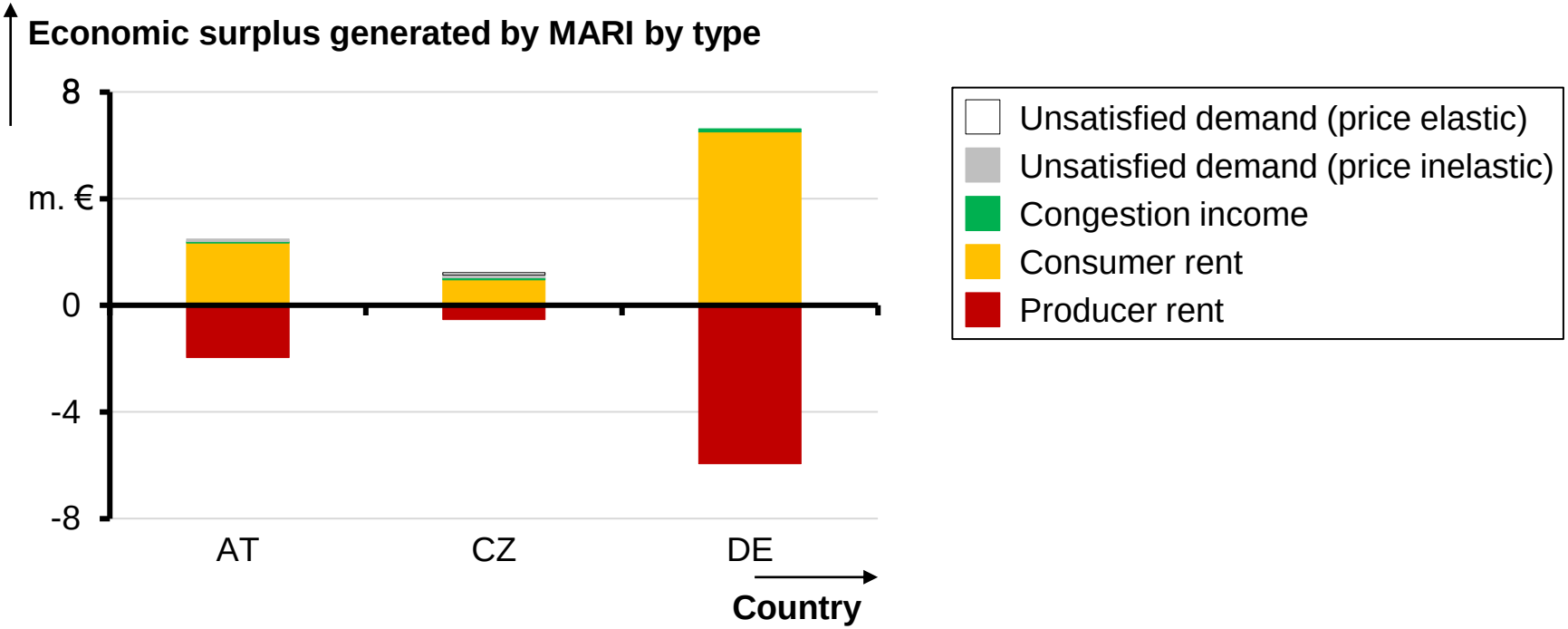
- Additionally satisfied demands (demands that would not have been fully satisfied in a local market) create additional economic surplus
- Assuming that the price cap reflects the cost for unsatisfied demand, it is possible to calculate the economic surplus of additionally satisfied demands as below.





Based on operational data from Q1/2024

- Calculation of economic surplus as comparison between actual mFRR activation with a reference scenario (same bids, demands and market design) but without exchange of balancing energy



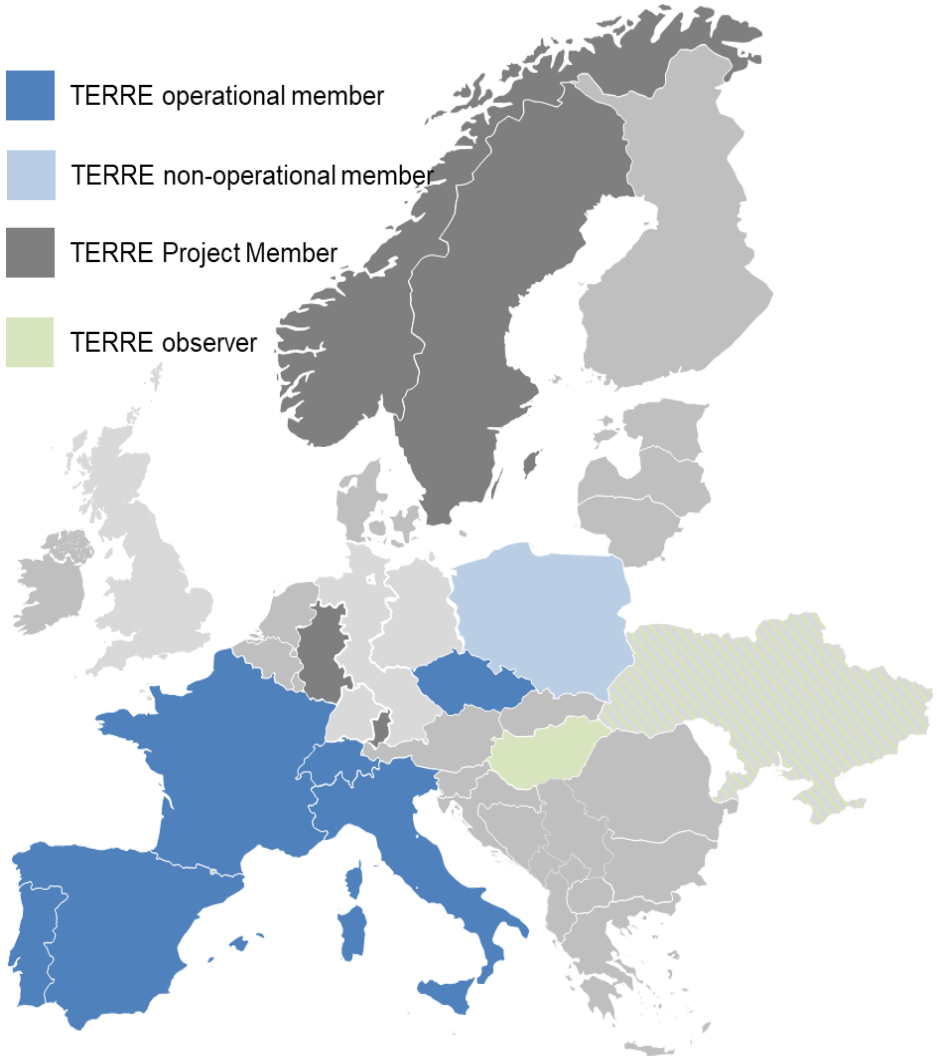
» Economic surplus (without pricing unsatisfied demand) sums up to 1.6 Mio. € for Q1/2024.

» Including unsatisfied demand economic surplus is 1.9 Mio. € for the same period in time.

Trans European Replacement Reserves Exchanges (TERRE)

Last main milestones

- The “Trans European Replacement Reserves Exchanges” platform include:
  - 6 operational members: REN (Portugal), Red Electrica (Spain), RTE (France), Terna (Italy), Swissgrid (Switzerland), CEPS (Czech Republic)
  - One non-operational member: PSE (Poland) which is expected to connect in 2024.
  - Two observers: Mavir (Hungary) and ENTSO-E

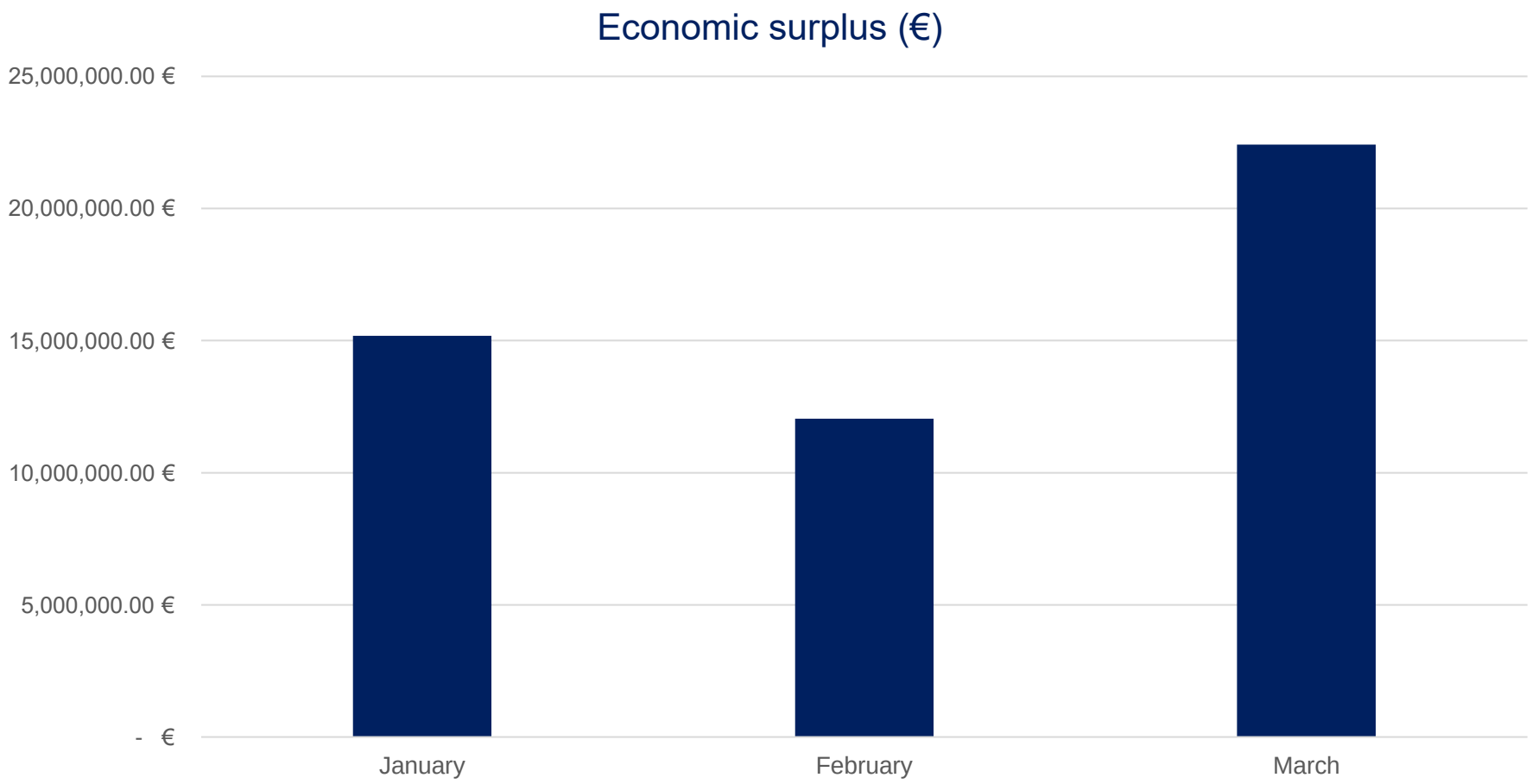


Relevant update

- TERRE TSOs met RR NRAs in January and April to discuss the future of the project, considering results from the public survey, TSOs constraints, and the legal framework (EBGL, RR IF, and upcoming EMDR).
- TERRE TSOs are organizing a public stakeholder workshop on the 26/04 to present conclusions of their exchanges with RR NRAs and the future of the project.

Market Results of Q1/2024

TERRE Economic surplus in Q1/2024

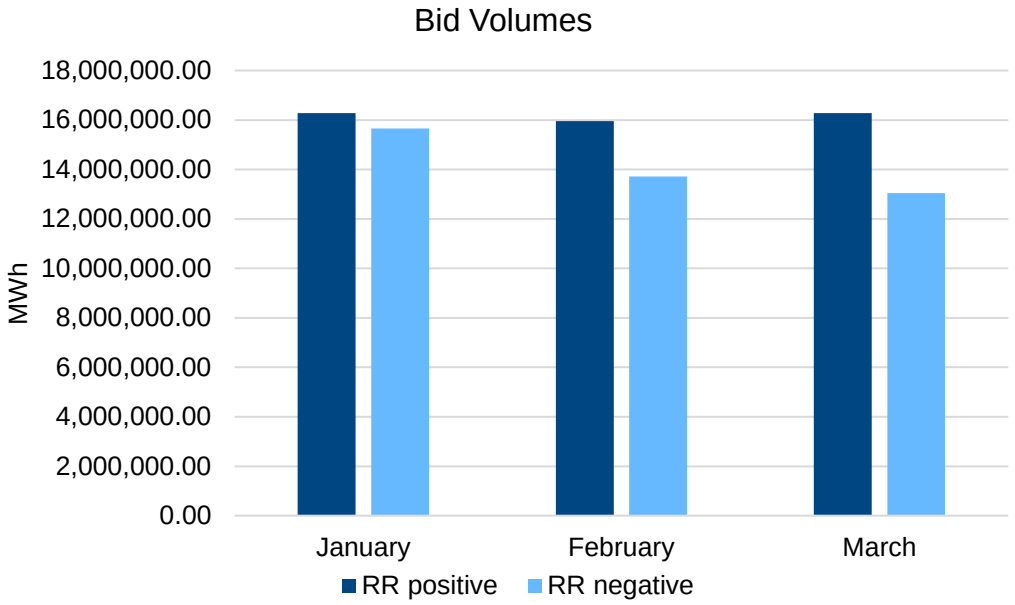


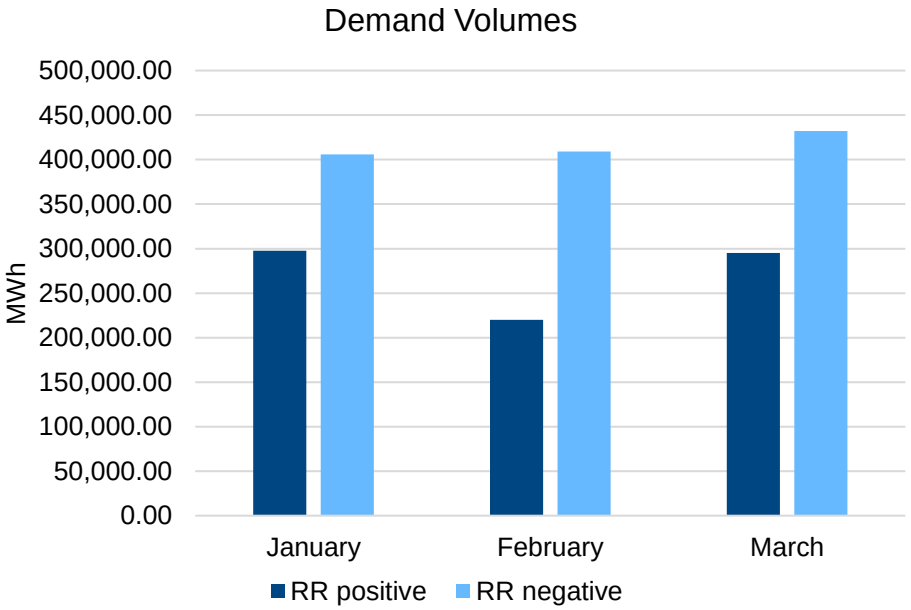
- TERRE platform provides important financial benefits for all countries involved in the project, around 16 million € per month on average during the beginning of year 2024. During the first quarter, the global economic surplus reaches more than 49 million € in total.

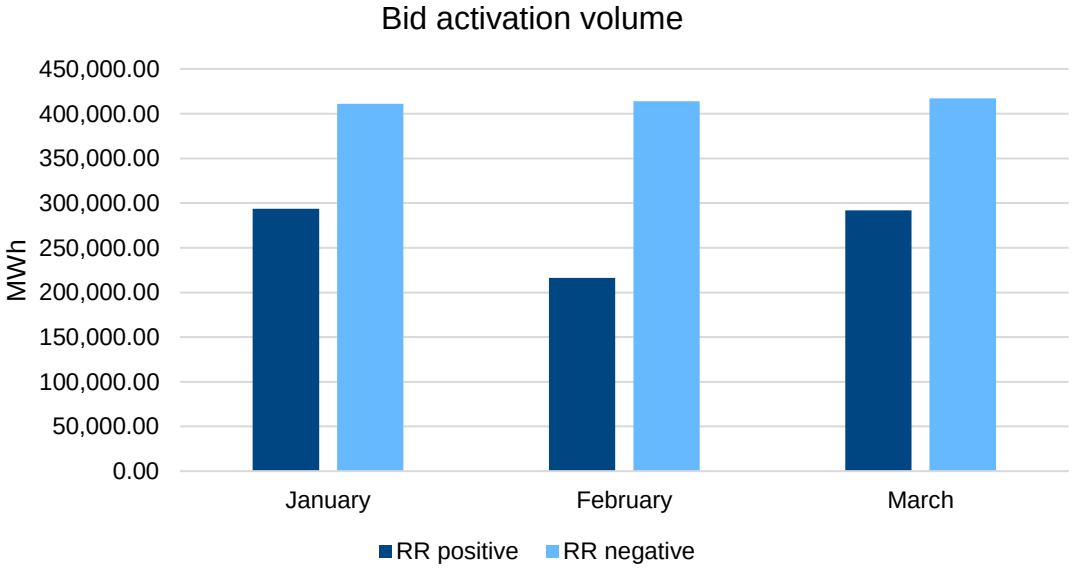
Operational Platform Reporting

TERRE Operational results

Based on operational data from 01.01.2024 to 31.03.2024





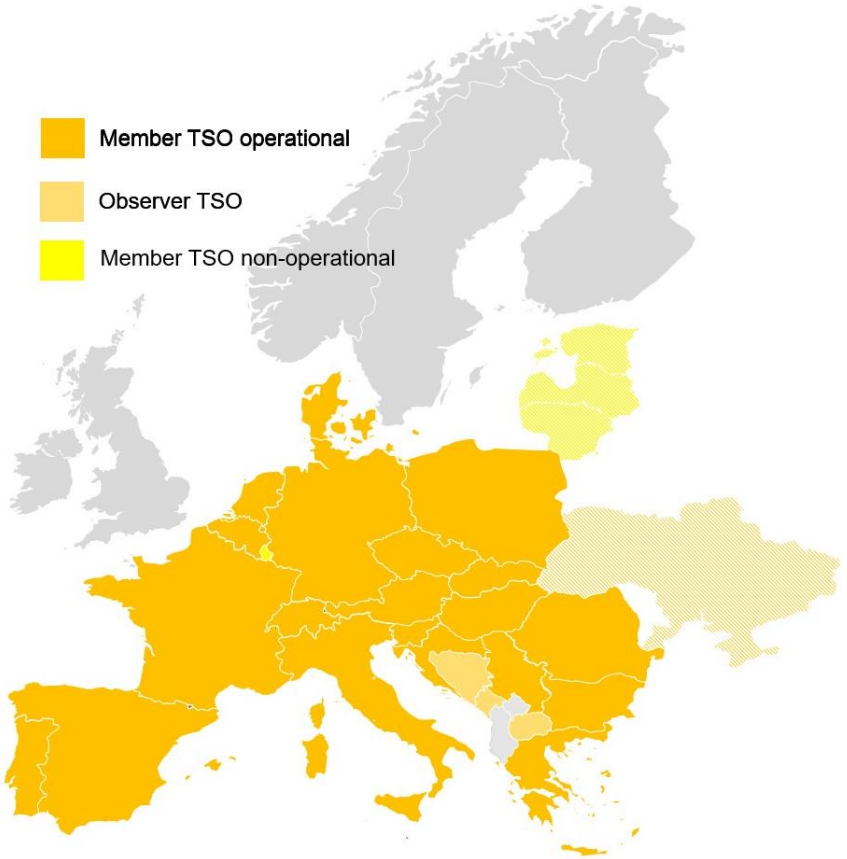


- Important volumes of bids, demands and activated bids are processed by the TERRE platform each month: on average more than 10 millions of MWh in both directions.
- Globally, volume of bids is much more important than demands which conduct to a high rate of demands fulfilled by the TERRE platform (the difference is due to unsatisfied inelastic demands).
- During Q1/2024, the number of activated volumes was on average around 265 000 MWh in positive direction and 415 000 MWh in negative direction.
- The TERRE platform was available during this period.

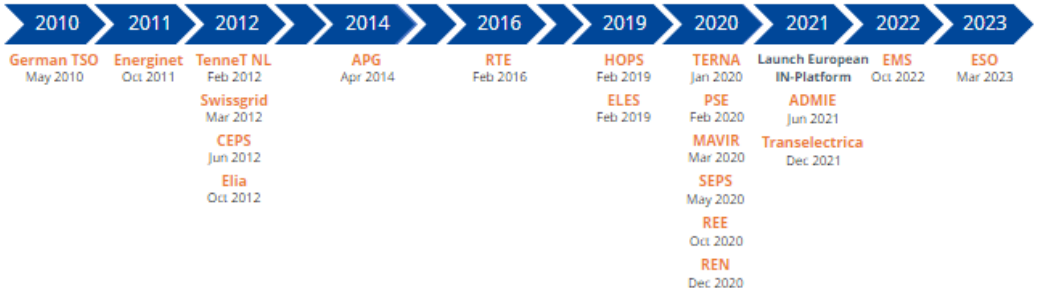
Market Results

Important achievements in IGCC

- All TSOs with the obligation to connect as a result of the EB Regulation are connected to IGCC*.
- IGCC is the first Balancing Platform to achieve this objective.



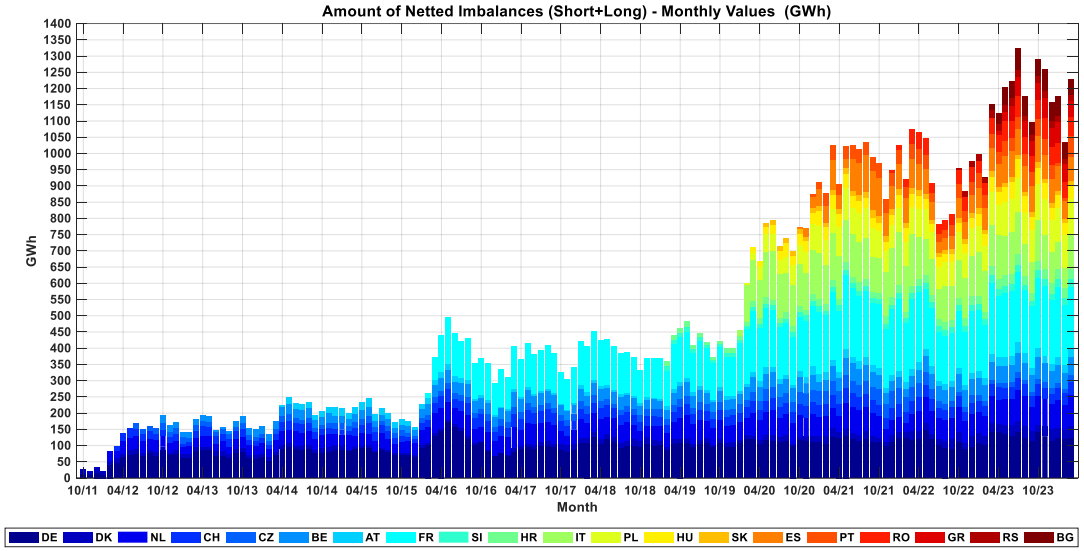
- IGCC has 27 members in total, out of which
  - 24 are operational members and
  - 3 are observers.
- With the go-live of ESO in March, all EU-TSOs are connected and can net their imbalances.
- Historical evolution (starting in 2010):



- Outlook 2024: planning of the accession of the Baltic TSOs to IGCC ongoing

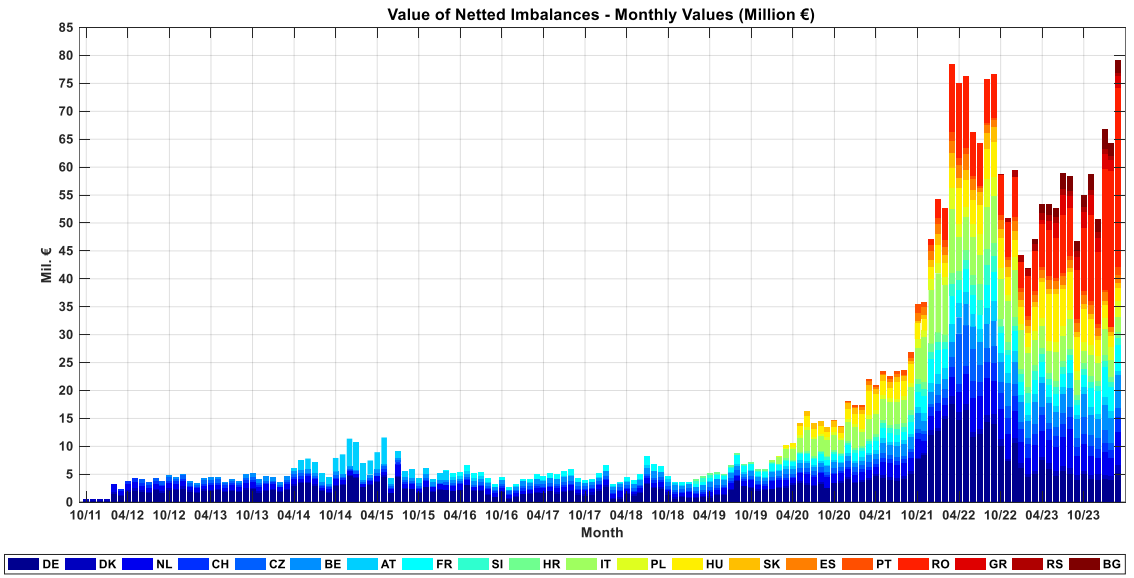
Market Results including Q1/2024

Imbalance Netting Energy Exchanges in IGCC



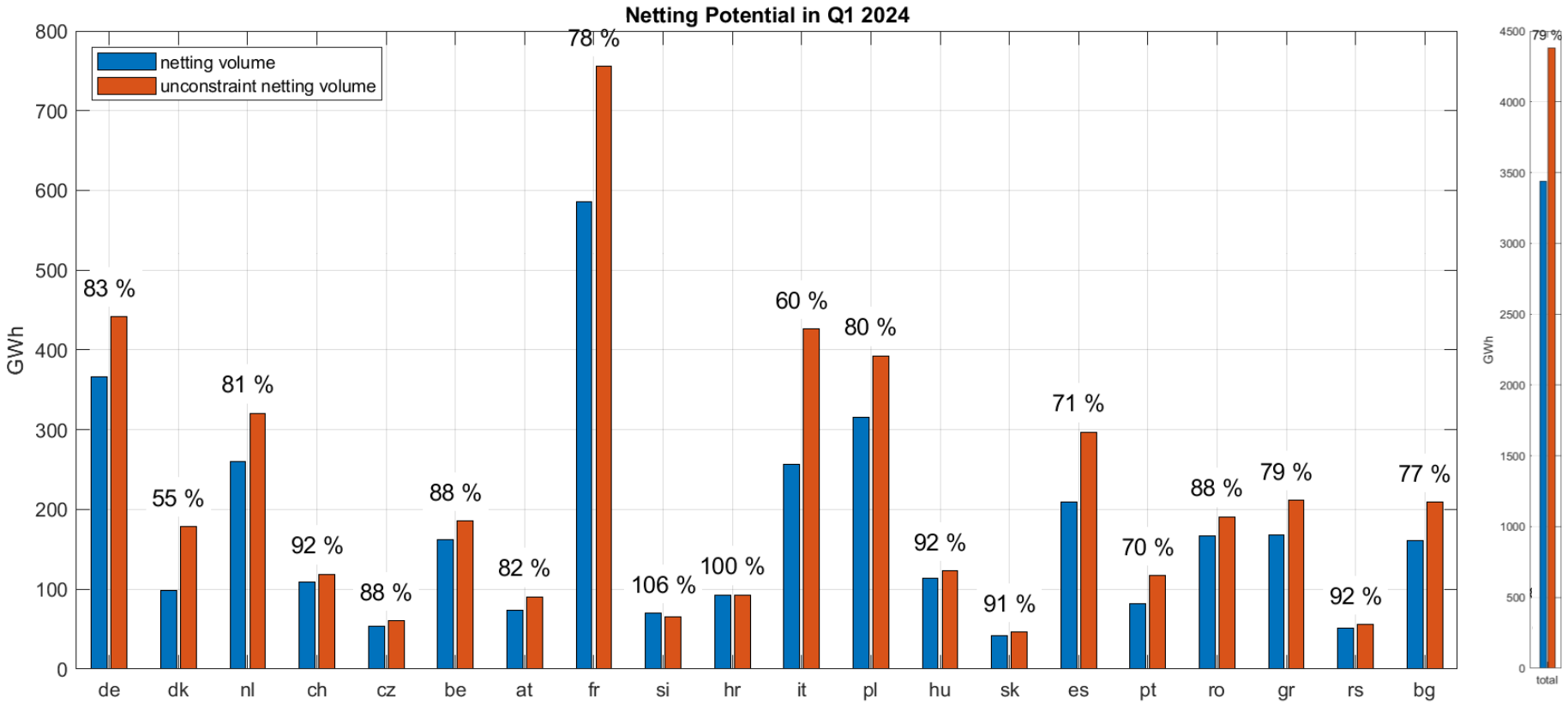
- The quarterly energy savings have reached around 3440 GWh in Q1/2024.
- After a temporary drop due to the PICASSO go-live and subsequent increase due to the remaining accessions, the netted imbalances reached a stable level

- The value of quarterly energy savings have reached around 210 million € in Q1/2024 and around 621 million € in 2023.
- Aggregated savings of the IGCC since 2011 are roughly 2.6 billion €

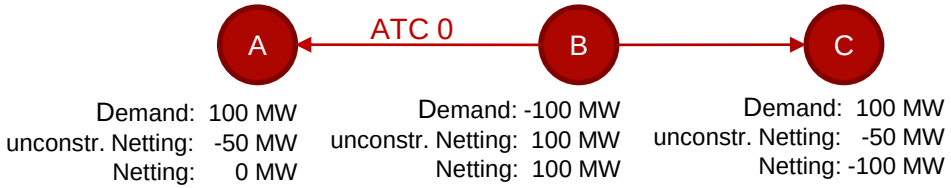


Market Results for Q1/2024

Imbalance Netting Energy Exchanges in IGCC



- The theoretical netting potential in Q1 2024 reached 4.4 TWh in total. 79 % of this total potential was used by the IGCC, the rest was not used due to limited transmission capacity
- Due to the proportional distribution of netting potential and maximization of netting, network constraints can lead to a netting volume that is larger than the unconstraint netting (see LFC area C in the example)

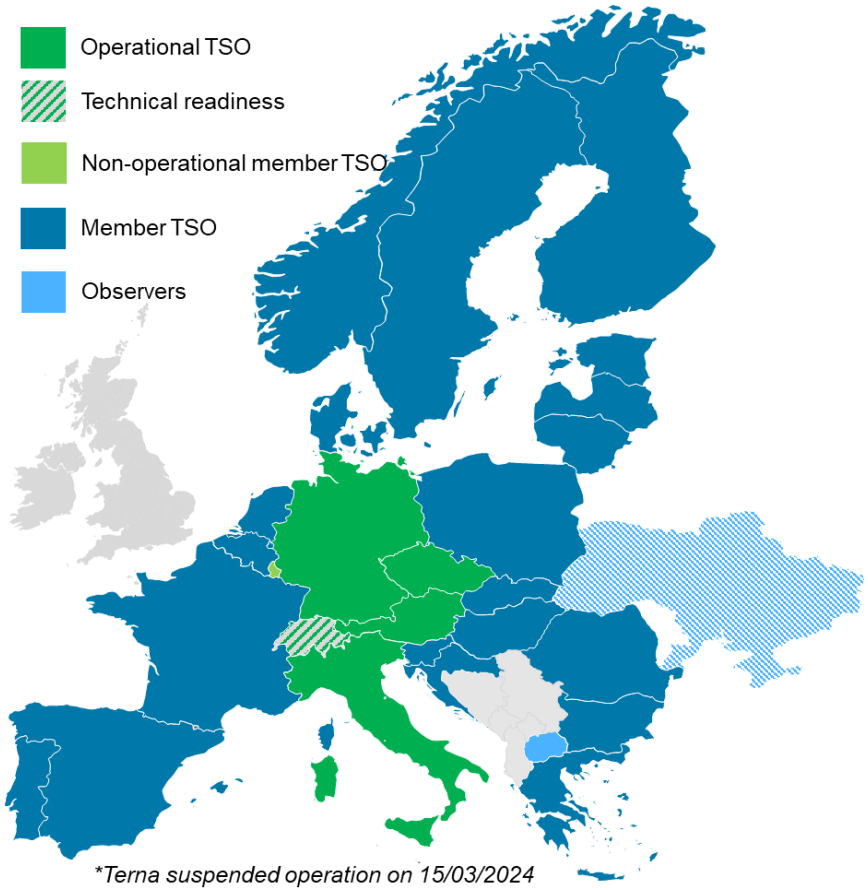


Platform for the International Coordination of automated Frequency Restoration and Stable System Operation (PICASSO)

- 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.
- 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 performed more than 7.8 Mio. market clearings per month 100 % availability.
- 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.



*Terna suspended operation on 15/03/2024

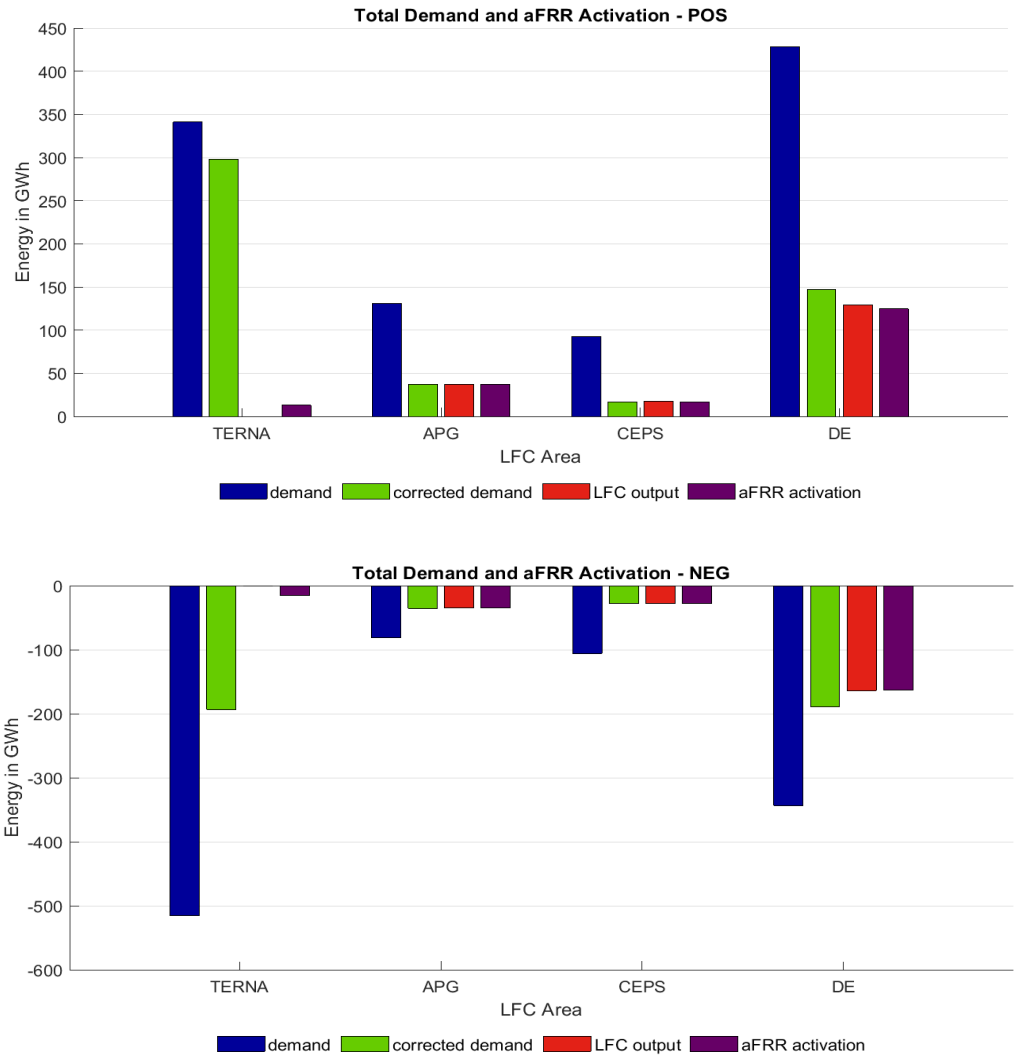
Operational Platform Reporting

Demand and activation

Based on operational data from 01.01.2024 to 31.03.2024

- Graph shows the aggregated energy amounts for the 3 PICASSO LFC areas and the German LFC-block covering the period from 2024/01/01 to 2024/03/31.

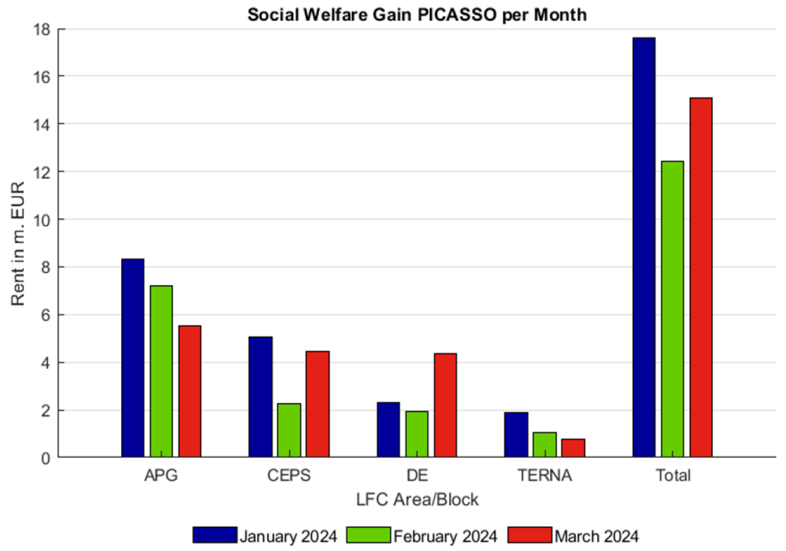
- The effect of the optimization steps is clearly visible:
  - The aFRR demand (blue) submitted to the platform is for most of the LFC areas much higher than the corrected demand (green) calculated by the platform (→ Netting within the PICASSO region and the IGCC)
  - There is a decrease visible between 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.
  - TERNA LFC output is still not available (see extra slide)

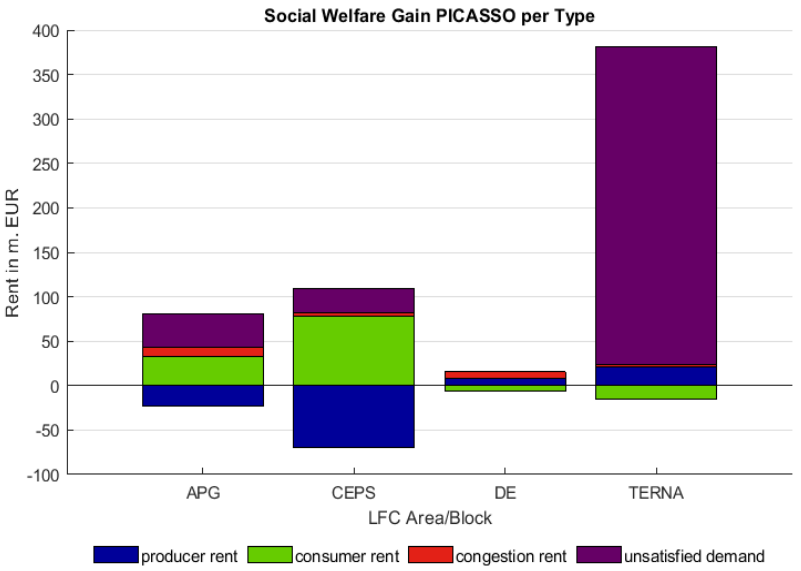


Market Results until End of March 2024

Economic surplus PICASSO

- 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 from January 2024 until March 2024 was around 45 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





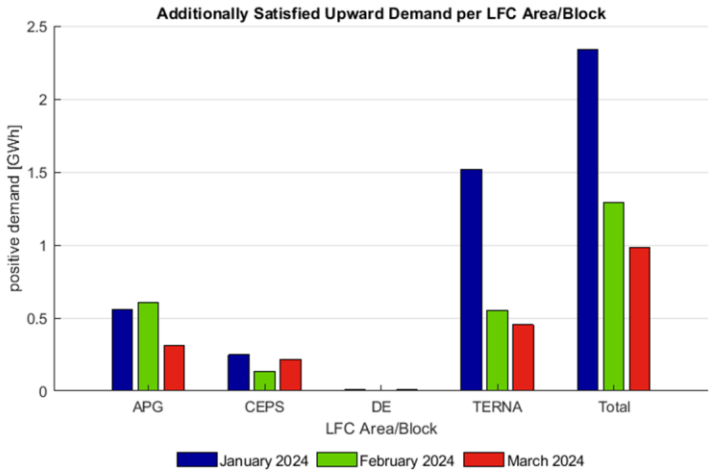
Market Results until end of March 2024

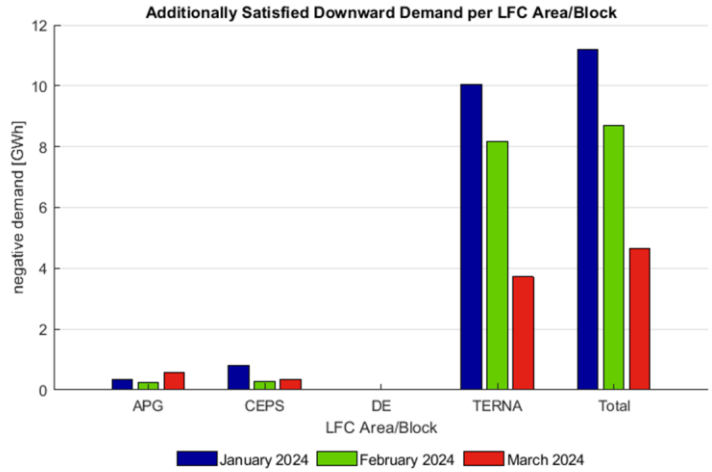
Additional demand satisfaction in PICASSO

- 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.





Conclusions

Outlook

- European TSOs have implemented MARI and PICASSO since 2017 (i. e. before entry into force of Guideline Electricity Balancing).
  - Several hundred experts from TSOs have contributed to MARI and PICASSO in the last years.
  - Also, cross-platform related topics are addressed under the framework of MARI.
  - During 2022, high CBMP were observed in both platforms (in relation to high day-ahead prices). Some TSOs that are technical ready to connect before their end of the derogation have delayed their go-live also based on these high CBMP. All TSOs and the platforms have investigated several mitigation measures that are at the moment under public consultation.

- PICASSO started operation in June 2022
  - Road to individual TSOs go-live will also continue in 2024
  - Using a market time unit of 4 seconds, the PICASSO optimizer has performed more than 10 Mio. market clearings since go-live with 100 % availability.

- MARI in in operation since October 2022
  - APG joined MARI on 2023/06/20.
  - The platform represents the hinge between TERRE and PICASSO.

- TERRE is in operation since January 2020.
  - Since the go-live 6 TSO connected to the platform (24 daily gates)
  - Ongoing exchanges with RR NRAs to agree on a way forward for the future RR process.

- First market results already show significant economic surplus generated by balancing platforms.
  - IGCC generated an economic surplus in Q1/2024 of around 220 Mio. €.
  - TERRE generated an economic surplus of more than 49 Mio. € in Q1/2024
  - PICASSO generated an economic surplus of more than 45 Mio. € in Q1/2024
  - MARI generated an economic surplus of more than 8.5 Mio. € in 2023.