WG Energy Solutions of April 4th 2025

Hybrid meeting

04/04/2025

For a smooth teleconference with 30+ people …
Some rules apply

- Please put yourself on mute at any time that you are not speaking to avoid background noise.
- If you receive a call, please ensure that you do not put this meeting **on hold.**
    - You can quit and reconnect later on.
    - You will be muted or kicked out of the session, if necessary.
- You will be requested to hold your questions for the end of each presentation.
    - Should you have a question, please notify via Teams or speak out if you are only via phone.
    - Share your question (with slide number) in advance so all participants may follow
    - Before you share your question, please announce yourself.
- If you have a poor internet connection, please dial-in.
- Finally, please be courteous and let people finish their sentences.
    - It is practically impossible to follow when 2 people are speaking at the same time in a teleconference.

Agenda

- 09:30 – 09:35: Welcome and approval MoM
- 09:35 – 10:05: Towards Roadmap 25-28
- 10:05 – 10:50: Finetuning of System Balance Philosophy
- *10:50 – 11:00: Coffee break*
- 11:00 – 12:00: Real-Time Price – design note II
- 12:00 – 12:15: Febeliec - Barriers of entry to Elia's explicit balancing products
- *12:15 – 13:05: Lunch*
- 13:05 – 13:45: EU & BE Balancing Program Update
- 13:45 – 14:45: Balancing Products Retrospective 2024
- 14:45 – 15:05: BSP Faster Settlement incentive
- 15:05 – 15:15: T&C BRP – Sequence of Go-Lives
- 15:15 – 15:35: Evolution of the Working Group
- 15:35 – 15:40: AOB

Minutes of Meeting for approval

Minutes of Meeting of WG Energy Solutions of 06/02/2024

- No comments received.
- Suggestion to approve.

Towards Roadmap 2025

Alexandre Torreele

Executive Summary

- Elia has been working the last years on the logic of waves as catalyst of change to further improve the functioning of the market in Belgium
    - Focus and impact for the market from 2016 to 2020: Opening of Balancing products to all type of technologies and for all voltage levels
    - Focus and impact for the market from 2021 to 2025: Connection to European platforms and related product evolutions

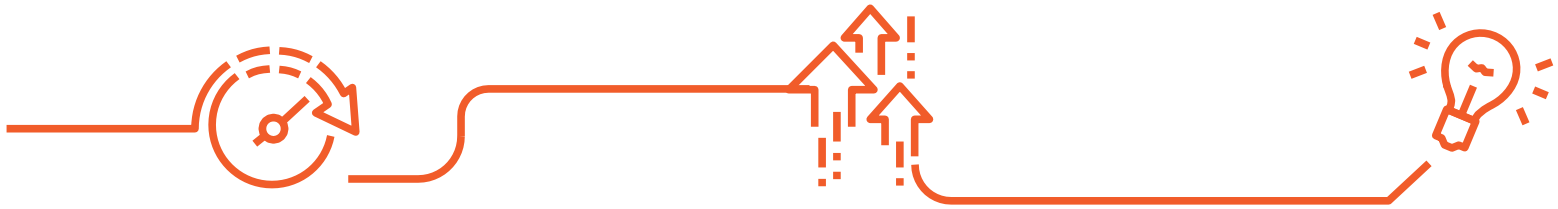
- With the connection to Mari platform in May 2025, a new focus area is being defined to continue to improve the functioning of the market and cope with the further integration of RES, the electrification and the valorization of the flexibility to keep a reliable and affordable power system in Belgium.

    - The new focus area will build on the previous waves and will materialize the balancing philosophy and CCMD supporting Elia's market developments since couple of years and including:

        - Evolution of our Explicit balancing products
        - Optimization of activation/procurement strategies, leveraging on foreign flexibility when possible
        - Evolution of our imbalance price signal
        - Development of key enablers (such as xBRP, ToE, …)
        - Active collaboration with DSOs and the market to alleviate the barriers for decentralized flexibility

- In light of that, a reflection on the name and organization of the WG seems desirable

A holistic approach towards increasing flexibility needs



Context

A rapidly changing environment…

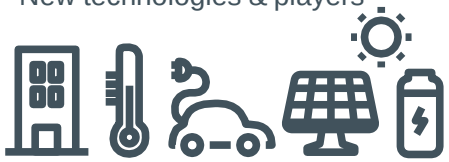
> RES intermittency
> Decentralized generation
> Digitalization
> EU Network Codes

Impact on Elia

… with challenges & opportunities…

Flexibility needs:
More important & more volatile

Flexibility sources:
New technologies & players



Answers of Elia

… requires an ambitious but pragmatic approach

Keep "needs" under control:
- Enforced BRP role
- Dynamic "needs" dimensioning
- Facilitate an efficient use of flexibility across all market timeframes

Cover "needs" efficiently
- Reserve sharing
- X border integration
- Shorter term procurement
- Open market to all
  - **All technologies**
  - **All players**
  - **All voltage levels**

First wave of changes with impact for market parties:

2016 - 2020

Opening Balancing Market to :

All technologies | All players | All voltage levels

	FCR	aFRR	mFRR
Opening to all technologies & Voltage levels	✓ (Apr 2017)	✓ (Oct 2020)	✓ (Jan 2017)
Access via ToE	NA	✗	✓ (Dec 2018)
Daily procurement	✓ (Jul 2020)	✓ (Oct 2020)	✓ (Feb 2020)

* Although T&Cs have opened the services to all voltage levels, additional efforts are needed to actually unlock significant volumes of flexibility in MV/LV

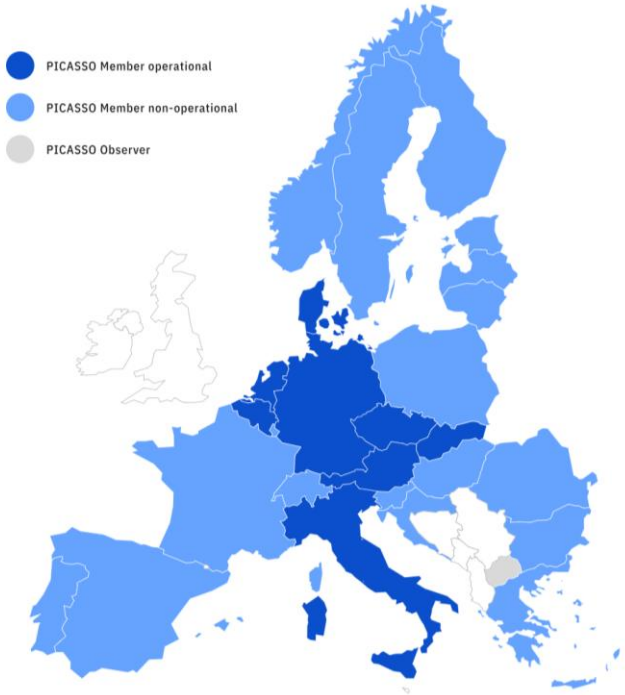
** An extension of ToE to aFRR and to MV/LV is still missing

Second wave of changes with impact for market parties:

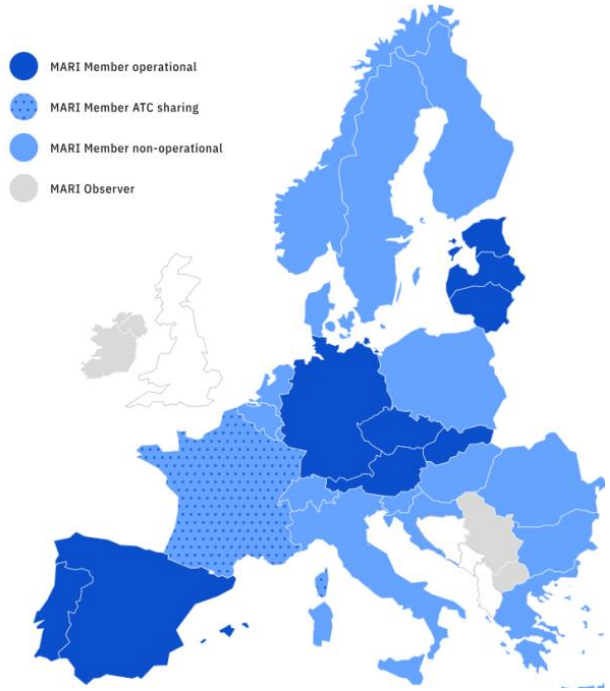
2021 - 2025

Harmonising Balancing Energy Products & Integrating EU FRR Energy Markets

PICASSO*: Nov 2024



MARI**: May 2025

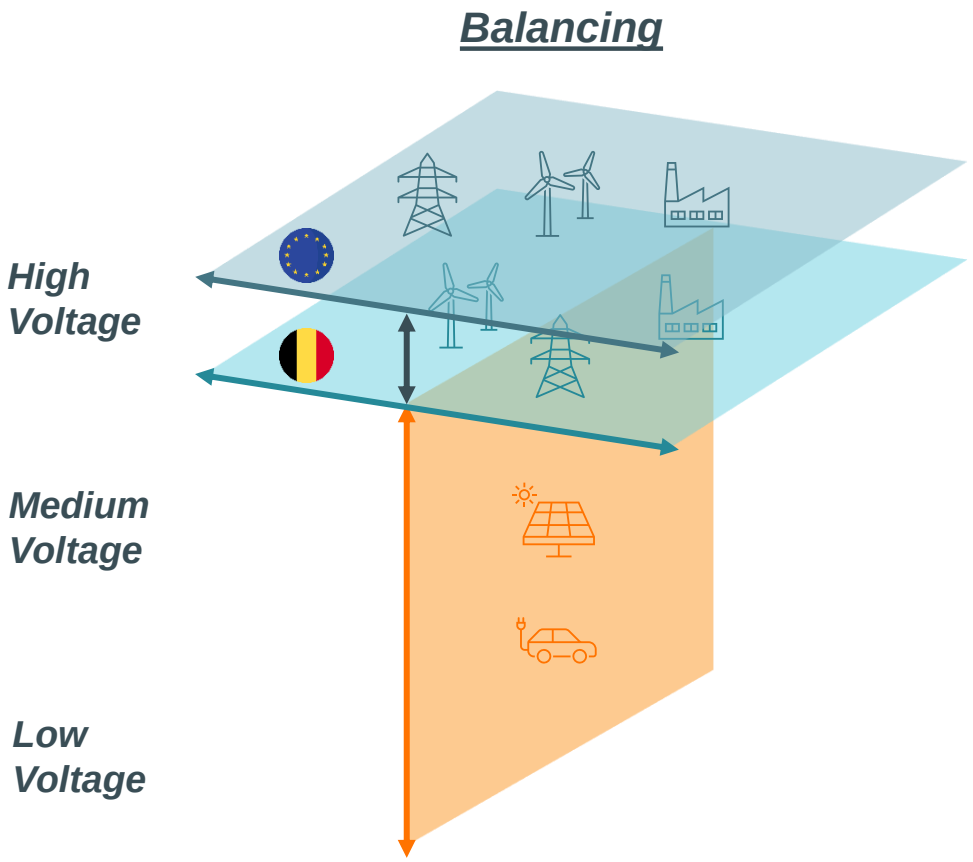


* Connection with 1st application of aFRR elastic demand

** The harmonised mFRR design went live in May 2024

What are the next priorities? (1/2)

Connect the Horizontal system and the vertical system!



Capitalize on XB opportunities:

- Reduce balancing energy activation costs
- Investigate potential for XB balancing capacity procurement
- Leverage on foreign liquidity
- Open opportunities to foreign countries

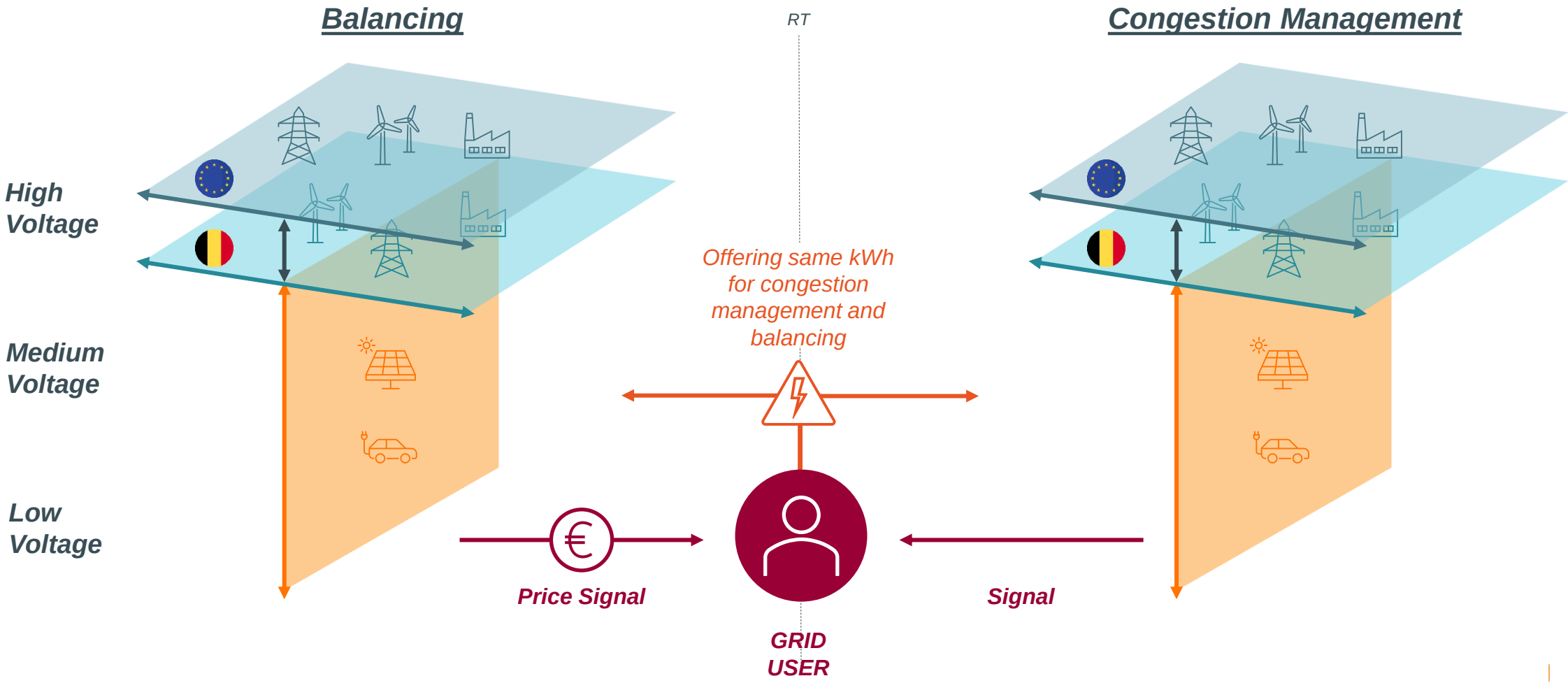
Unlocking local flexibility at all voltage levels is key to accommodate more RES and electrification !

- Lower entry barriers to explicit balancing
- Efficient reaction to adequate price signals
- Digitalisation & operational excellence
- Lower barriers to valorize flex at all voltage levels via the market
- Turbo charged collaboration with DSOs and market parties

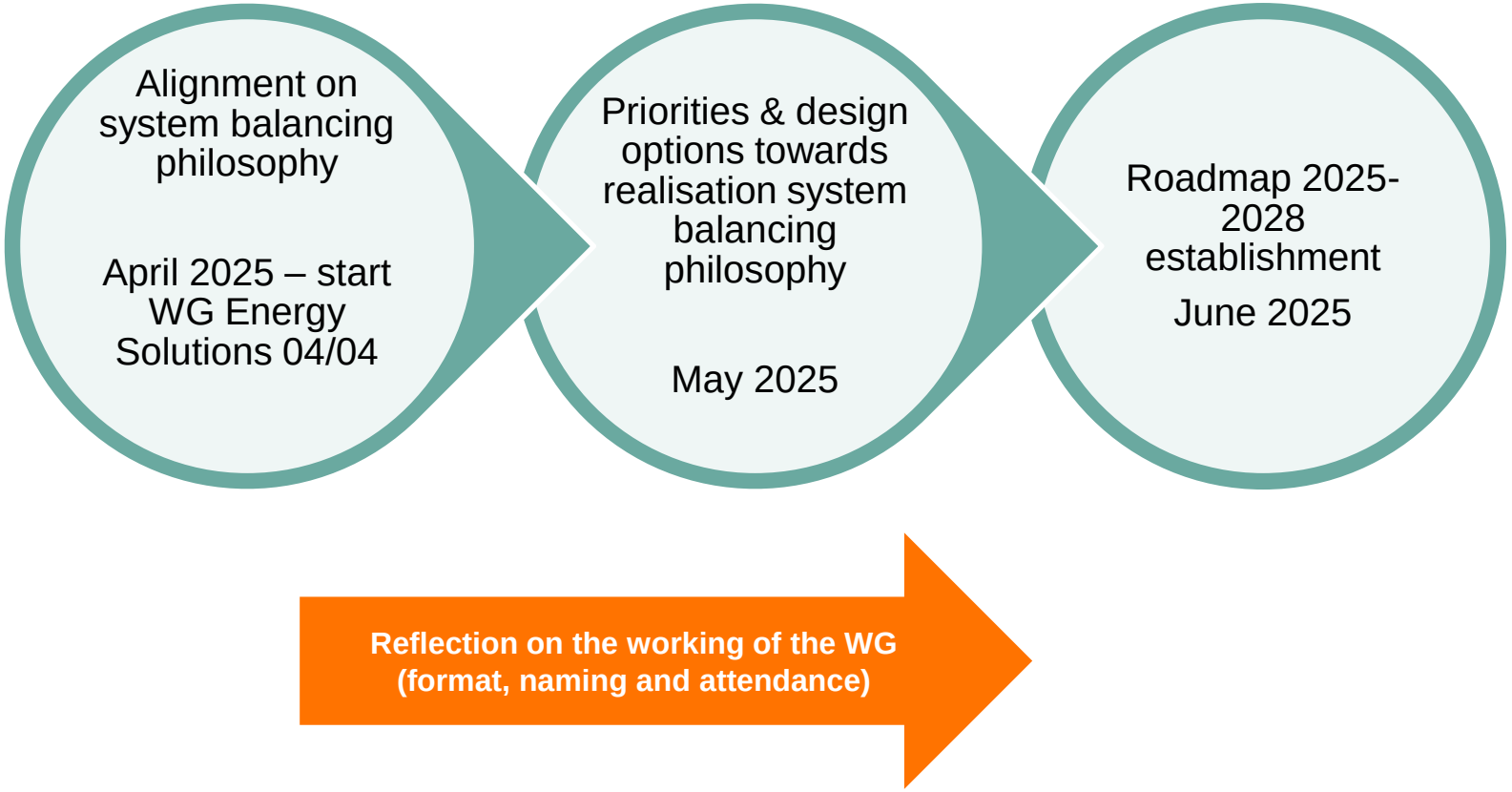
This requires a finetuning of the **system balancing philosophy** guiding the priorities & design options for a good co-existence of implicit & explicit flexibility in a European context

What are the next priorities? (2/2)

Joint consideration of congestion management and balancing is needed due to increasing interaction



Steps towards a concrete roadmap



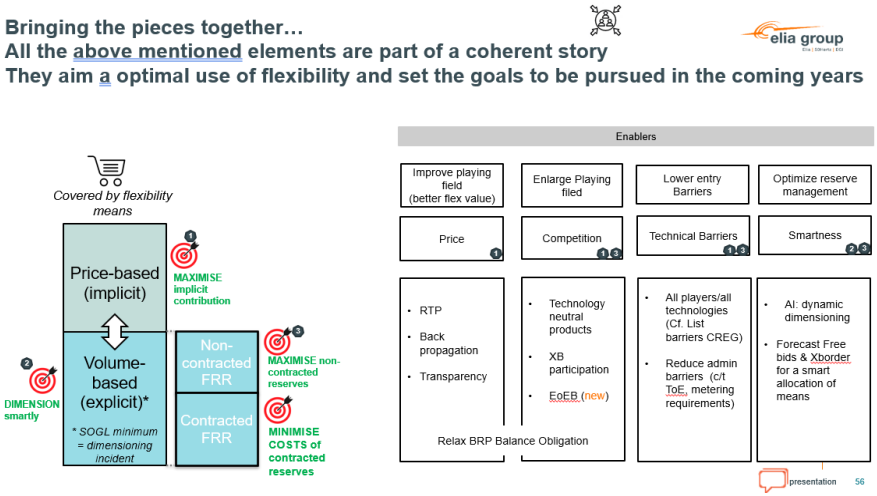
Finetuning of System Balance Philosophy

Status, key open questions and way forward

Caroline Bosschaerts

What is the Elia system balance philosophy?

- A document aiming at **explaining the way we apply a decentralized balancing model** in Belgium, which should serve **as "north star" to steer** the studies, product & market design evolutions to be initiated in the coming years

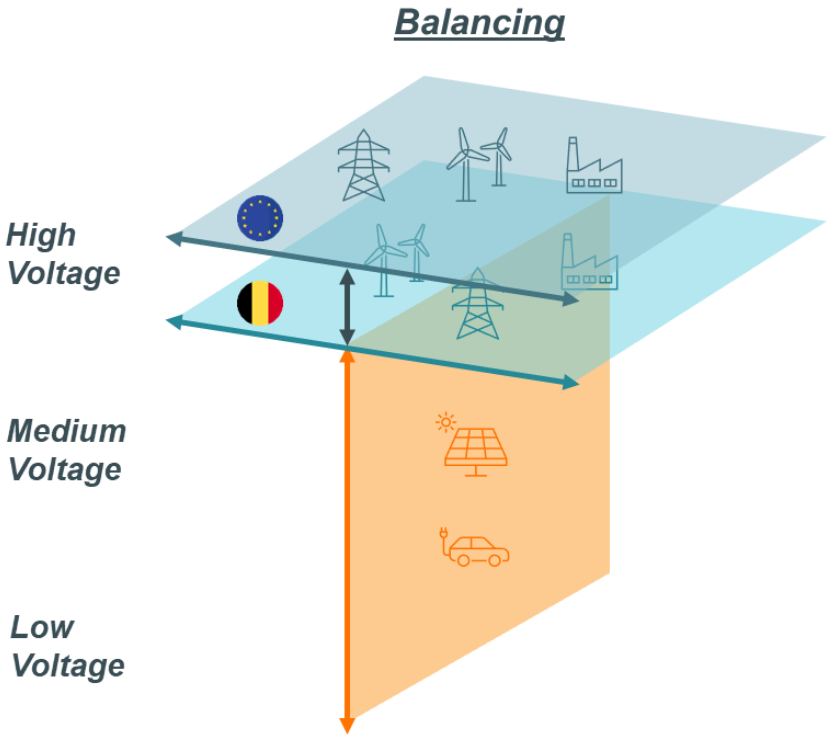


- This document was **first created in 2021**. At that time, the key focuses of the philosophy were to **encourage implicit flexibility** by implementing **CCMD** - with "better price signals" and "more competition (incl. behind the meter)" – while **continuously working on the reduction of the barriers** for explicit participation in the system

- The system balance philosophy is meant to be an **overarching document**, which **provides direction and frames action plans** for the years to come. It should be **stable but not fixed**, as it should be able to adjust to the most recent market evolutions, to possible learnings/experience feedback and to new trends expected in the future.

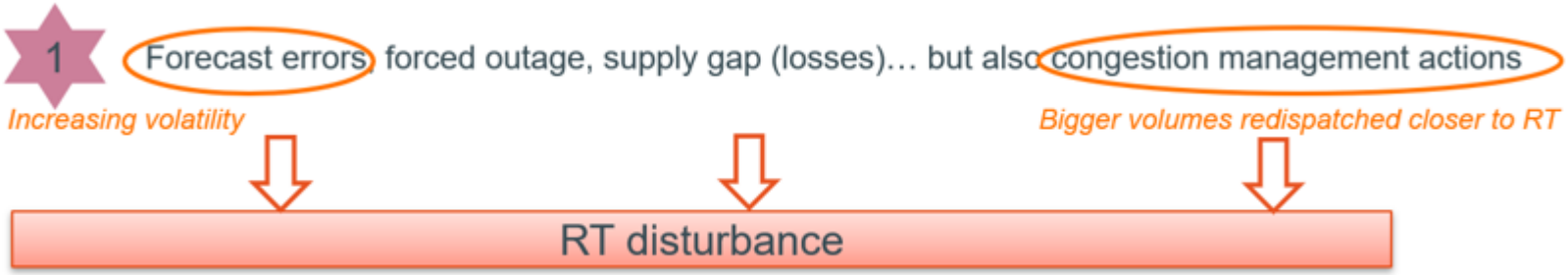
- Since it serves as basis for the roadmap of the years to come, the system balance philosophy should be **transparently communicated and as far as possible aligned** with the regulators and the market parties.

Drivers for 2025 finetuning exercise



Purpose of today's presentation is to give the status of this exercise and explain the key remaining open questions, as well as the way forward to address them

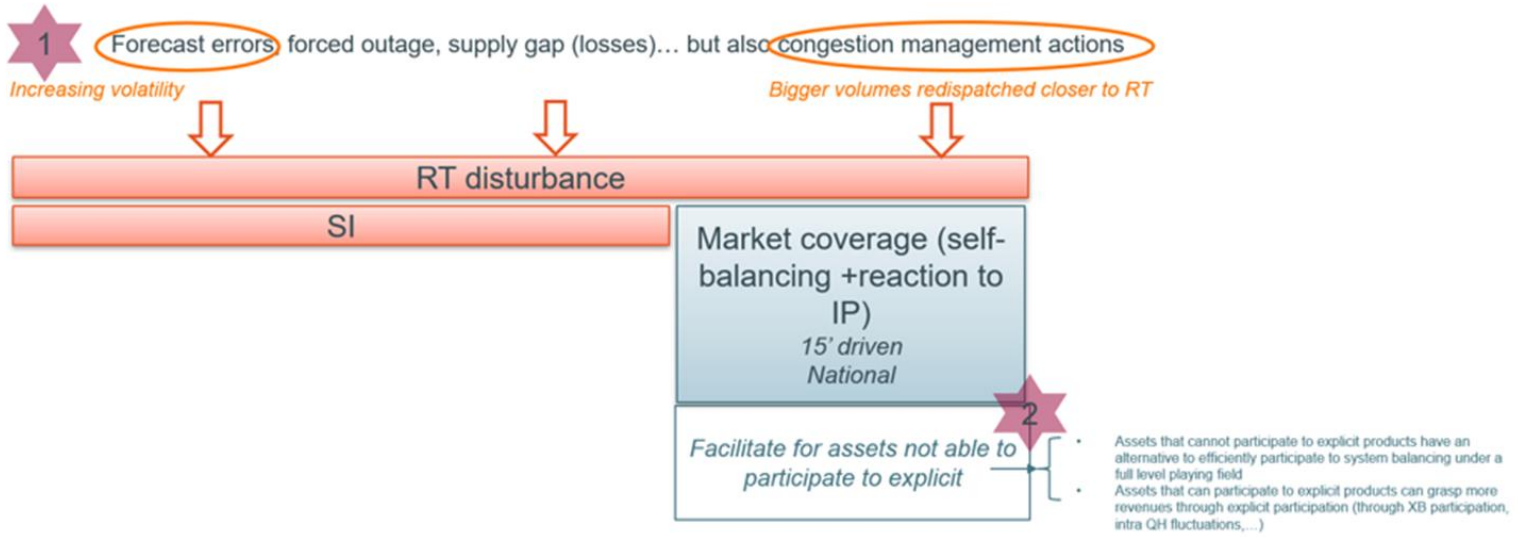
The causes of real-time disturbance



1

KEY OPEN QUESTION n° 1 : How are the RT disturbances (and hence the flexibility needs) going to evolve in the next 10 years considering the increased penetration of renewables and the increased frequency of congestion management actions (up to real-time)?

The contribution of BRPs to solve the RT disturbance



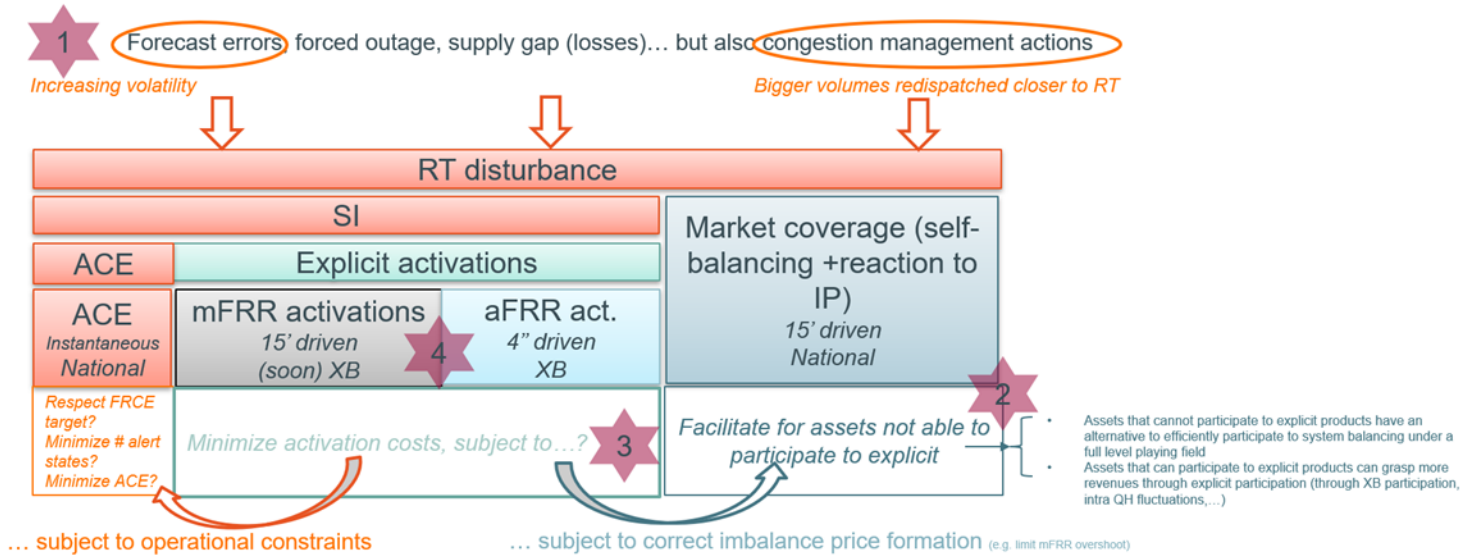
2

KEY OPEN QUESTION n° 2 : How to make sure that implicit reaction to Imbalance Price (IP) is facilitated (on a full level playing field) without making it more attractive than participating in explicit **balancing products?**

2'

KEY OPEN QUESTION n° 2 bis : Which reasons can explain that an asset (<25MW) cannot participate to explicit balancing products? Which ones are considered as unnecessary barrier for product participation (see key open question n° 7) and which ones are justified to maintain the balancing products reliability?

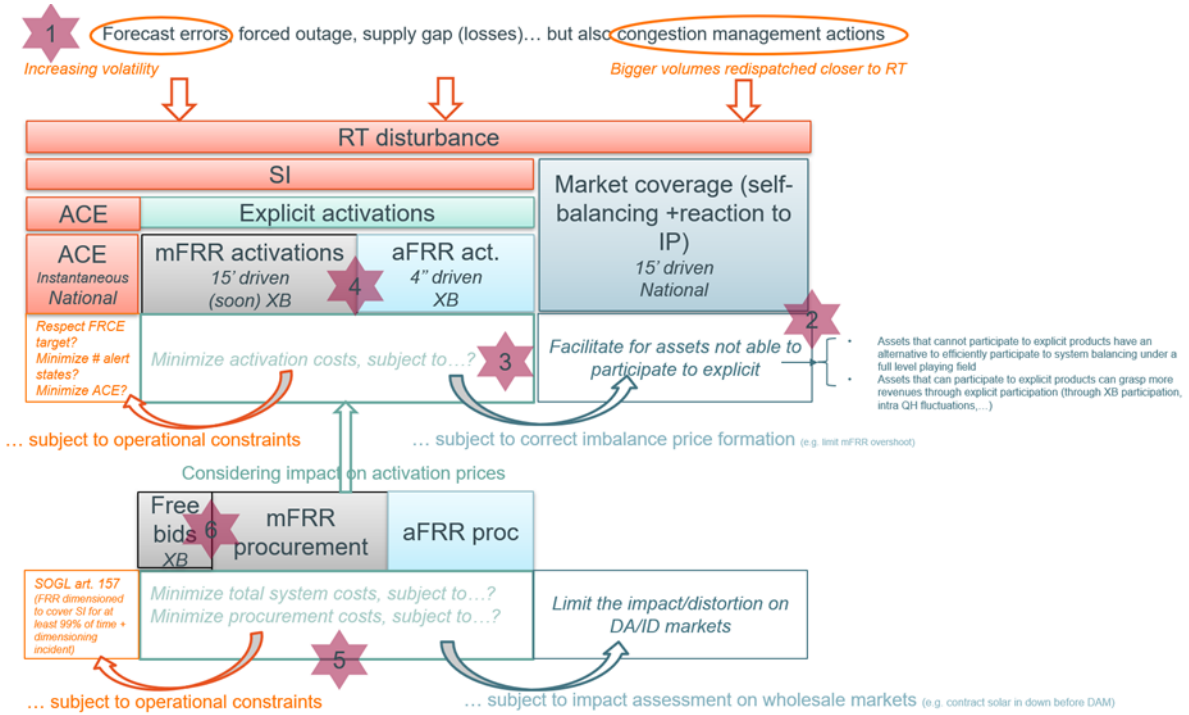
The activations made by the TSO to solve the residual RT disturbance



3 **KEY OPEN QUESTION n° 3 :** When defining the mFRR volume to be demanded, what should be the objective function pursued by the TSO?

4 **KEY OPEN QUESTION n° 4** : Is it feasible and how to implement such an objective function in practice?

Procurement of balancing capacity to secure the availability of balancing energy for explicit activations



5

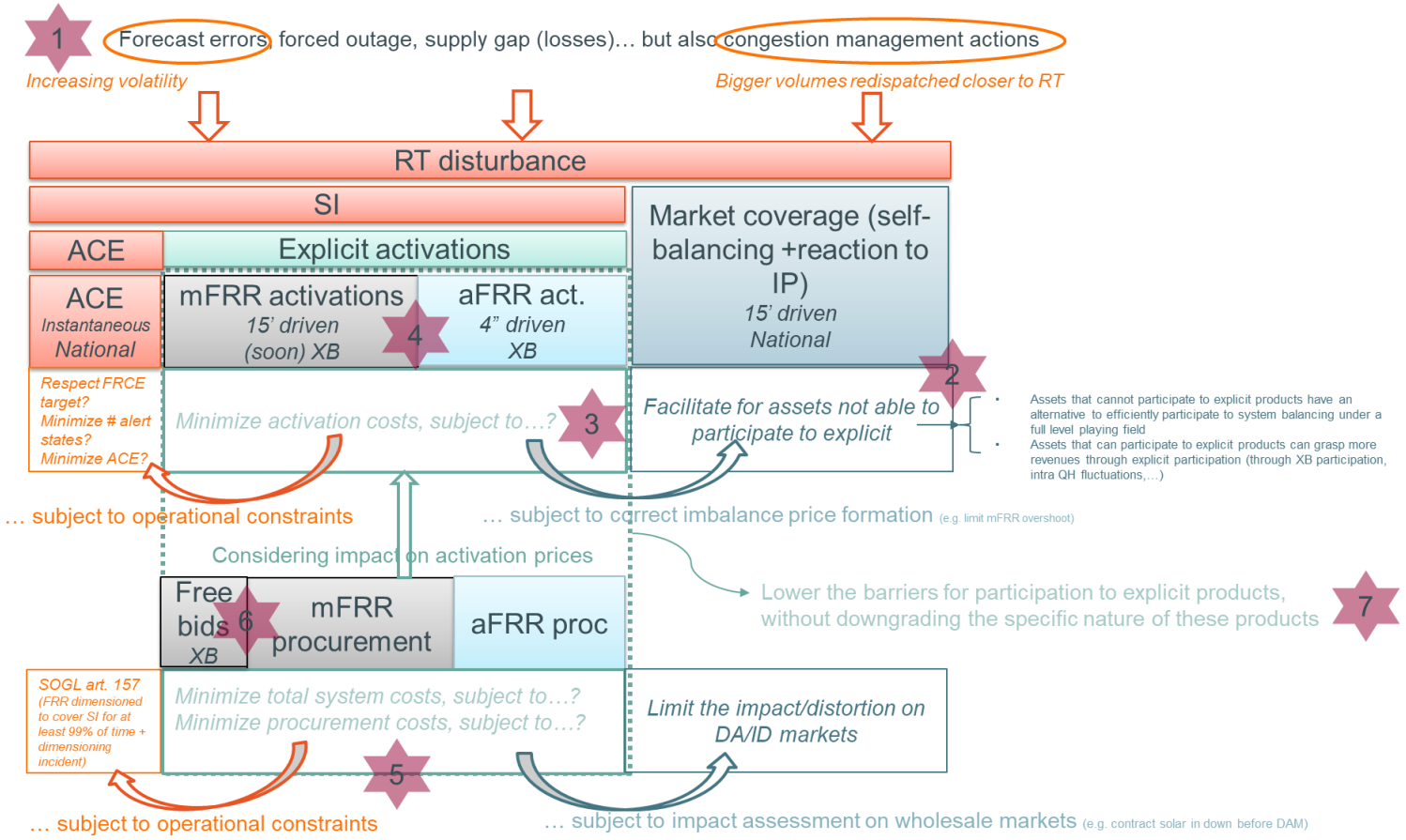
KEY OPEN QUESTION n° 5 : When defining balancing capacity procurement strategy, which objective function should be pursued by the TSO?

6

KEY OPEN QUESTION n° 6 : Is it feasible and how to implement such an objective function in practice?

(note that this includes the possibility to rely on non-contracted energy bids expected to be available in BE or abroad)

Lower the barriers to unlock additional flexibility



7

KEY OPEN QUESTION n° 7 : How and to which extent should the barriers for participation in the balancing (capacity and energy) markets be lowered, while avoiding a downgrade of the products?

Summary - Key open questions

1	Evolution of the flexibility needs in the next 10 years	Partly addressed in AdeqFlex ’25 – to be complemented by roadmap 2025-2028
2	Facilitation of implicit reaction for assets that cannot participate to explicit balancing products	RTP (Imbalance price formula evolutions + Imbalance price forecast) + link with question n° 4 & 7
3	Objective function pursued with (m)FRR activation strategy	*Principles to be described in this exercise of finetuning of the system balance philosophy*
4	How to implement this activation strategy in practice?	Depending on answer to question n° 3, possibly (partially) covered by ongoing incentive*
5	Objective function pursued with FRR procurement strategy	*Principles to be described in this exercise of finetuning of the system balance philosophy*
6	How to implement this procurement strategy in practice?	To be added to roadmap 2025 - 2028
2’&7	How and to which extent lower the barriers for explicit participations?	Several ongoing initiatives to be structured in the roadmap 2025 - 2028

* on the economic optimization of the use of balancing energy products

Way forward

Today

- The status of the exercise (consisting in finetuning the system balance philosophy) has been presented today
- The list of the key open questions has been shared

Address key open questions n° 3 and 5 (objective functions) and integrate the other remaining key open questions in the roadmap 2025-2028

*We welcome any feedback or questions you would have**

WG ES June 2025

- Today's presentation will be complemented by answers to key questions n°3 and 5
- Roadmap 2025-2028 will be explained

* *The feedback can be sent to your KAM energy and/or to caroline.bosschaerts@elia.be (with your KAM energy in cc)*

Real-Time Price – design note II

Elise Aulanier

Executive summary

- **“Real-time price” design note II**:
  - It outlines Elia’s approach to refining the Imbalance Price formula
  - It details the three main drivers of price evolutions (section I.) and the key five objectives (section II.)
  - “Hands-on”, it discusses potential formula concepts (section III.) and their assessments (section VI.)
  - It provides technical details (appendices)

- The goal is to gather **stakeholder feedback**, to support the ongoing reflections on the Imbalance Price evolutions

- Decision on the final formula expected in 2026

- **Public consultation** period: **April 4th to May 16th 2025**

This second “Real-time price” design note aims to provide an update and collect feedback for the evolutions of the Imbalance Price formula

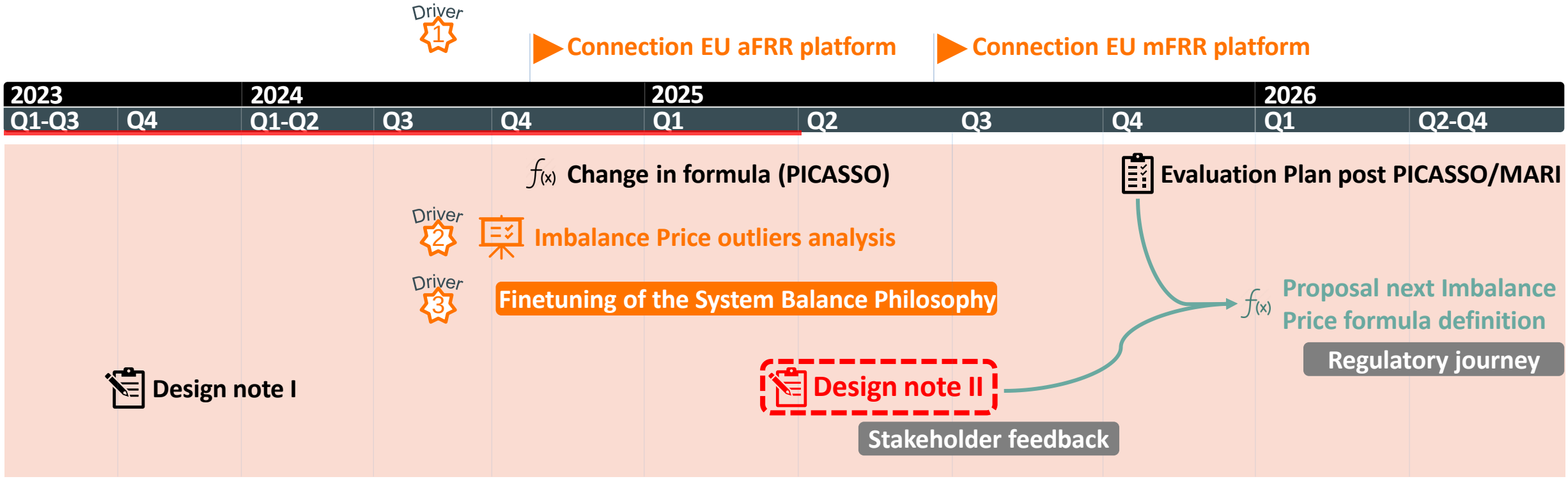
RECALL

- The “Real-time price” initiative aims to reshape the Imbalance Price
- To achieve this aim, evolutions are twofold: the improvement of the **price formula** itself and the enhancement of the **price publications**

Design note II **is :**

- **A waypoint** on the ongoing reflections on **the Imbalance Price formula**
- An **invitation for stakeholder feedback,** for collaborative development

Elia identifies 3 main drivers influencing these evolutions (section I.)



We focus on 5 key objectives for the Imbalance Price (section II.)

VISION

Provide a *robust and reliable price signal* in real-time, *supporting an effective decentralized balancing model* and allowing assets which cannot participate explicitly to valorize their flexibility implicitly.

OBJECTIVES

According to Elia, the Imbalance Price should strive to ...

1. **Be representative of the average system conditions over the ISP**
2. **Be targeted for assets that cannot participate explicitly**
3. **Discourage intra-ISP oscillations created by real-time implicit reactions**
4. **Be future-proof as balancing strategy evolves**
5. **Be publishable close to real-time**

Abbreviations: ISP = Imbalance Settlement Period

According to Elia, the Imbalance Price should strive to ...

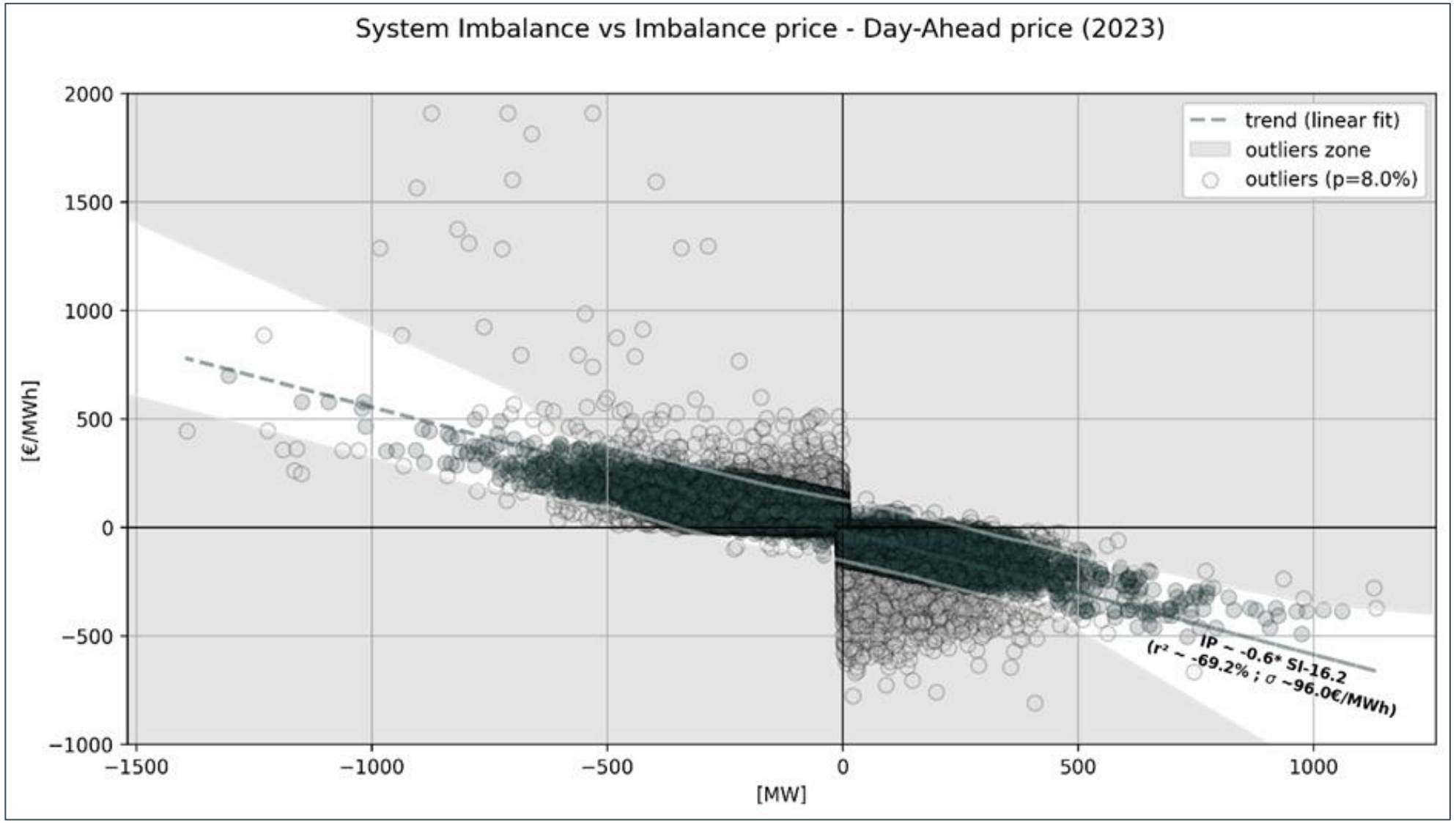
Objective 1: Be representative of the average system conditions over the ISP → *Imbalance Price outliers analysis*

1. Plot *Imbalance Price - Day Ahad price = f(System Imbalance)*

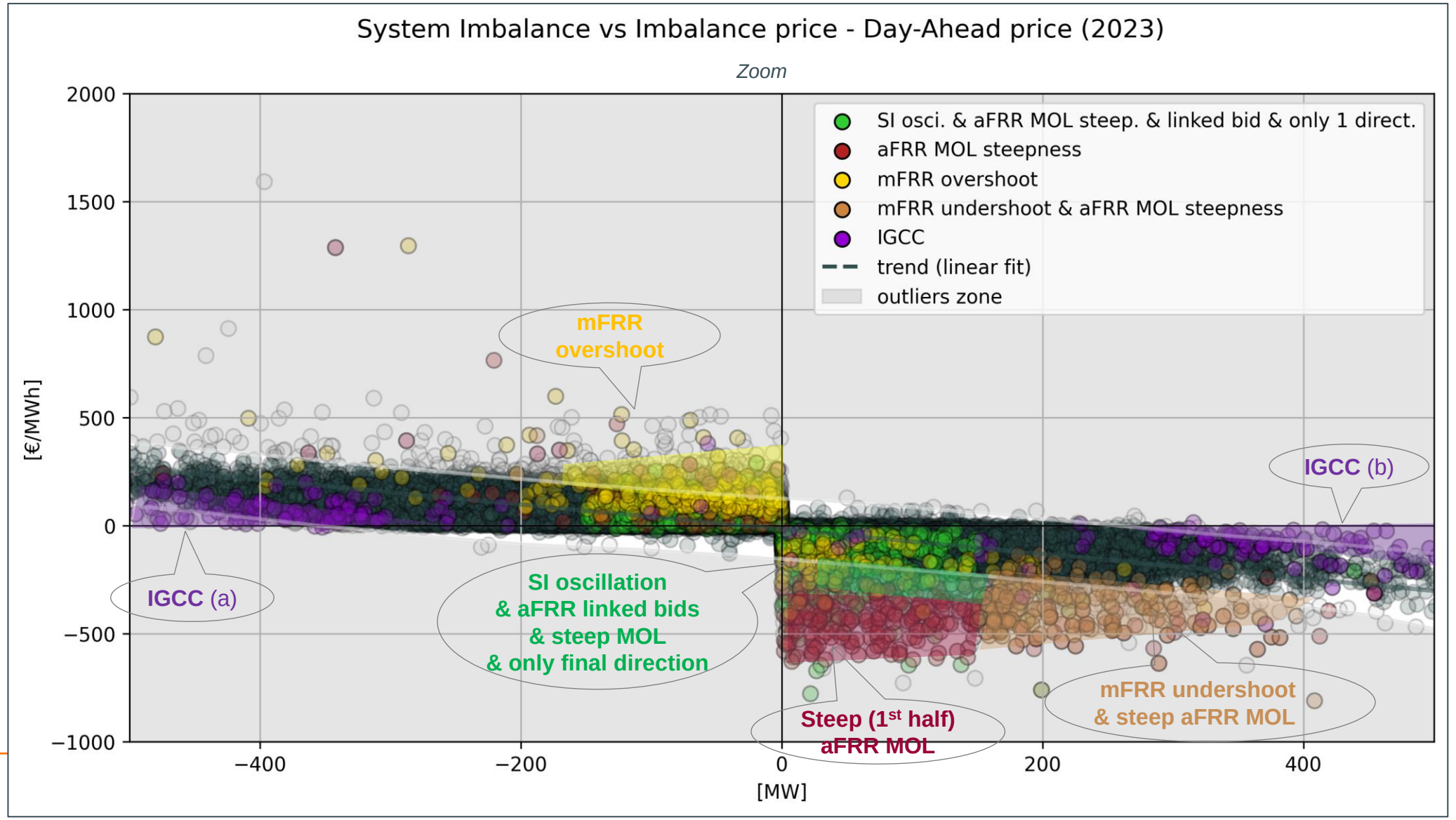
2. Identify the outliers

Outliers = quarter-hours where the Imbalance Price does not seem to correctly reflect the real time value of energy

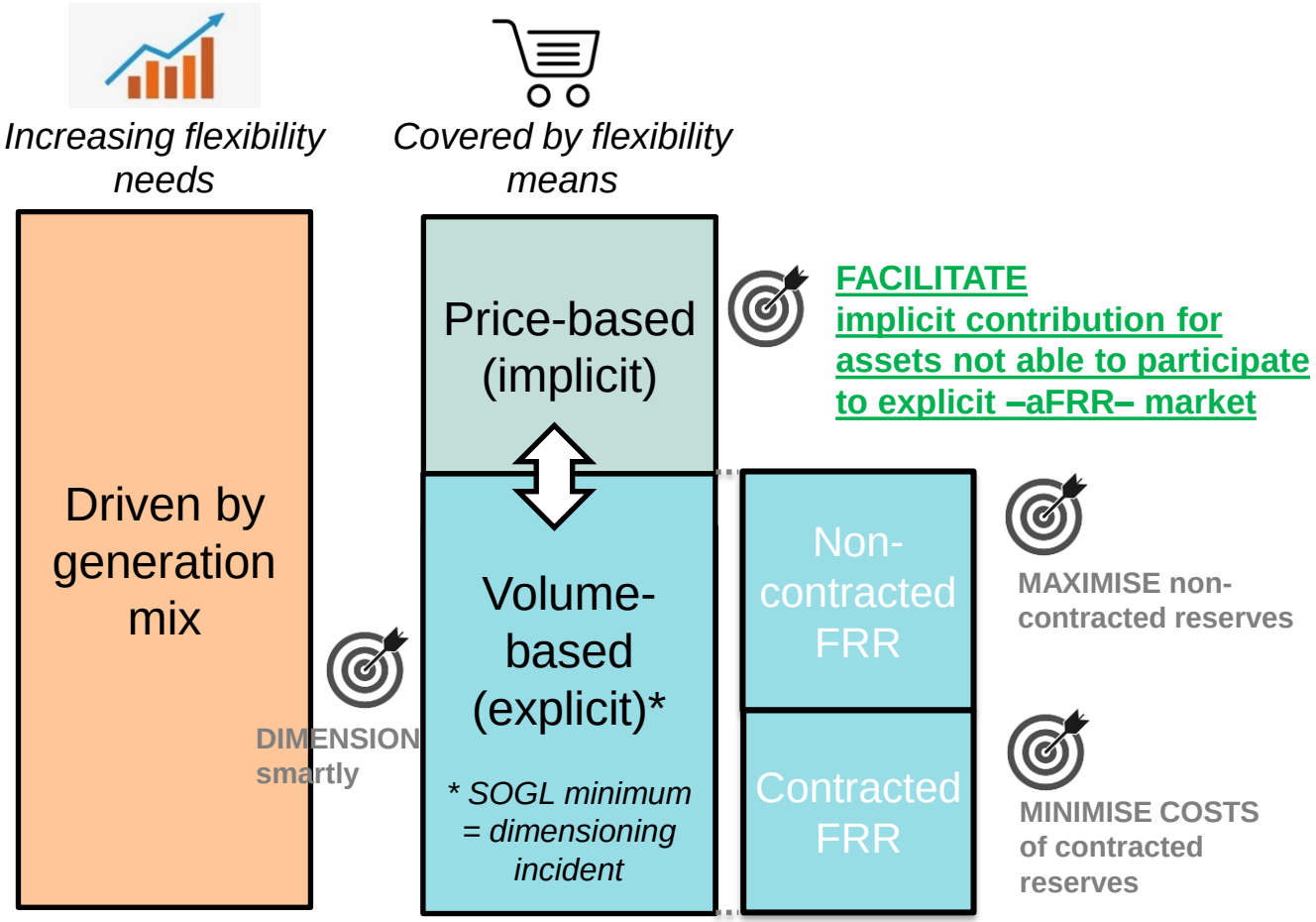
Outliers → 8% of total number of quarter-hours in 2023



Objective 1: Be representative of the average system conditions over the ISP → *Imbalance Price outliers analysis*



Objective 2: Be targeted for assets that cannot participate explicitly → *System Balance Philosophy finetuning*



- From a balancing cost perspective:

  1 MW explicit flex ~ 1 MW implicit flex
  (partial procurement)

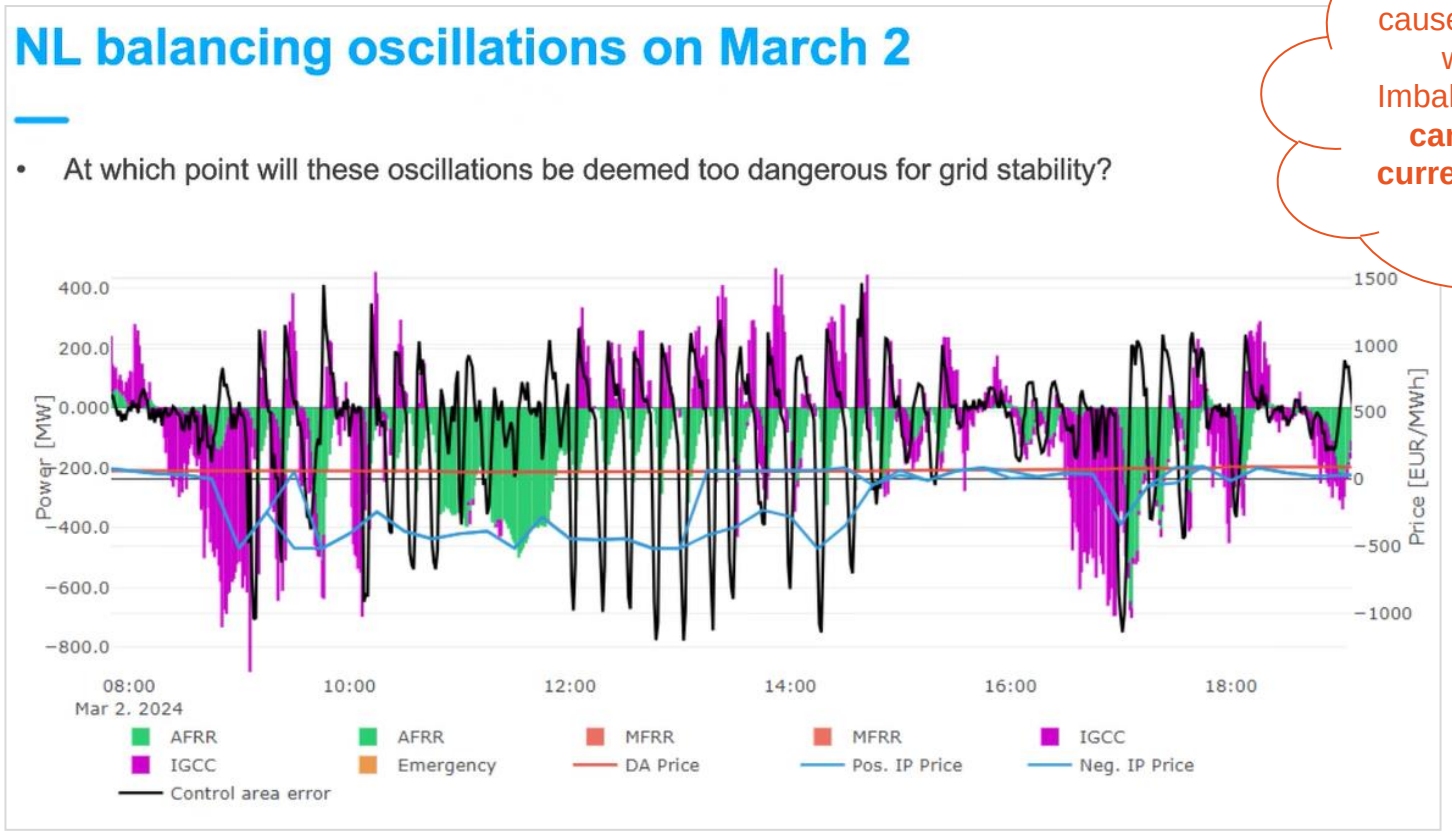
- From a system operation perspective (balancing):

  1 MW aFRR > 1 MW implicit flex
  (finer system regulation)

Abbreviations: SOGL = System Operation Guidelines

Objective 3: Discourage intra-ISP oscillations created by real-time implicit reactions

- Implicit balancing: **one imbalance settlement price per quarter-hour → no aFRR-like reaction!**
- Avoiding price-driven intra-ISP oscillations from real-time reactions is **a must for a safe and well-functioning decentralized balancing model**, once very fast assets (e.g. large scale batteries, wind parks) are massively connected to the grid



Large scale batteries can cause major grid security issues without evolution of the Imbalance Price formula as they **can follow volatility of the current Imbalance Price 1-min publications**

Objective 4: Be future-proof as balancing strategy evolves

- **Current balancing model:** proactive mFRR Scheduled Activation and aFRR limited to intra-ISP fluctuations
- But **tomorrow**?

BALANCING STRATEGY EVOLUTION?

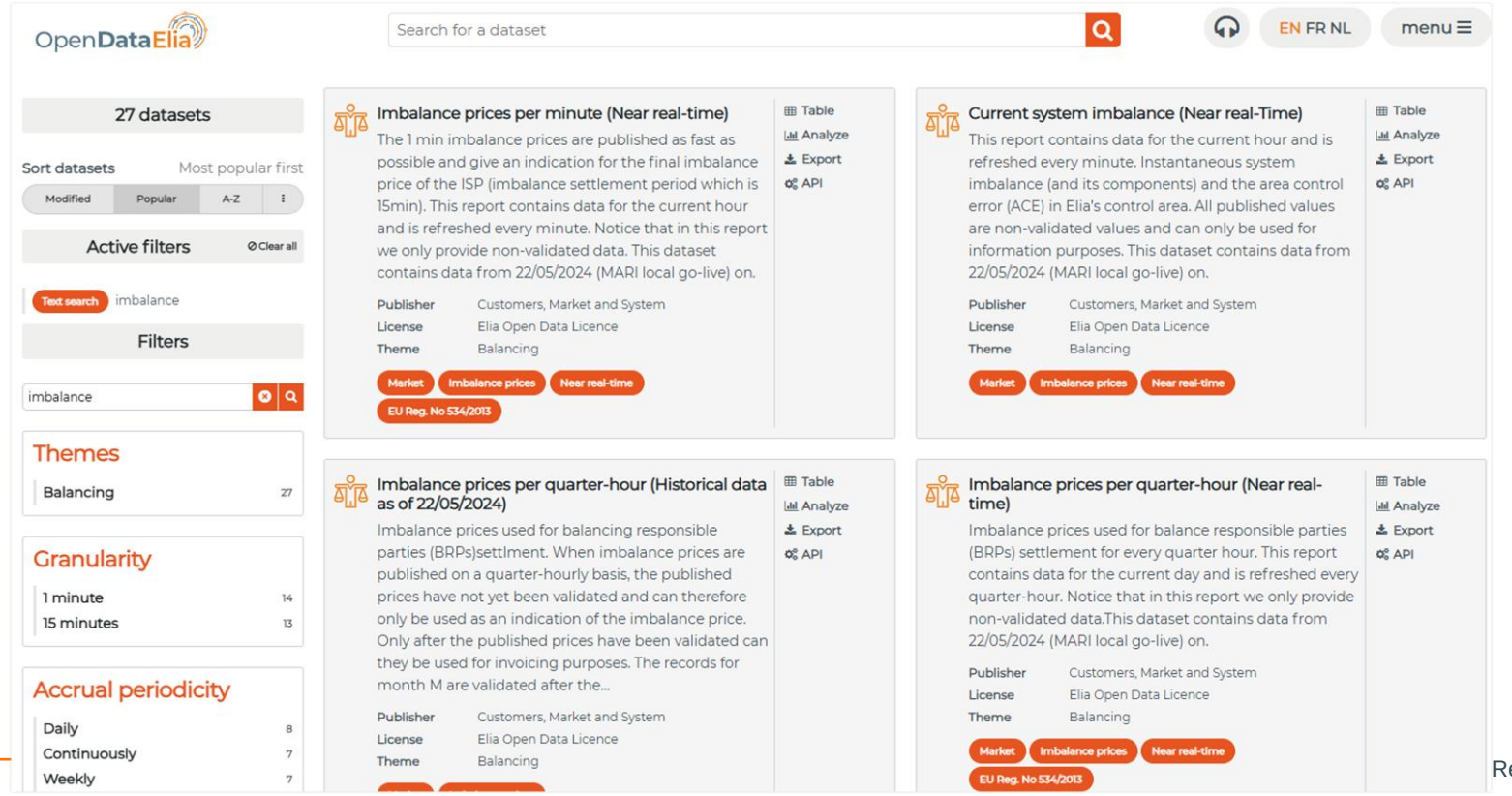
mFRR platform demand submission

BEFORE QH - 4 minutes

NOW QH - **11** minutes

Objective 5: Be publishable close to real-time

- Continue the **current 1-min Imbalance Price publication with cumulative values** and introduce **an Imbalance Price forecast**, so that the maximum flexibility can be engaged in the system in an efficient and safe way → **ensure a level playing field for all BRPs, while it does not exclude BRPs to run their own estimation**



How can we reach those objectives?

Potential concepts of formulas are defined (section III.) and the most promising ones are evaluated against the 5 price objectives (section IV.)

“Ingredients”	“Recipes”	“Tasting”

“Quality control”

“Quality control”

Determine components: aFRR, mFRR, spot index, etc.

Define Imbalance Price formulas

Assess against the 5 key objectives

- Recall: We do not want to propose the next formula yet, it is planned for 2026

Potential concepts of formulas are defined (section III.) and the most promising ones are evaluated against the 5 price objectives (section IV.)

"Ingredients"

"Quality control"

Determine components: aFRR, mFRR, spot index, etc.

	Compo. name	Definition	Passed quality control?
mFRR	mFRR marginal price	$$P_{mFRR,15'} = \begin{cases} \max\left(MP_{mFRR,SA}, MP_{mFRR,DA\ prev.ISP}, MP_{mFRR,DA\ cur.ISP}\right), SI \leq 0\ MW \\ \min\left(MP_{mFRR,SA}, MP_{mFRR,DA\ prev.ISP}, MP_{mFRR,DA\ cur.ISP}\right), SI > 0\ MW \end{cases}$$	?
mFRR	mFRR volume-weighted and time corrected average price	$$P_{mFRR,15'} = w_{mFRR,SA}\, MP_{mFRR,SA} + w_{mFRR,DA\ prev.ISP}\, MP_{mFRR,DA\ prev.ISP} + w_{mFRR,DA\ cur.ISP}\, MP_{mFRR,DA\ cur.ISP}$$	✓
aFRR	aFRR volume-weighted price average over all optimisation cycles	$$P_{aFRR,15'} = \frac{\sum_{oc=0}^{225} MP_{aFFR,4"} \times \lvert vol_{aFRR,4"}\rvert}{\sum_{oc=0}^{225} \lvert vol_{aFRR,4"}\rvert}$$	✓
aFRR	aFRR simple price average over all optimisation cycles	$$P_{aFRR,15'} = \frac{\sum_{oc=0}^{225} MP_{aFFR,4"}}{225}$$	✓
Spot	Continuous trading Intraday price index	$$P_{spot,15'} = w_{ID,15'} P_{continous\ ID,15'} + w_{ID,30'} P_{continous\ ID,30'} + w_{ID,60'} P_{continous\ ID,60'}$$	?
Spot	Intraday Auction volume-weighted price average	$$P_{spot,15'} = w_{IDA_1} P_{IDA_1} + w_{IDA_2} P_{IDA_2} + w_{IDA_3} P_{IDA_3}$$	?
Spot	VoAA-based	$$P_{spot,15'} = \frac{VoAA_{up} + VoAA_{down}}{2}$$	?

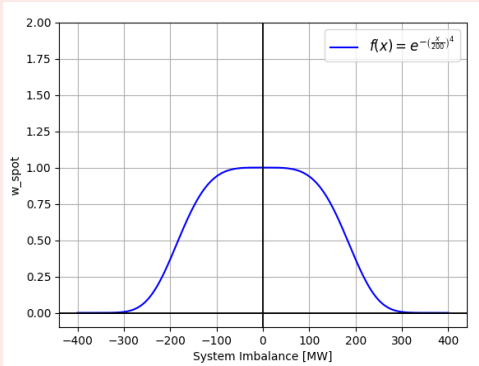
Legend: ✓: passed; ?: cannot conclude yet; ×: failed

Potential concepts of formulas are defined (section III.) and the most promising ones are evaluated against the 5 price objectives (section IV.)

"Recipes"

"Quality control"

Define Imbalance Price formulas

Formula name	Definition	Passed quality control?
MAX/MIN WITH SMOOTHED DEADBAND	$$IP = w_{spot}P_{spot,15'} + w_{FRR}\begin{cases} max(P_{aFRR,15'}, P_{mFRR,15'}), & SI \leq 0\ MW \\ min(P_{aFRR,15'}, P_{mFRR,15'}), & SI > 0\ MW \end{cases}$$ where: • w_{spot} is defined as :  • $w_{FRR} = 1 - w_{spot}$	✓
WEIGHTED AVERAGE WITH DYNAMIC WEIGHTS	$$IP = w_{mFRR}P_{mFRR,15'} + w_{aFRR}P_{aFRR15'}$$ where: • Weights are defined as: $w_{mFRR} = \frac{\lvert vol_{mFRR,15'}\rvert}{\lvert vol_{mFRR,15'}\rvert + \lvert vol_{aFRR,15'}\rvert}$, $w_{aFRR} = \frac{\lvert vol_{aFRR,15'}\rvert}{\lvert vol_{mFRR,15'}\rvert + \lvert vol_{aFRR,15'}\rvert}$	✓

Legend: ✓: passed; ?: cannot conclude yet; ×: failed

Potential concepts of formulas are defined (section III.) and the most promising ones are evaluated against the 5 price objectives (section IV.)

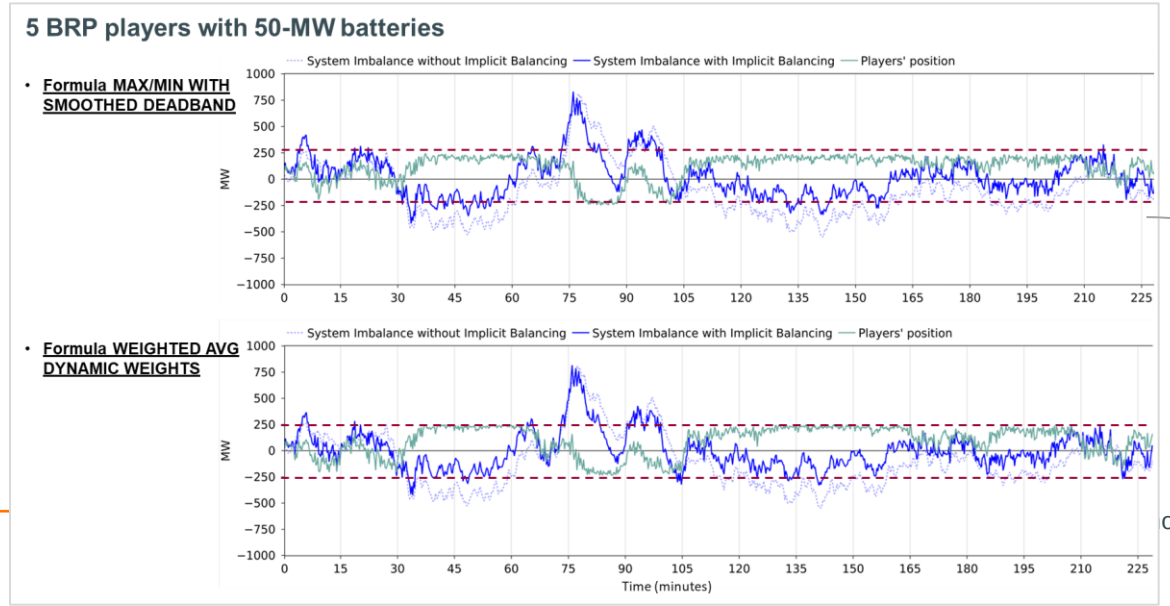
"Tasting"

Assess against the 5 key objectives

PRICE FORMULA	KEY OBJECTIVES				
	Representative	Targeted	Discourage oscillations	Future-proof	Publishable
MAX WITH SMOOTH DEADBAND	●	●	●	●	●
WEIGHTED AVG DYNAMIC WEIGHTS	●	●	●	●	●

● : Rating, from better to weaker

e.g. Visual output of the test "self-learning bots implicit balancing"



Test protocol details in Appendices

Feedback collected will support ongoing work on refining the possible evolutions of the Imbalance Price formula

- This note provides an update on the Imbalance Price formula reflections.

- **Public consultation** period:
  April 4th to May 16th 2025

- We are looking forward for your **feedback!**

Feel free to contact your KAM if anything unclear

febeliec
federation of belgian industrial energy consumers

Barriers of entry to Elia's explicit balancing products

Proposal of list of barriers to be lowered

Febeliec represents the industrial consumers of electricity and natural gas in Belgium

Proposal Febeliec

- **Barriers to entry to Elia's explicit balancing products are too high**
  - Barriers to entry are strongly linked to access to the market
  - Elia is the monopolist and should enable access to the market as much as possible
  - In the past, Elia has proven to be a pro-active, pro-competition TSO when it comes to explicit balancing products

1. Real time communication specifications: no overqualifications (eg no need for scada-to-scada for aFRR)
2. Gateway on each asset that participates within a group (so central gateway via FSP is not possible). This should be changed, possibly with other checks to see if assets provide the required services

Proposal Febeliec

3. Standard products are very challenging to deliver, even sometimes impossible (mFRR: you can change every quarter of an hour), while the legal framework allows for minimum activation or neutralization (not implemented) => must change at EU
4. Elia can create specific products to allow demand-side management to participate in mFRR products (e.g. mFRR flex, drop-to product)
5. Pre-qualification test: only for communication, not for activation if aFRR: qualification happens by activation
6. Switching from one pool to another
    1. No re-qualification needed
    2. Switching takes too long: aim should be that you can switch from one day to another (now more than 1 month)

Proposal Febeliec

7. Multiple FSP per delivery point (per access point is already possible)
8. FSP – industry: voluntary standard contract?
9. Review of penalties: progressive penalty (first breach: benefit of the doubt)
10. All tension levels should be able to participate in the explicit reserve market (e.g. no ToE for low voltage)
11. Each product has a separate Elia-tool, sometimes several tools per product (e.g. a tool for the auction, for nominations, validations,…) => harmonize

Agenda

- 09:30 – 09:35: Welcome and approval MoM
- 09:35 – 10:05: Towards Roadmap 25-28
- 10:05 – 10:50: Finetuning of System Balance Philosophy
- *10:50 – 11:00: Coffee break*
- 11:00 – 12:00: Real-Time Price – design note II
- 12:00 – 12:15: Febeliec - Barriers of entry to Elia's explicit balancing products
- *12:15 – 13:05: Lunch*
- 13:05 – 13:45: EU & BE Balancing Program Update
- 13:45 – 14:45: Balancing Products Retrospective 2024
- 14:45 – 15:05: BSP Faster Settlement incentive
- 15:05 – 15:15: T&C BRP – Sequence of Go-Lives
- 15:15 – 15:35: Evolution of the Working Group
- 15:35 – 15:40: AOB

EU & BE Balancing Program Update

Martine Verelst / Cécile Pellegrin / Kris Poncelet

Agenda of today's presentation

- MARI update
- Imbalance netting in the aFRR dimensioning
- Coming Stakeholder management interactions : T&C consultation planning

MARI update

MARI update

Reminder – WG ES 06/02/25

- *Now that we're connected to PICASSO and have ended the related hypercare period, work of all concerned teams is put on **priority on the preparation of our accession to MARI.***
- *As announced in last WG Energy Solution, in this context, the detailed planning of the MARI connection has been reviewed in order to confirm the target go live window. The refinement and reassessment of the detailed planning led to confirm **Wednesday 21st of May** as **target go live date**.*
- *Effective connection will be confirmed at the latest 2 weeks upfront (possibly still conditional to the finalization of EU approval process).*

- The MARI Connection **remains targeted on Wednesday 21st of May conditionally to the confirmation of the qualitative & stable implementation,** and more particularly of the different testing results foreseen in the coming weeks.
- **A final confirmation** of the go-live date **will be sent to the members of WG Energy Solutions and all BSPs** 2 weeks before the go-live. This confirmation might still be subject to the final approval in accordance with the accession process on European level
- For reminder, there are no changes of T&C mFRR linked to this go live, nor changes in the BSP implementation

Imbalance netting in the aFRR dimensioning

Context: the role of imbalance netting in the aFRR dimensioning

- The aFRR needs are primarily dimensioned to cover 99% of simulated aFRR activations via a probabilistic method (complemented by a feedback loop adapting the aFRR needs in function of the performance on the FRCE target parameters).
- The simulated aFRR activations (on 5' basis) are derived from the following data:
  - System imbalance
  - Simulated mFRR activations (values derived from the System imbalance)
  - Imbalance netting/IGCC
- The training of the model is based on simulated aFRR activations for the period [M-49 to M-2], where M is the month in which the trained model is used
- Following the accession to the aFRR-Platform, netting of imbalances happens
  1. Through the IN-Platform
  2. Through the aFRR-Platform
- As more TSOs connect to the aFRR-Platform, imbalance netting will increasingly be performed implicitly by the aFRR-Platform.

Challenges following the accession to the aFRR-Platform

While the fundamental idea is to consider imbalance netting in the dimensioning:

1. The **LFCBOA is ambiguous with respect to accounting for imbalance netting in the simulated aFRR activations** :
    - LFCBOA Article 9(3) and Article 9(5) generally refer to “imbalance netting”
    - LFCBOA Article 9(6) refers to “IGCC activations”

2. **There is currently no data on the total volume of imbalance netting**. This because, while Elia has access to the volumes netted via the IN-Platform (IGCC), the aFRR-Platform currently only calculates and provides a correction signal for the aFRR controller reflecting the total automatic frequency restoration power interchange via the aFRR-Platform. This correction signal consists of both:
    - interchanges related to the netting of aFRR demands between TSOs participating to the aFRR-Platform (so-called “implicit netting”); and
    - interchanges related to the selection of aFRR Energy Bids for the purpose of satisfying other TSOs’ aFRR demands

Proposed way forward following an alignment with CREG

Target solution:

- Actively look for solution on the aFRR-Platform to retrieve the data related to implicit netting (ongoing)
- Perform the necessary amendments in the Elia applications to consider this additional data
- Clarify in a following amendment of the LFC BOA that imbalance netting refers to both imbalance netting through the IN-Platform and the implicit netting through the aFRR-Platform

Short term solution:

- Temporarily scale up the IGCC exchanges observed after the connection to the aFRR-Platform in order to maintain an overall volume of imbalance netting that is similar as in the period before the connection to the aFRR-Platform.

Coming stakeholder management interactions

T&C BSP consultation planning

- Coordinated public consultation on the T&C BSP FCR, aFRR and mFRR
  - Planned to start second half of May
  - Changes concern:
    - BSP Faster Settlement
    - FCR Evolutions (phase II)
    - mFRR Low-Voltage
    - Some other minor precisions / corrections

Flex Product - mFRR

CURRENT SITUATION

High voltage & medium voltage can participate to mFRR and transfer of energy is in place.

Local implementation is in place to allow connection with EU platform.

	HV	MV	LV
Access	☑	☑	◎
Opt-out /pass-through	☑	☑	◎
ToE CSM	☑	☑	◎
ToE CM	◎		
EU connection for energy (MARI)	◎		

WORKING PLAN 2025 – TARGET GO LIVE

The connection to the EU platform for bidding and activation of energy (**MARI**) will be in place.

Transfer of Energy Corrected Model will be possible for high voltage.
The market will be fully opened for mFRR, including the CSM for transfer of energy on headmeter.

In complement ELIA will also work on the rewrite of the auction tool and on the BSP faster settlement (see here after)

- Q1'25 — MARI connection
- Q2'25
- Q3'25 — ToE CM HV
- Q4'25 — access LV to mFRR on headmeter + ToE CSM

HV = high voltage, MV = medium voltage, LV = low voltage
ToE = transfer of energy
CSM = central settlement model (aggregated correction); CM = corrected model (individual correction), CM Initially only for Elia HV

Flex Product – access LV to mFRR + ToE CSM on headmeters

HIGH LEVEL CONCEPT

- aFRR LV was used as a basis to define the mFRR LV concept
- Keep it as simple and pragmatic as possible
- Take a first step, to allow a “proof of concept”, to check the interest and understand needs and constraints of potential actors

IN MORE DETAILS

Similar to aFRR LV

- Conditions for Low-Voltage Delivery Points to participate: inclusion of Low-Voltage Delivery Points, with a voltage of 1kV or lower, in a Low-Voltage Delivery Point Group
- Minimum size of a mFRR Low-Voltage Delivery Point Group: 0.1MW
- Processes to onboard/update/prequalify Low-Voltage Delivery Point Groups
- Possibility to propose a bid with a combination of one (or more) mFRR Low-Voltage Delivery Point Group and one (or more) Delivery Point Providing Group
- Methodology to calculate the size of a mFRR Low-Voltage Delivery Point Group

Only for mFRR LV

- Today, in the context of an mFRR activation, an external communication layer (ECL) is used to exchange information between Elia and market party. This communication system is suited at the level of a Low-Voltage Delivery Point Group, but not at individual Delivery Point level because it would require significant investment for implementation. Therefore, we made a simplifying assumption to define the participation status on individual Low-Voltage DP level in mFRR: the processing of each mFRR activation is made under the assumption that all LV DPs part of the LV DPG participate in the mFRR Energy supply

Contact persons

KAM Energy

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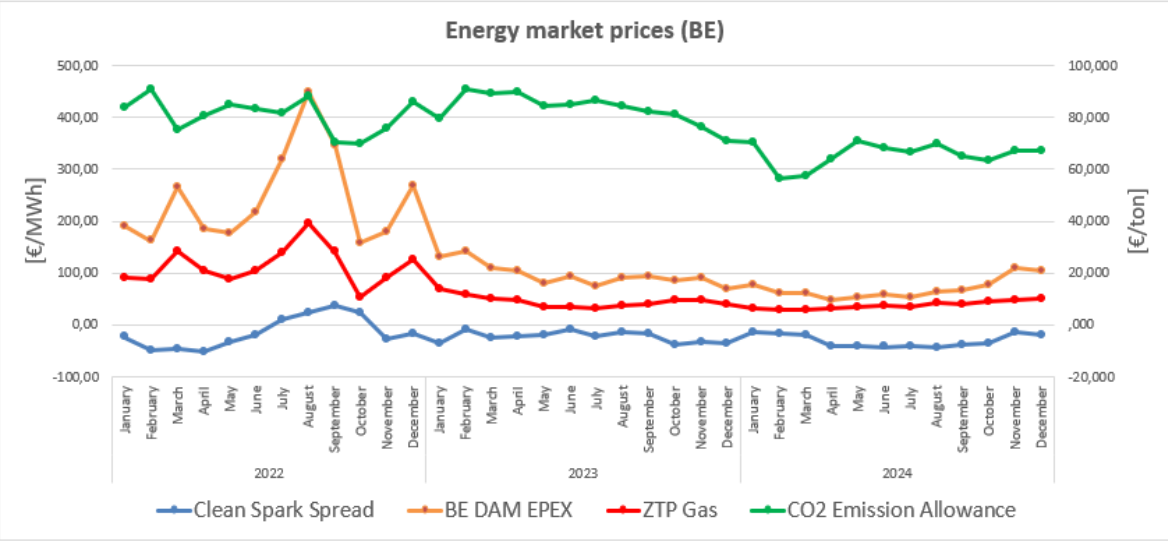
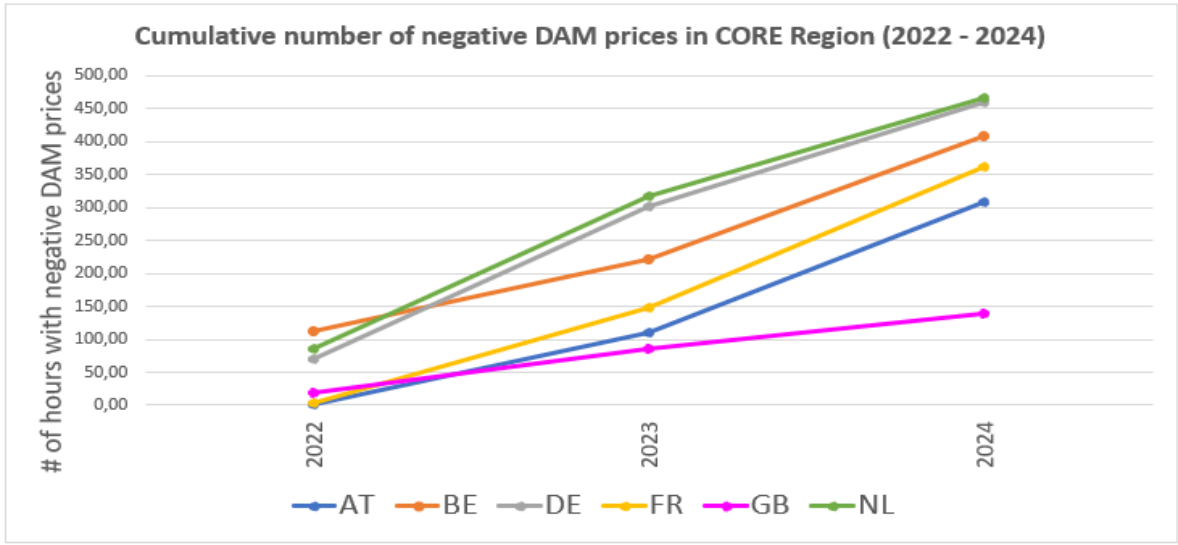
Balancing Products – retrospective 2024

Raf Gheuens / Suzanne Guérard / Kris Poncelet

Wholesale market evolutions

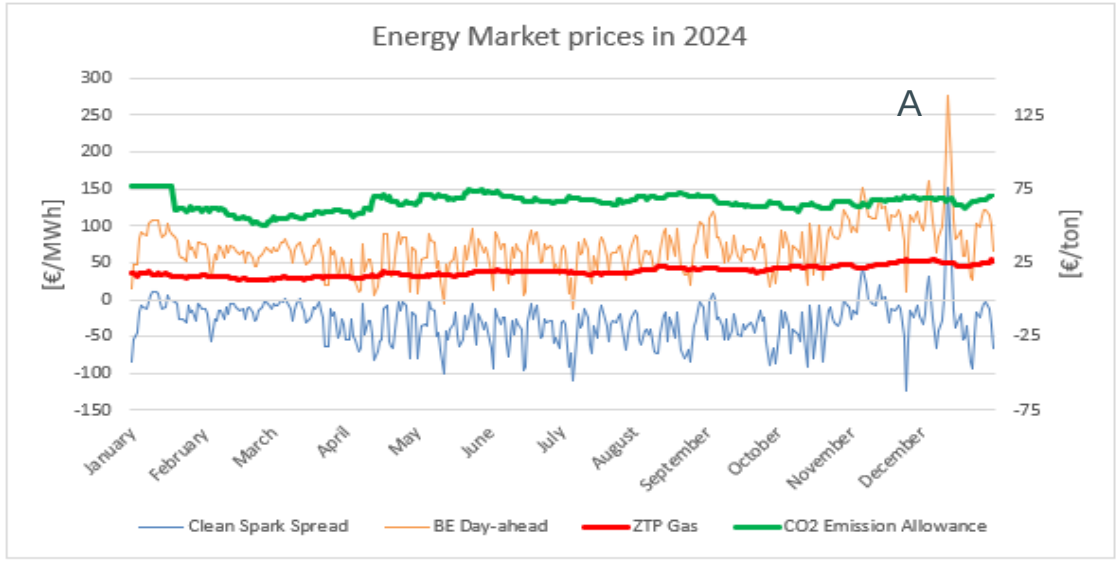
Wholesale market evolutions

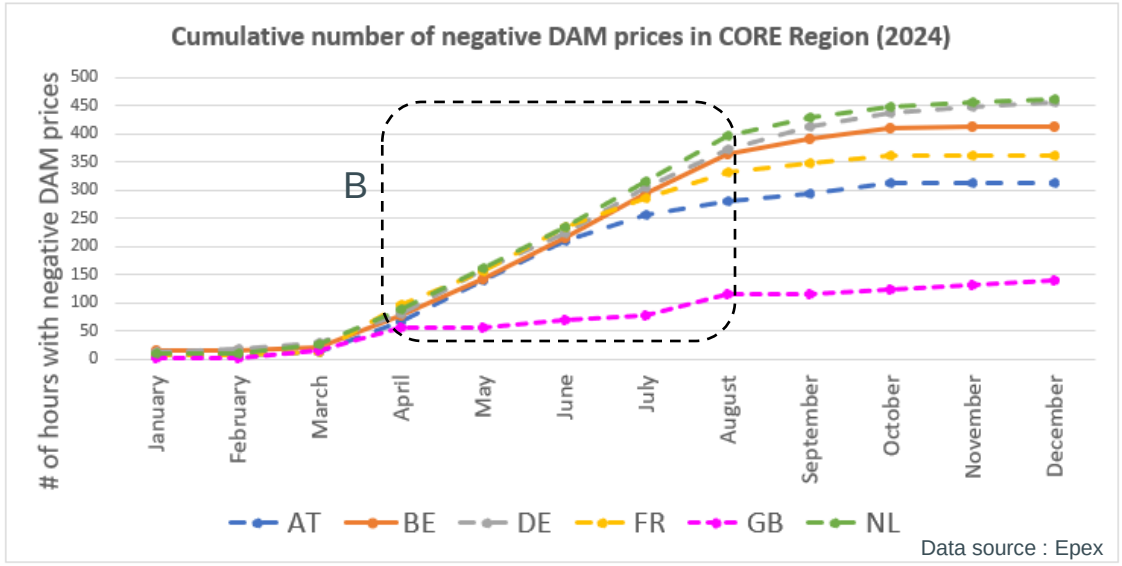




- Overall, in 2024, prices on the wholesale energy markets had a downward trend.
  - The average BE day-ahead prices decreased with respect to previous years driven by higher RES production (solar and wind).
  - The gas price also dropped (2024: 38 €/MWh vs 2023: 44€/MWh) linked to large diversification and high storage levels. Geopolitical tension brought some volatilities on the market but gas prices were in general dampened by the mitigation measures.
  - CO2 price has been reduced by 22% (2024 : 65€/ton vs 2023: 83€/ton).
  - The average clean spark spread (CSS) was more negative in 2024 compared to 2023 and a significant increase in the number of periods with negative day-ahead market prices has been observed

Wholesale market evolutions





A – Limited number of price spikes in the day-ahead market → Linked to more tense situation in the CWE region.

B – Increasing number of hours with negative prices, mainly in the summer period, highly correlated with solar production and increasing share of PV installations (reinforcing the “Duck curve” over years)

Yearly average DAM (€/MWh)	AT	BE	DE	FR	GB	NL
2022	261,4	244,5	235,4	275,8	241,18	241,9
2023	102,1	97,2	95,1	96,8	108,1	95,8
2024	81,5	70,3	78,4	57,9	72,3	77,2

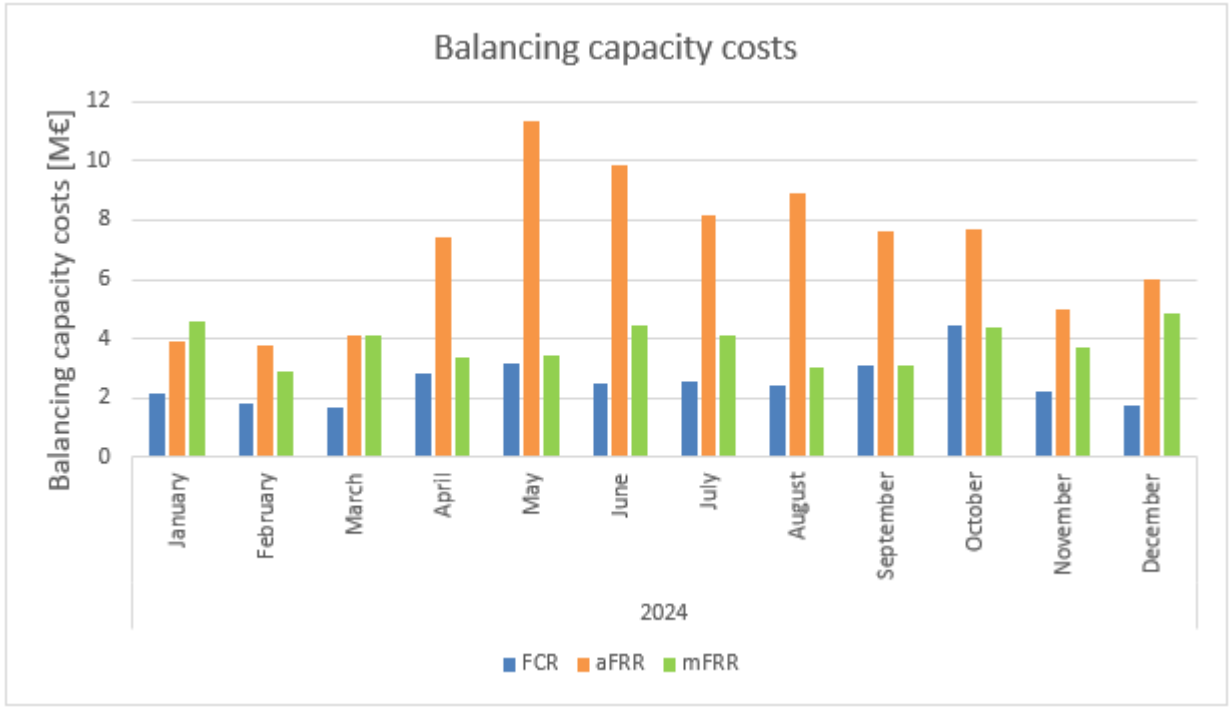
Exchange rate £ - €
2022 : 1,17 ; 2023 : 1,14 2024 : 1,21

CSS computed with an efficiency of 50%.

Year	Yearly average CSS (€/MWh)	Number of hours with negative prices
2022	-13,82	112
2023	-23,21	221
2024	-30,30	404

FCR – aFRR – mFRR Overview

Wrap-up of capacity costs in 2024 : Stable but heterogeneous across products.



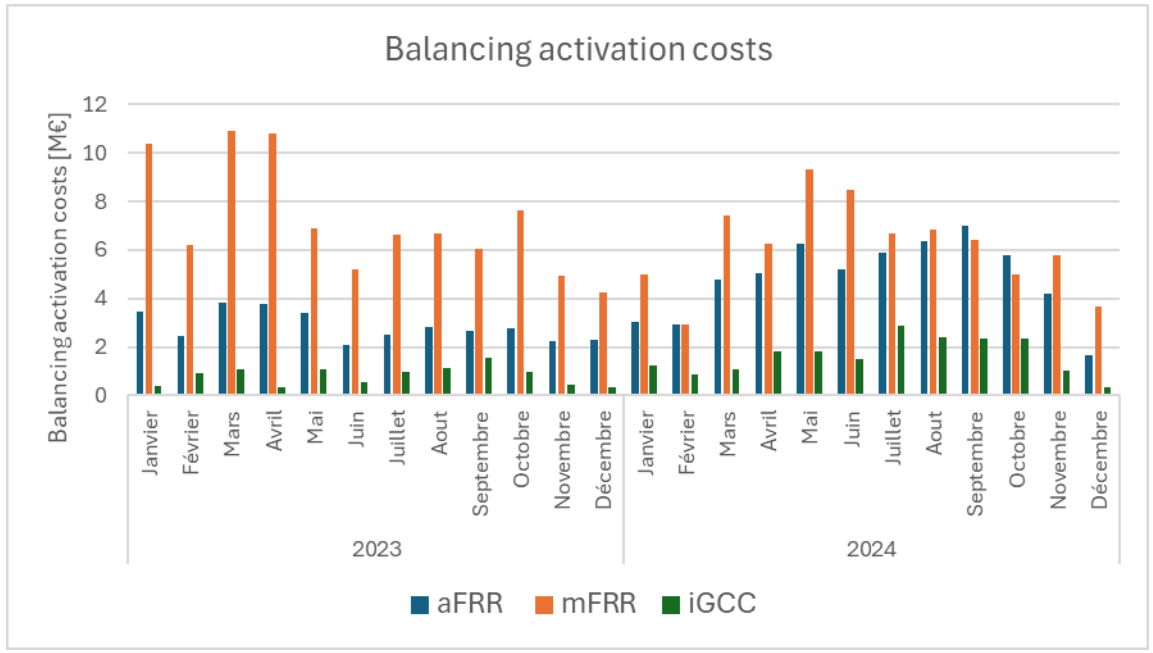
Total capacity costs in 2022, 2023 & 2024

Costs in M€	FCR	aFRR*	mFRR
2022	20,1	174,7	78,0
2023	16,4	74,2	70,9
2024	30,6	83,8	45,9

(*) Note: In 2024, the volume to procure for aFRR was dynamically determined as of 1st of October.

- Total balancing capacity costs remained stable compared to last year
- FCR cost increased in 2024 due to a limited liquidity and a slight increase of procured volume
- aFRR capacity costs slightly increased in 2024 due to a more negative clean spark spread
- mFRR capacity costs significantly decreased in 2024, in line with the decreasing trend in DAM price

Wrap-up energy costs in 2024



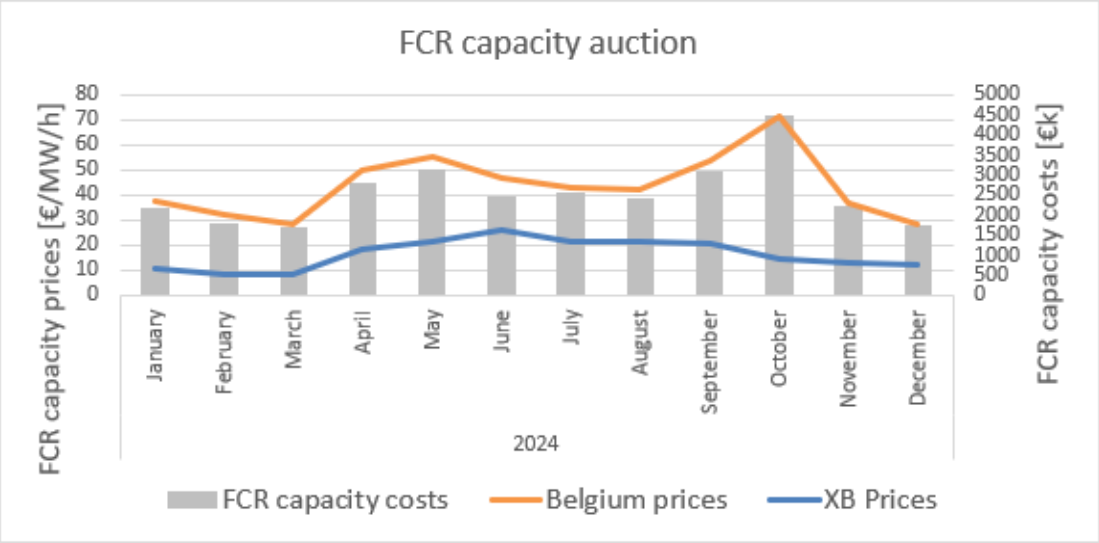
Total activation costs in 2023 & 2024

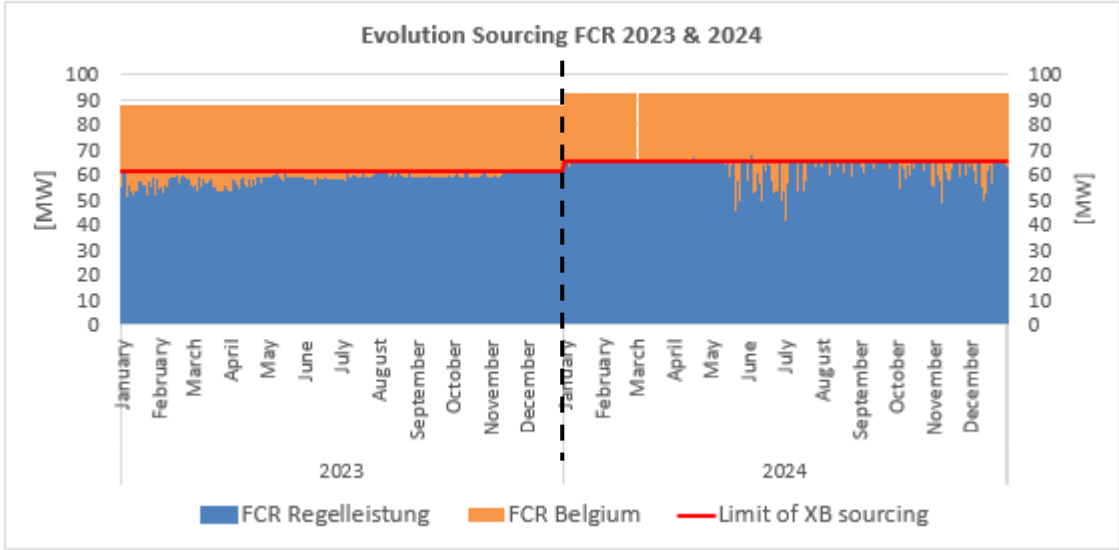
Costs in M€	aFRR	mFRR
2023	34,2	86,5
2024	59,4	73,8

- Total balancing activation costs increased in 2024 by 10% versus 2023.
- aFRR activation costs strongly increased in 2024 driven by more negative prices in downward direction prior to the connection to the aFRR-Platform.
- mFRR activation costs dropped in 2024.

FCR

FCR capacity auctions – No convergence (yet?) with XB prices.





- Increase in volume to be procured (86 to 93MWs / Core share 27 to 28MWs)
- Liquidity remained very tight
  - It resulted in BE prices being continuously more expensive than XB ones
    - ➢ The largest part of Belgian demand was satisfied by XB volumes
  - Due to the limited liquidity, there was an increasing amount of gate 2 auctions (20) for Belgium to cover the Core share.
  - For comparison, in 2023 the amount of gate 2 auctions was 11.

Year	FCR to be procured BE (MW)	Core Share BE (MW)	Avg BE price (€/MW/h)	Avg XB price (€/MW/h)	Total FCR capacity cost (M€)
2023	88	27	26,2	12,8	20,2
2024	93	28	43,7	16,2	30,6

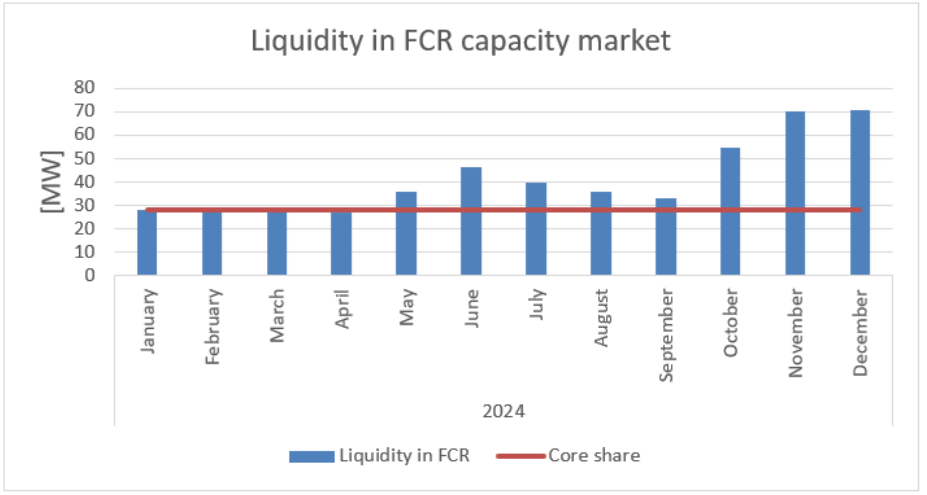
Excl. “FCR congestion rent impact”

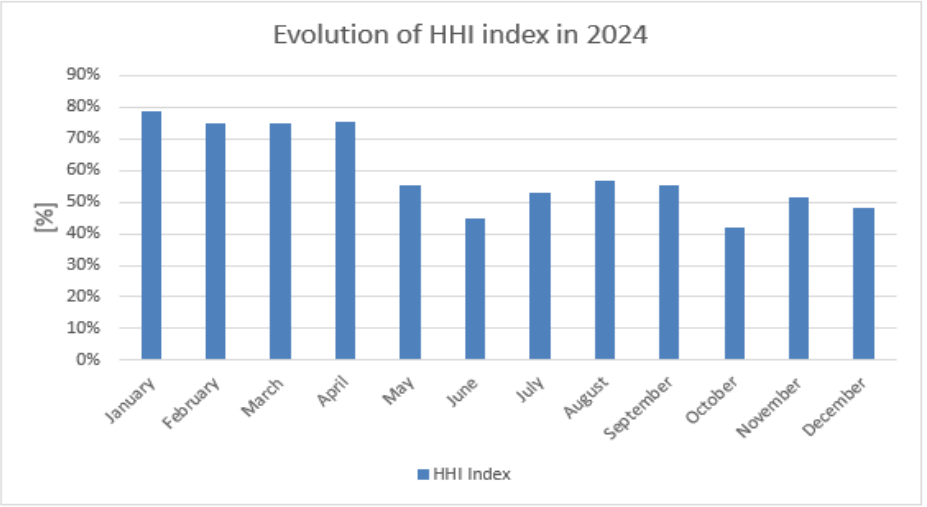
FCR market evolution – Strong improvement in the liquidity on the market following the aFRR D-1 go-live.

Despite the limited liquidity observed in 2024, there was a clear positive evolution during the year.

- shift of GCT of aFRR capacity auction in October has resulted in a clear increase in offered volume for FCR
- Increase of prequalified volume with some new volumes entering the market (+18MW)

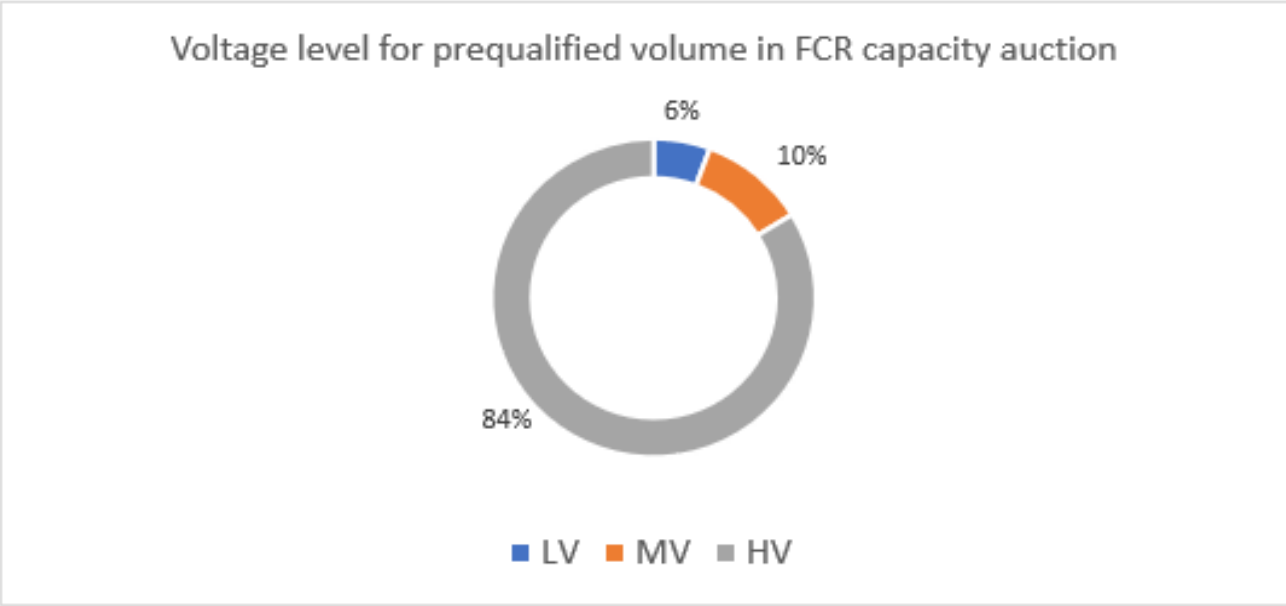
- **HHI index*** evolution highlighted an increase in FCR capacity market competition in 2024.





* HHI index has been computed based on awarded volumes.

Overview of market – LV increased their participation to FCR capacity market

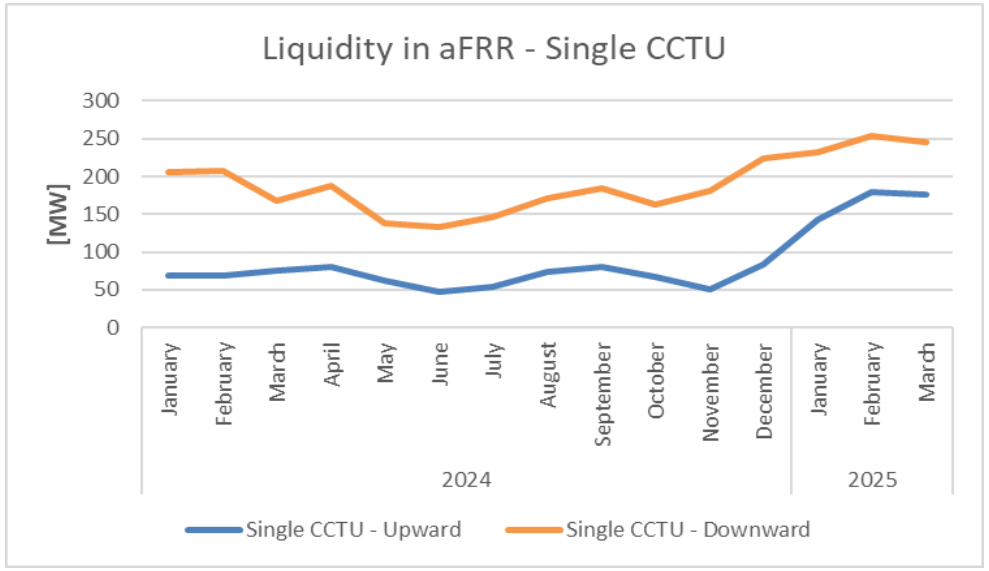


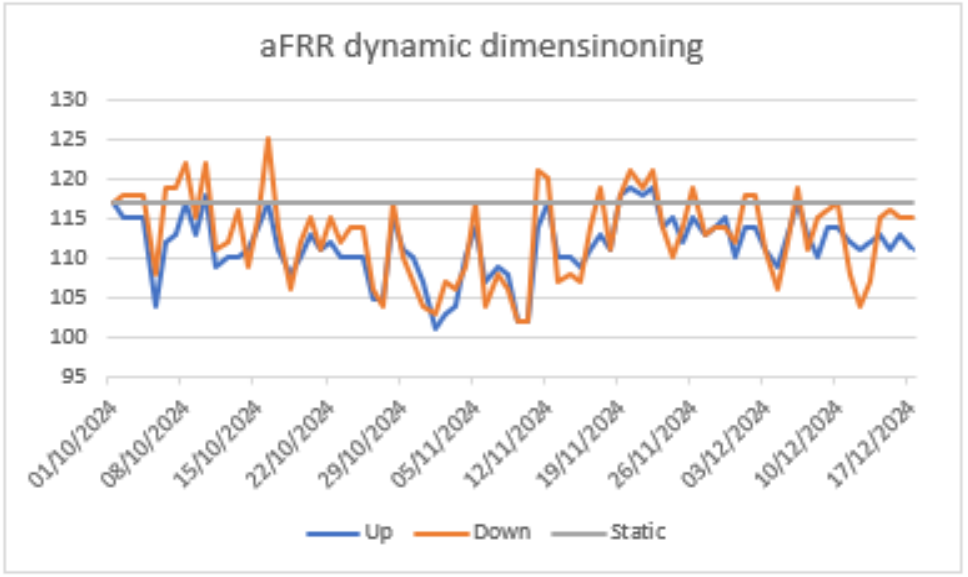
Prequalified volume evaluated on 31/12/204

- In 2024, participation of LV capacities to the FCR capacity market kept increasing (+7MW) and represents 6% of the prequalified volume.
- In terms of participation, FCR is mainly delivered by LV and MV.

aFRR

The liquidity in the aFRR capacity market strongly increased end 2024-start 2025





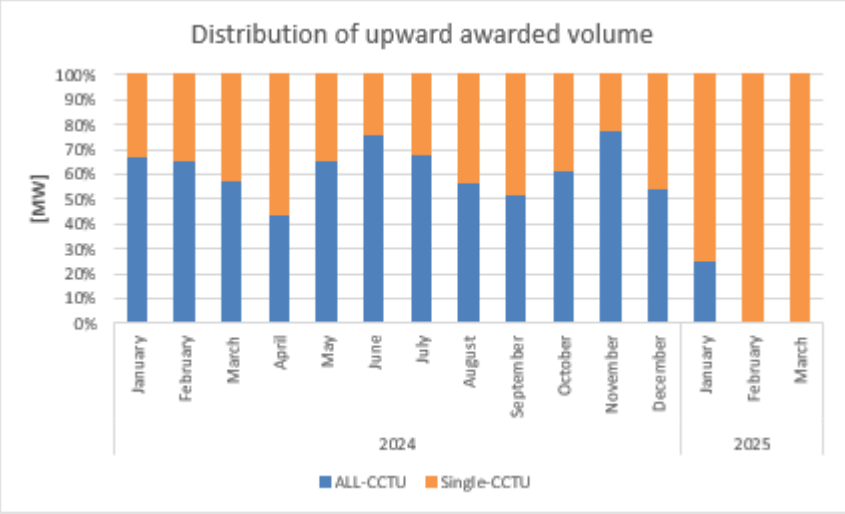
- The **volumes offered in the single-CCTU** aFRR capacity product **significantly increased end 2024 – beginning 2025** and this **particular in the upward direction**.

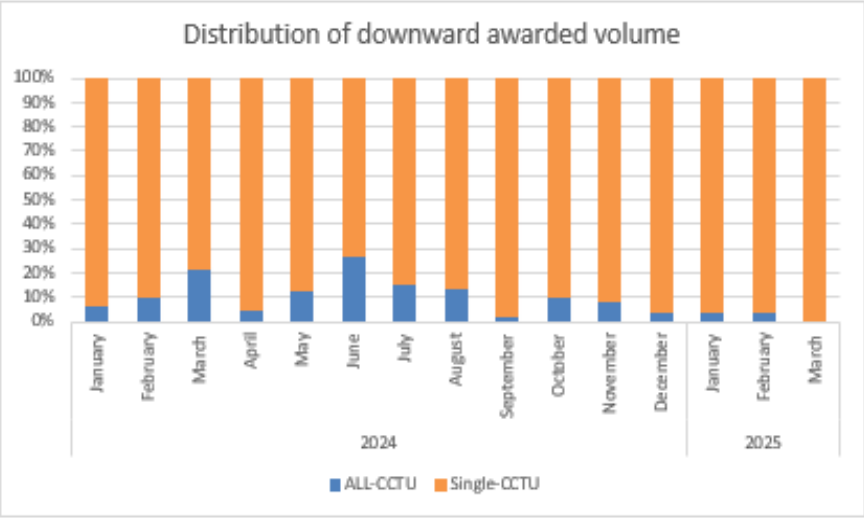
- The relative liquidity is further increased by an observed **decrease (on average) of the procured aFRR capacity following** the go-live of **aFRR dynamic dimensioning** in October 2024.

- aFRR capacity procured decreased by about 5% in both upward and downward direction since the go-live.*

* Note that this leads to a slight increase in the volume of upward mFRR procured as the dimensioned needs for FRR were not impacted by the go-love of aFRR dynamic dimensioning.

The increase of liquidity in the Single-CCTU product led to an increase in awarded Single-CCTU volumes…

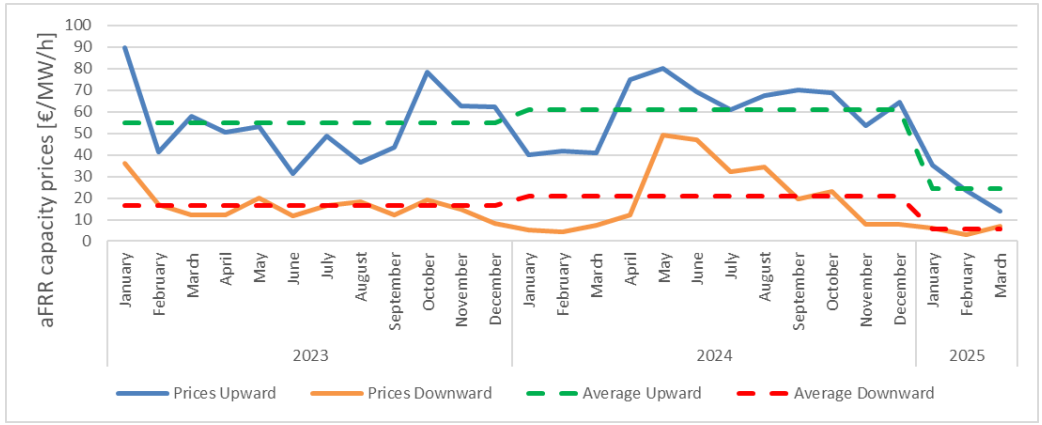




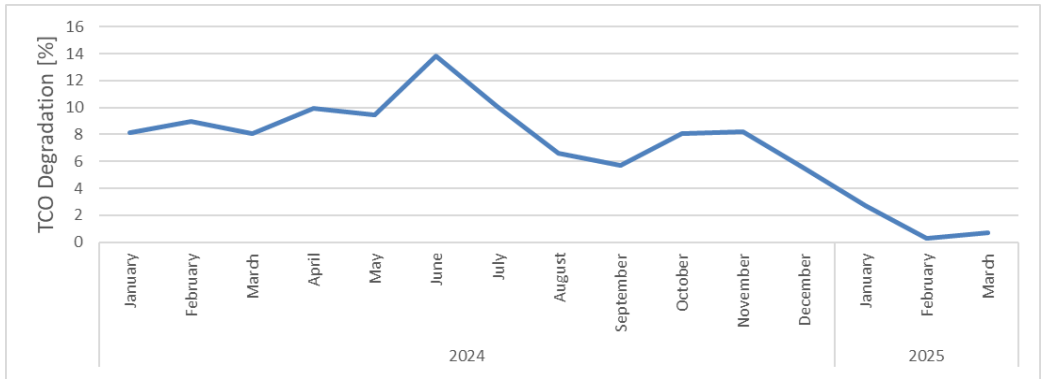
- **Throughout 2024, the share of volumes awarded from the All-CCTU product remained rather stable**
  - Significant ALL-CCTU share in the upward direction.
  - Highly limited All-CCTU share in the downward direction
- **As of 2025, the share of upward volumes awarded in the Single-CCTU product have drastically increased**.

- Considering the recent and anticipated evolutions, **Elia will analyze in 2025 the possible evolutions of the aFRR capacity auction**

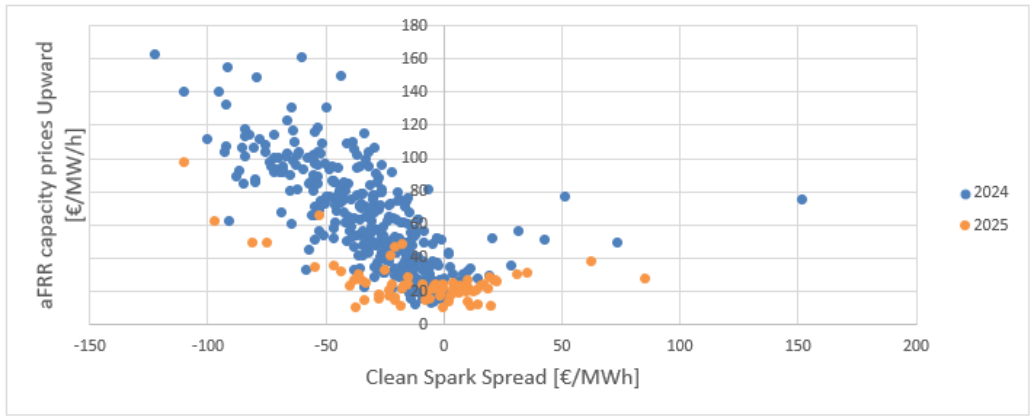
… which result in significantly lower capacity prices/costs start 2025



While aFRR capacity prices (and costs) slightly increased in 2024 (relative to 2023), a **significant decrease in aFRR capacity prices and costs is observed early 2025** due to more and more competitive Single-CCTU bids

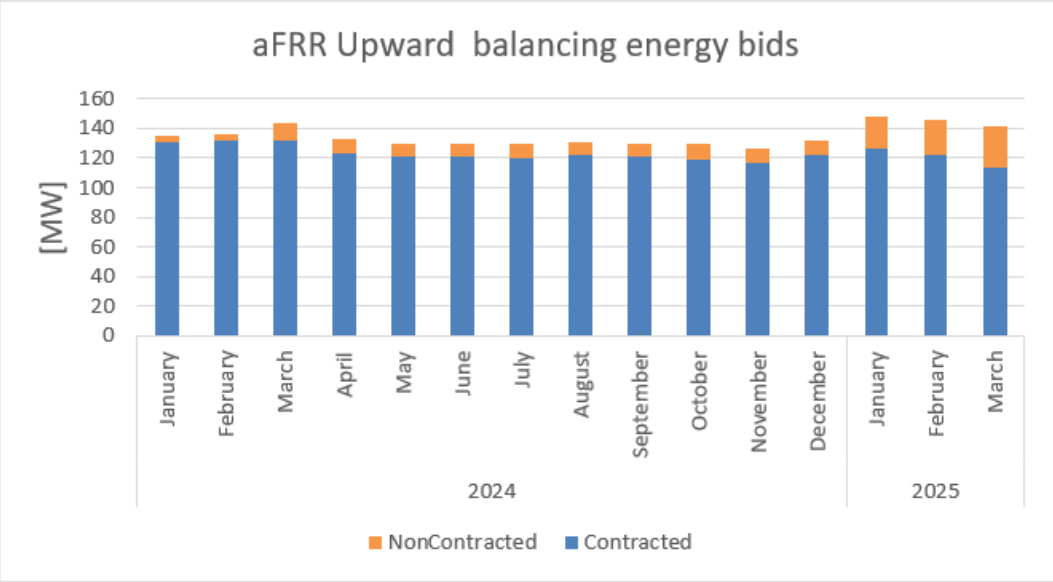


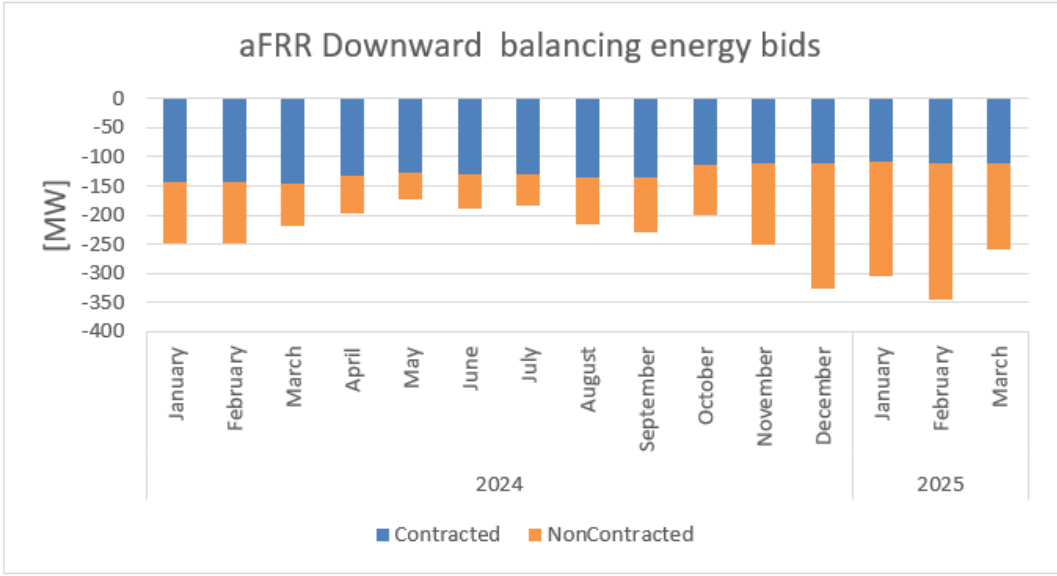
The strong increase of periods with only Single-CCTU bids awarded resulted in an **average TCO degradation factors close to 0% since the start of 2025**



While 2024 upward aFRR capacity prices were still strongly correlated with the clean spark spread (CSS), this **correlation with the CSS seemed to have largely disappeared in the beginning 2025, reflecting a shift in technology determining the aFRR capacity price in the upward direction**

Also in aFRR Energy the liquidity is gradually increasing





- ⇨ **Volumes of non-contracted upward aFRR Energy Bids** remain highly **limited and stable throughout 2024**
- ⇨ **An increase of non-contracted upward volumes is observed start 2025** (in line with the increase of liquidity of single-CCTU upward capacity bids)

- ⇨ **Volumes of non-contracted downward aFRR Energy Bids further increased** following the connection to the aFRR-Platform on 26th of November 2024 (and the transition to paid-as-cleared remuneration of aFRR Energy)
- ⇨ The average **volumes of non-contracted downward aFRR Energy Bids now reach highly significant values**

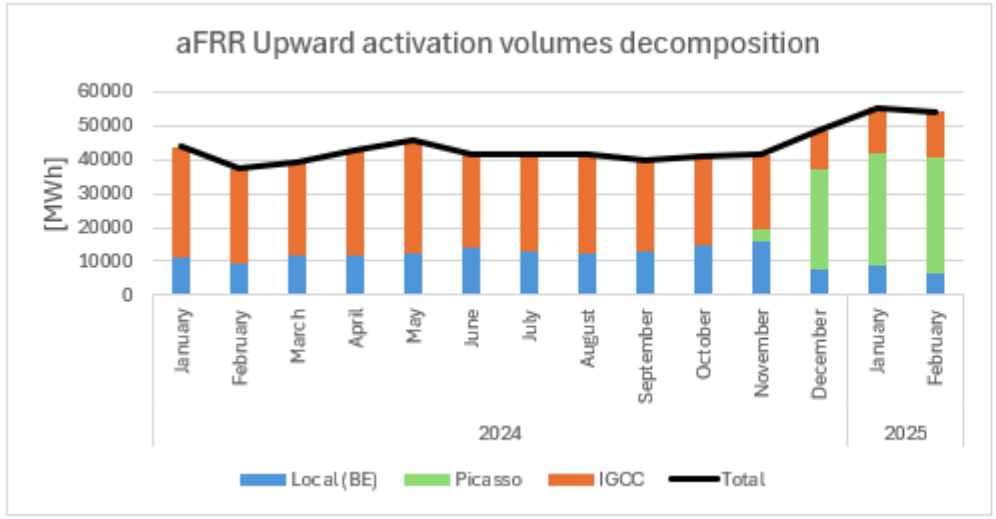
To note:

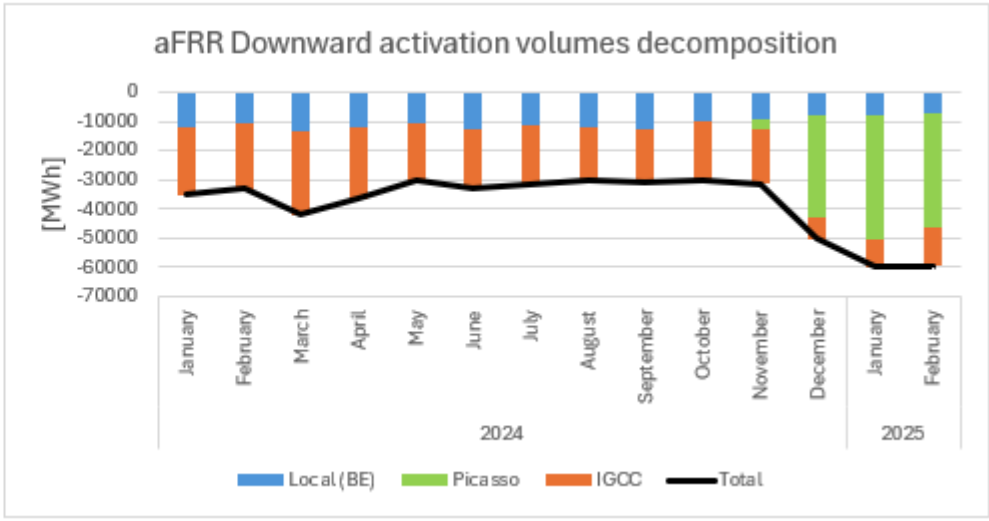
The **possibilities** given to BSPs since November 2024 **to use a shorter activation period and to use a real-time baseline are actively used**

aFRR was **opened to** low-voltage in 2025 **but no volumes have yet participated**

- ⇨ Study ongoing on prequalification process and the measurement and communication requirements for low-voltage units
- ⇨ PoC of ToE for aFRR LV is foreseen for early '26

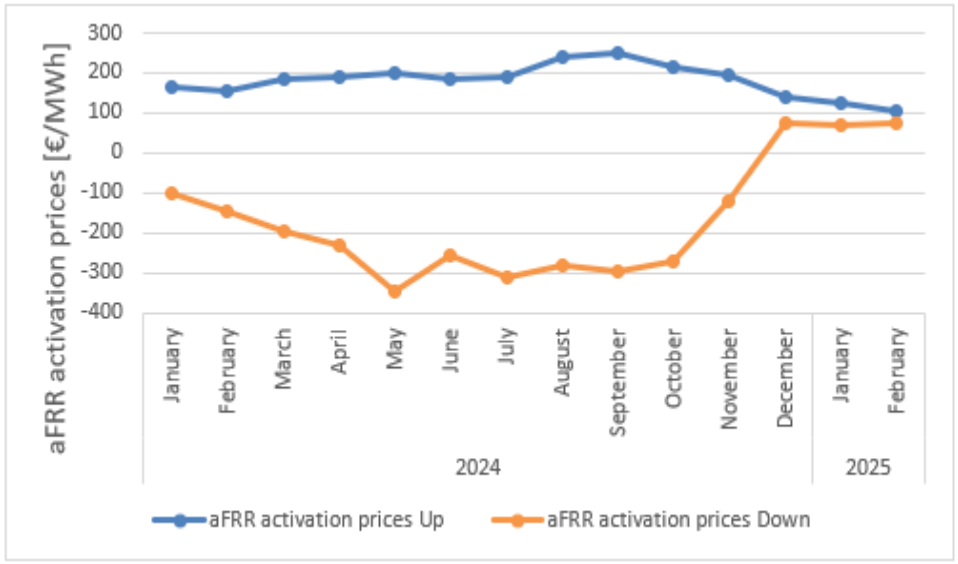
Selection and activation of aFRR Energy Bids remained stable until connection to the aFRR-Platform

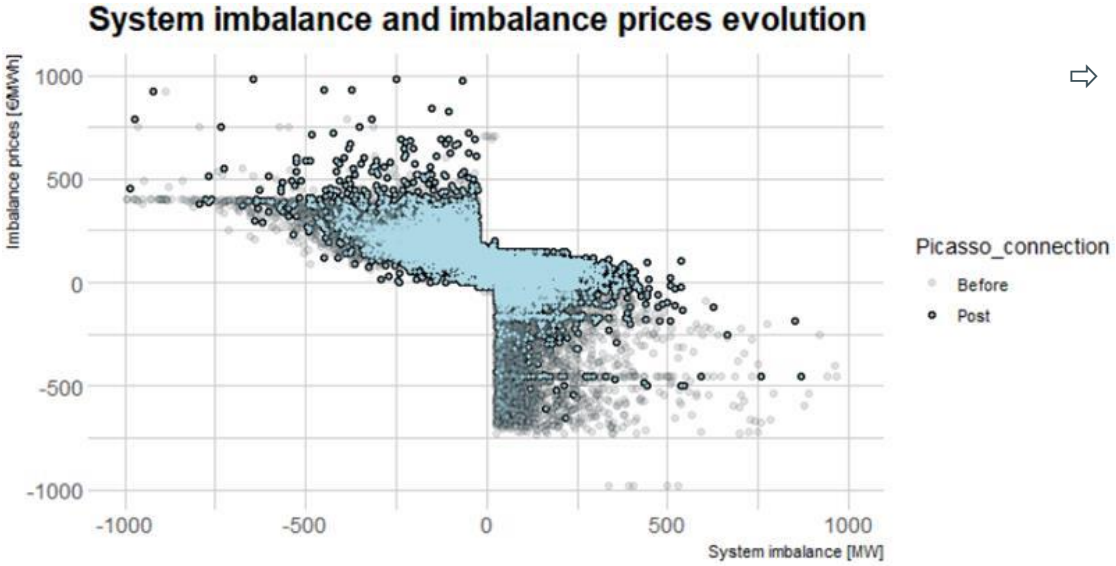




- **Activations of Belgian aFRR Energy Bids are strongly reduced** following the connection to the aFRR-Platform- (in both upward and downward direction)
- The vast **majority of the aFRR demands in both upward and downward direction are now satisfied via the aFRR-Platform** through implicit netting or selection of aFRR Energy Bids in other LFC Areas
- An **overall increase of the upward and downward aFRR demands that can be satisfied** is observed (in particular in the downward direction)

aFRR energy prices significantly decreased following the connection to the aFRR-Platform

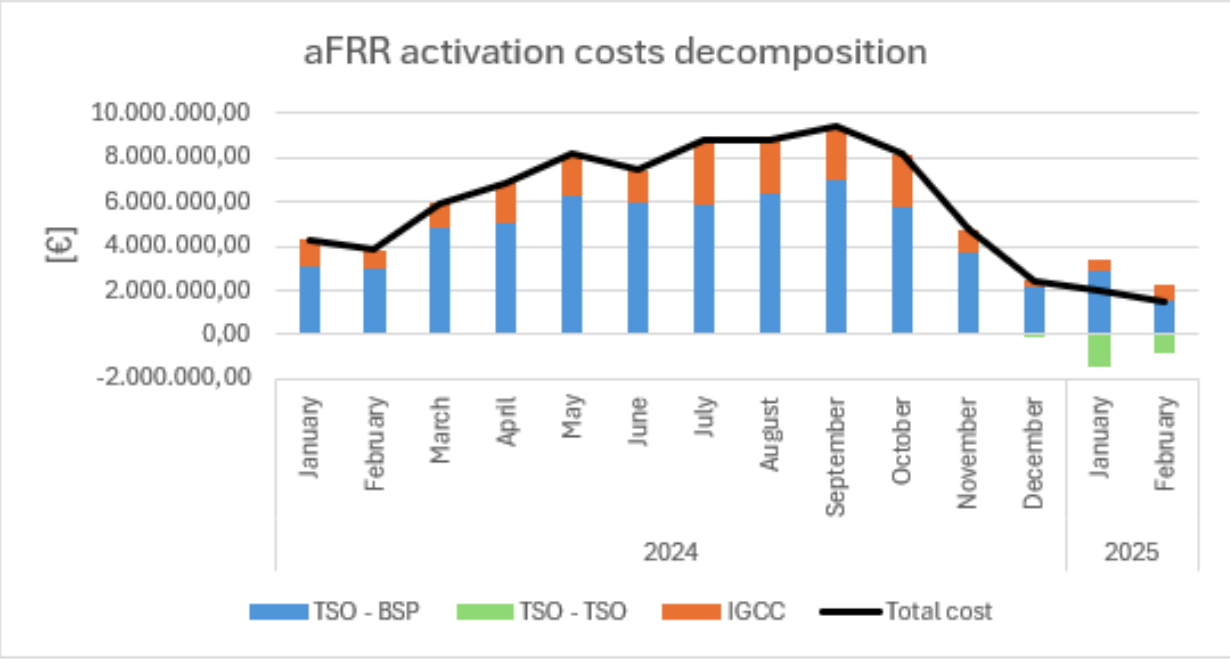




- ⇨ The **connection to the aFRR-Platform has led to significantly lower prices for aFRR Energy (in particular for downward aFRR Energy)**

- ⇨ The connection to the aFRR-Platform led to **more moderate imbalance prices**
  - ⇨ For negative system imbalances, the imbalance price tends to be lower after connection to the aFRR Platform
  - ⇨ For positive system imbalances, the imbalance price tends to be significantly higher (and very largely positive) after connection to the aFRR Platform
  - ⇨ The discontinuity of the imbalance price around a system imbalance of 0 MW has largely disappeared

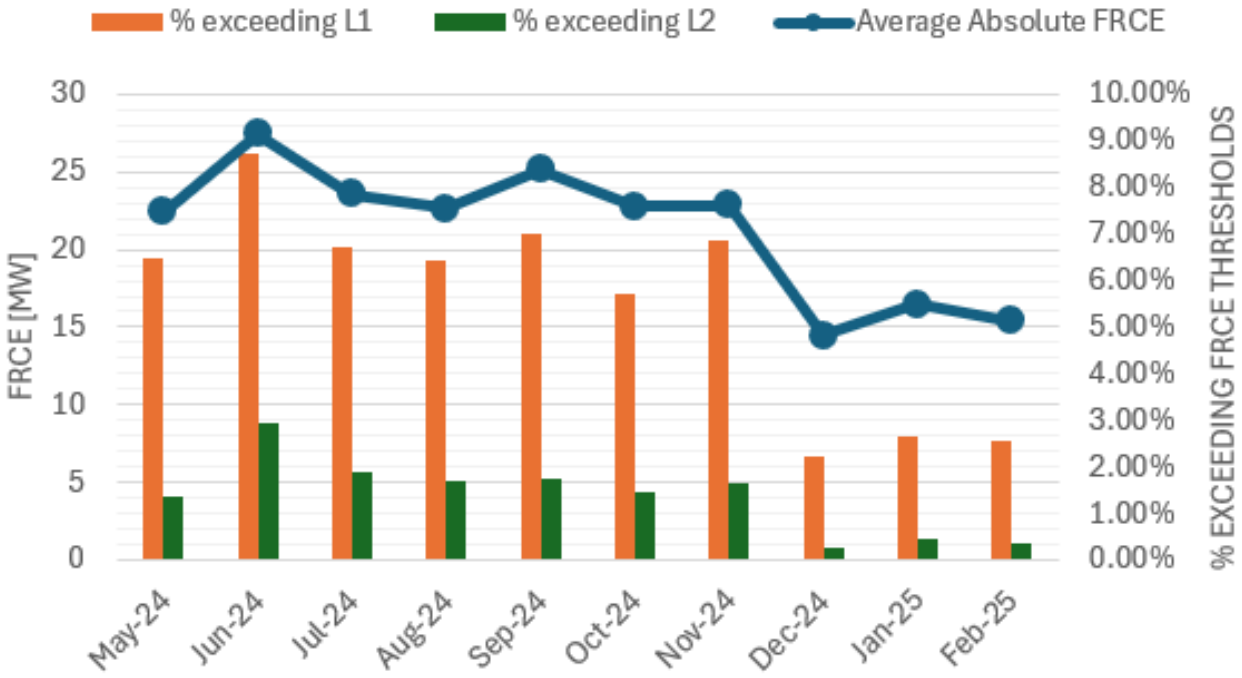
aFRR balancing costs have strongly reduced following the connection to the aFRR-Platform



⇨ The **cost for aFRR balancing energy** (including imbalance netting) has very **drastically reduced following the connection to the aFRR-Platform and the increase of liquidity in aFRR Energy Bids**

- Jan 2024 – Oct 2024: average cost of ~6.5 M€/month
- Dec 2024 – Feb 2025: average cost of ~2 M€/month

Regulation quality significantly improved following the connection to the aFRR Platform

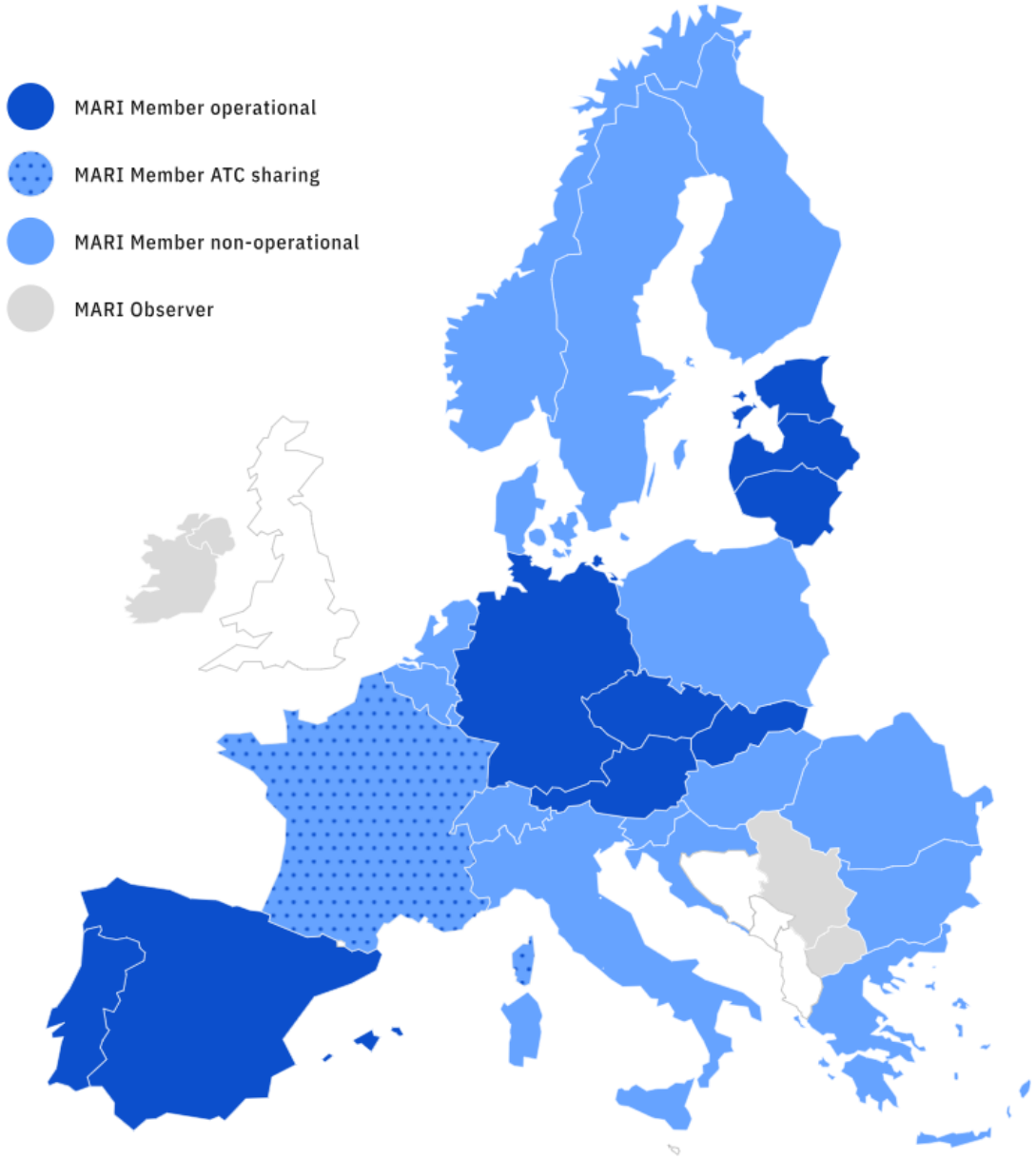


Note: To enable a clear comparison, the values reported on the percentage where the FRCE exceeded the level 1 / level 2 thresholds are based on the level 1 and level 2 values applicable between January and June 2025

Access to additional liquidity following the connection to the aFRR-Platform **significantly reduced the average absolute FRCE (ACE)** as well as the frequency of periods with more severe FRCE

mFRR

Organization of mFRR market at European level- in 2024, the mFRR context was the preparation of our connection to MARI



More than 30 European TSOs involved in this project

Access to a larger mFRR balancing market

Wide range of benefits

for our Value Chain and the Energy Transition

- ✓ Better dispatch of production, consumption and storage
- ✓ Helps facilitating the integration of RES in the EU

for TSO's

- ✓ Access to additional volumes
- ✓ Activation of foreign energy through standard processes

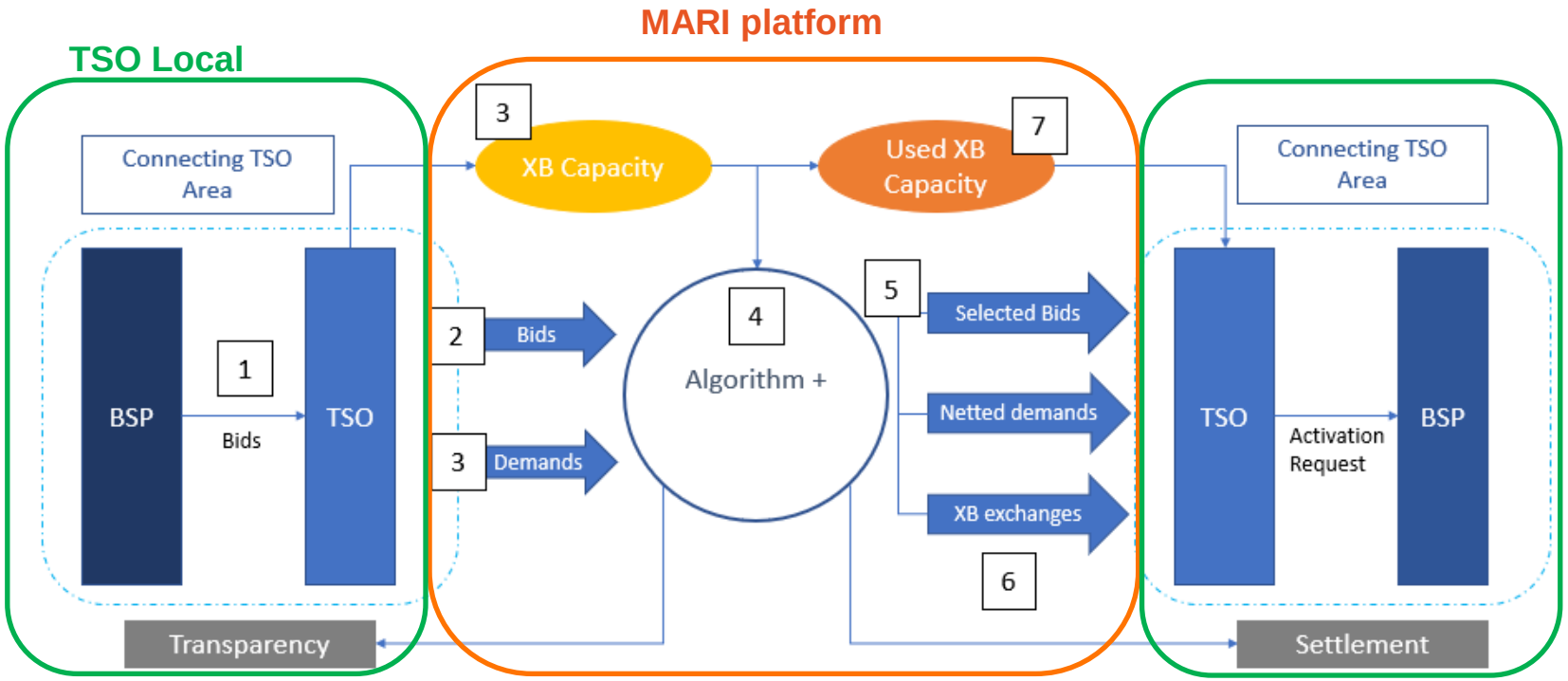
for BSP's

- ✓ More opportunities to trade their services

for the community

- ✓ Welfare gains
- ✓ Cost efficiencies

Description of how the mFRR process will work after our connection to MARI



Since the local go-live, we are applying the MARI framework locally
After the connection date, our tools will send bids, demands and information on cross border capacity to MARI
MARI will process this information and send our tools a list of bids to activate, and information on used cross border capacity

Key observations since the local mFRR go-live of 22 May 2024

- **No revolution**
- Total mFRR balancing capacity costs remain stable compared to January-April 2024
- There is sufficient mFRR liquidity in capacity auctions
- Average energy bid prices keep a steady trend
- Total energy costs remain within the same range as before the local go-live

Additional observations mFRR retrospective 2024

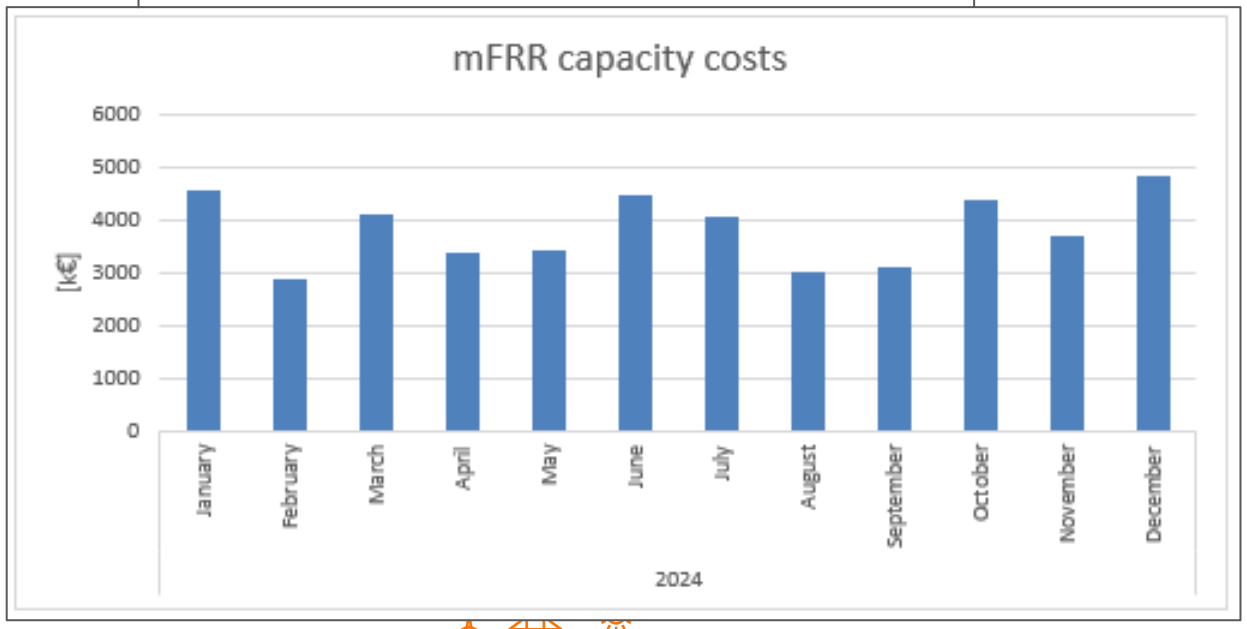
- There is a 35% decrease in capacity costs driven by DAM prices
- In 99,997% of the cases, the liquidity in capacity auctions is sufficient
- mFRR activation costs drop by 10%

mFRR capacity- decrease in total costs driven by DAM prices

Average DAM prices **decreased by 28%** in 2024 compared to 2023*

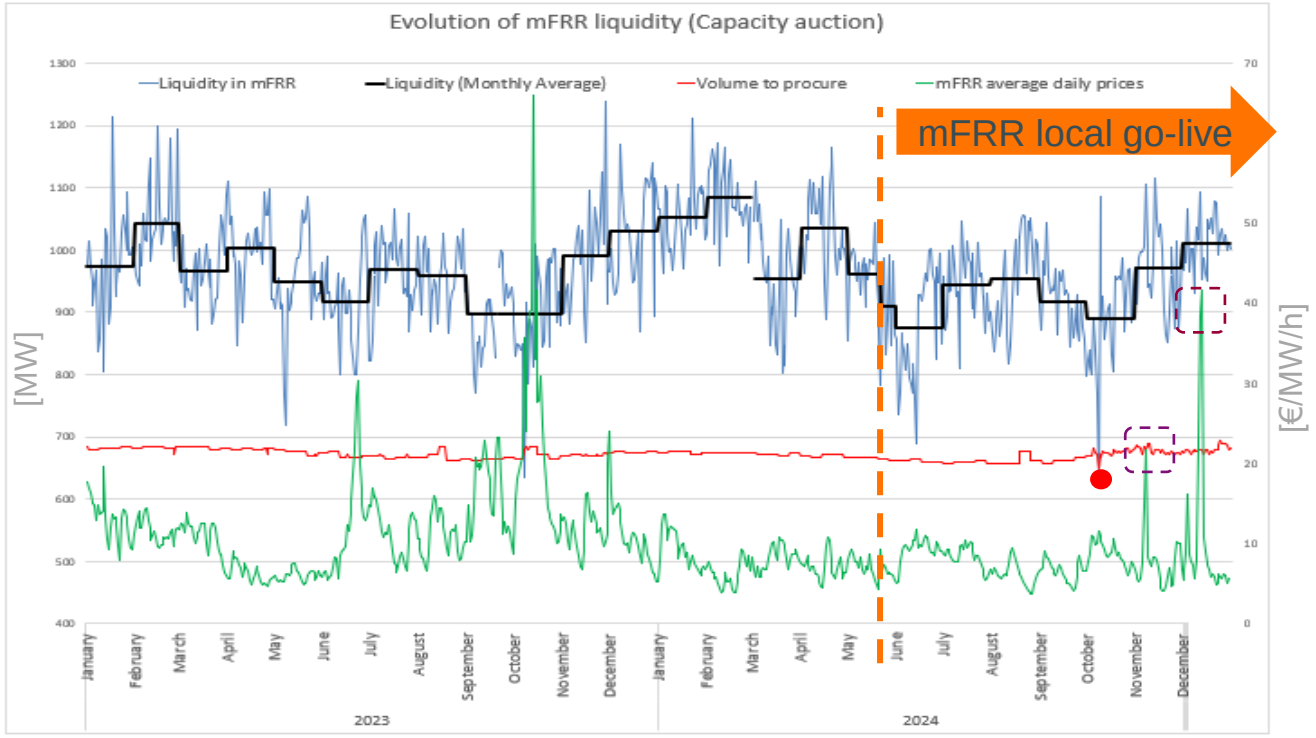
mFRR total capacity costs decreased by 35% in 2024 compared to 2023*

Year	BE day-ahead prices [€/MWh]	Average mFRR capacity prices [€/MW/h]
2022	244,55	13,40
2023	97,28	12,01
2024	70,23	7,81



* 244.5 €/MWh in 2022, 97,28 €/MWh in 2023, 70.23 €/MWh in 2024

mFRR capacity – no change in the liquidity and price dynamics

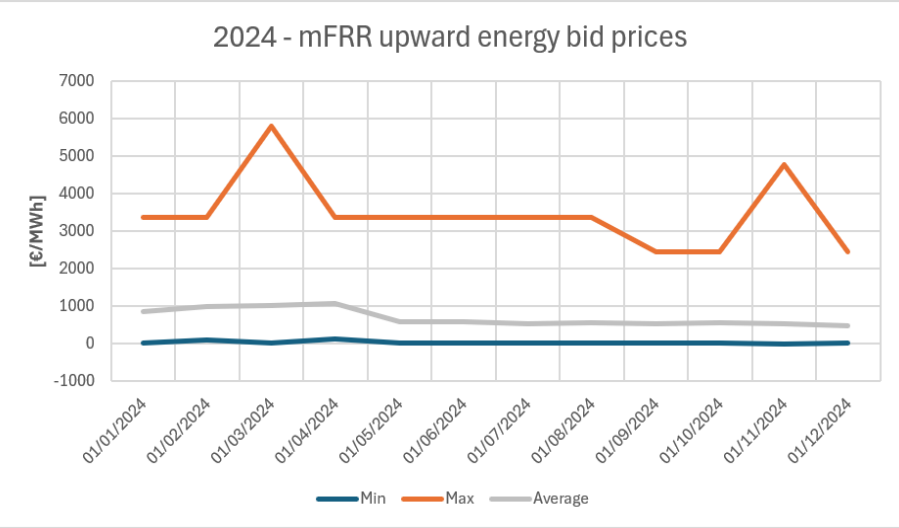


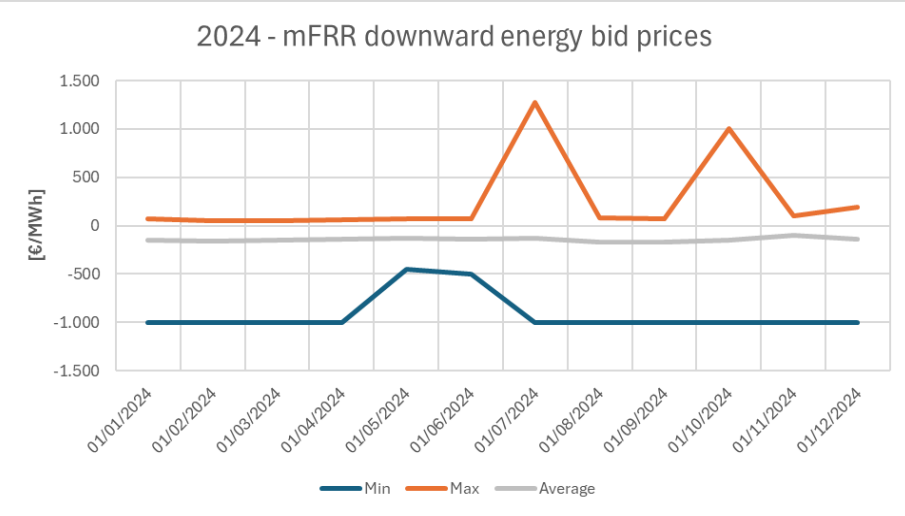
- Gate2 Auction
- more tense situations

In more than 99,997% of the cases (compared to 99,994% in 2023 and 99,51% in 2022), mFRR upwards offered volumes are higher than the volume to procure*

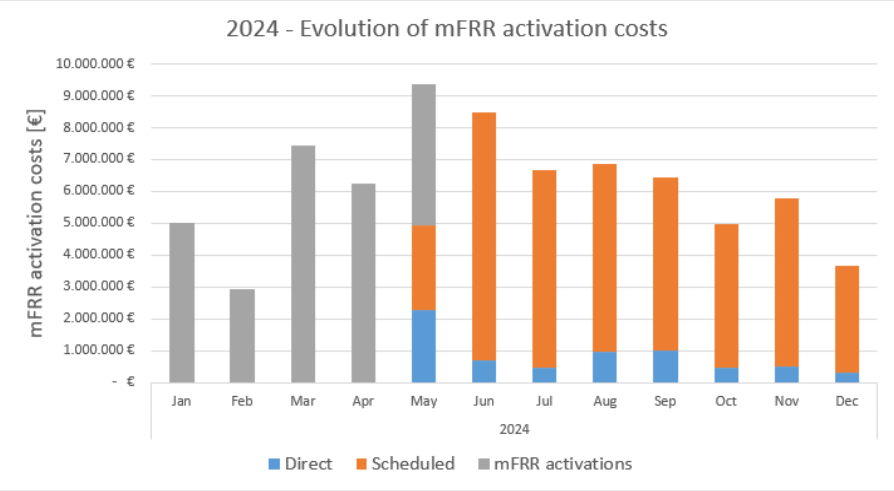
*in 2024, we had in total only 1 second gate auction **compared to 2 gate2 in 2024 and 18 in 2022**

mFRR energy- average upwards and downwards prices & activation costs





Average upwards and downwards energy bid prices keep a steady trend



Activation costs (total in both directions) remain within the same range as before the local go-live.

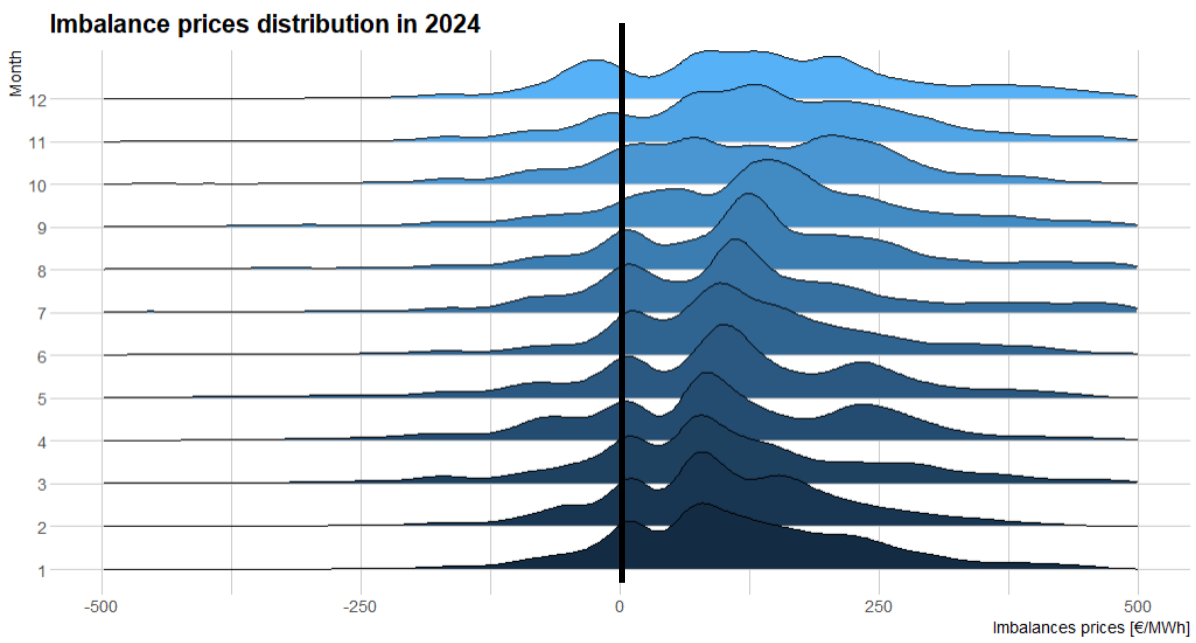
The decomposition by type of activations highlights a larger contribution to the mFRR balancing costs of the scheduled activations. On a yearly basis, the mFRR activation costs dropped by 10%.

Note: the impact of the shift from implicit to explicit bidding is still under analysis; amongst other things, it changes the reference system to measure liquidity; it will be presented in a next WG ES

Imbalance price and System imbalance

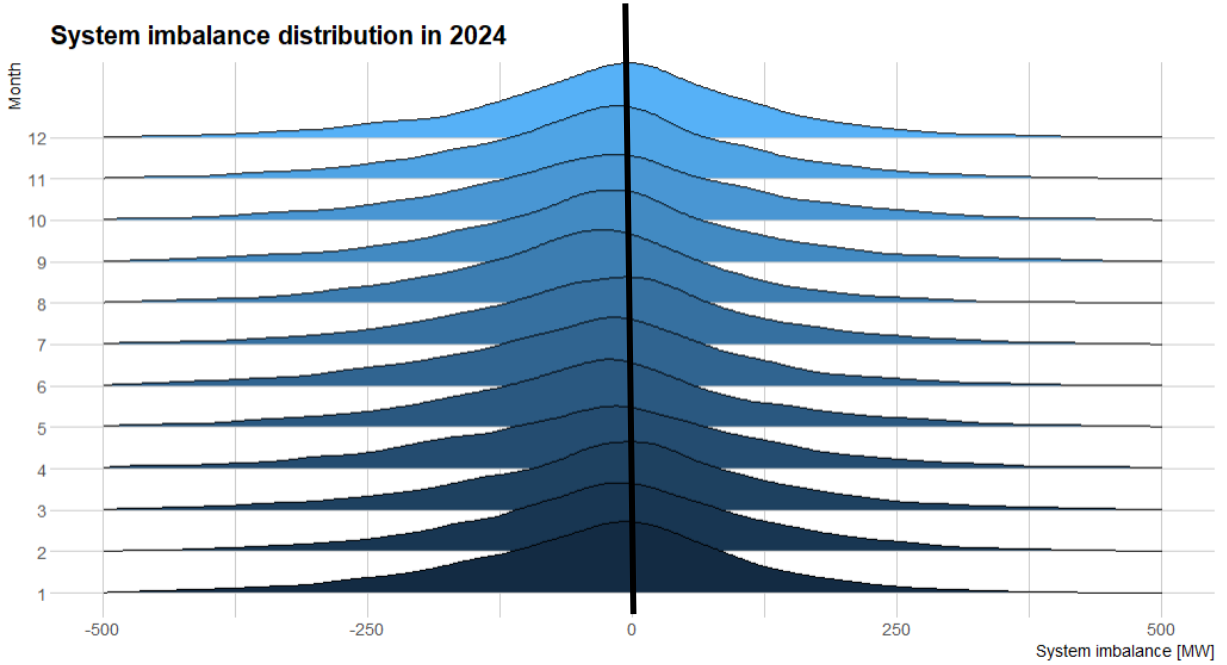
Imbalance prices shifting towards the positive side after connection to the aFRR-Platform while the System imbalance tends towards zero

Jan'24 – Dec'24



- On average, the imbalance price decreased in 2024 relative to 2023 (70 €/MWh in 2024 vs 96,1 €/MWh in 2023).
- Two opposite patterns in 2024 relative to negative imbalance prices:
  - High share of negative imbalance prices in the first part of 2024 (Up to 40% for some months)
  - Strong decrease of negative prices after summer and further decrease following the connection to the aFRR-Platform

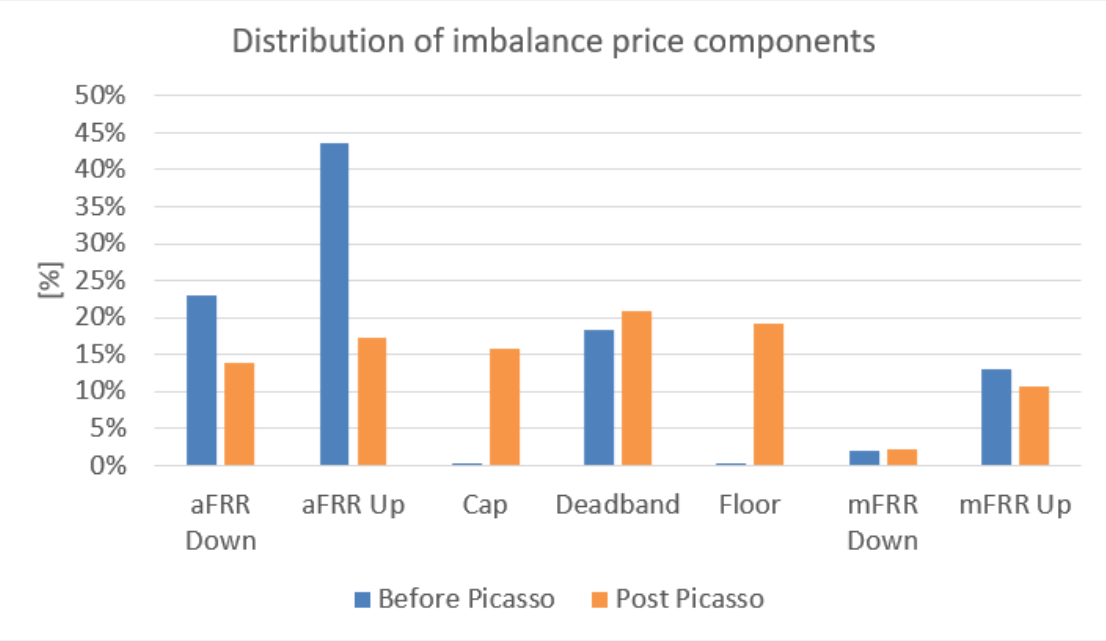
Jan'24 – Dec'24



- The average System imbalance was more strongly negative in 2024 (-29MW in 2023 vs -45MW in 2024)
- The average system imbalance was significantly less negative following the connection to the aFRR-Platform

The connection to the aFRR-Platform also led to a change in *distribution* in the imbalance price components

22/05/2024 – 31/12/2024



⇨ Strong reduction of the frequency with which the aFRR component sets the imbalance price

⇨ Corresponding increase of periods where the Cap and the Floor set the imbalance price

BSP Faster Settlement incentive

Martine Verelst

Scope of incentive 2025 “BSP faster settlement & invoicing”

final decision CREG October 2024

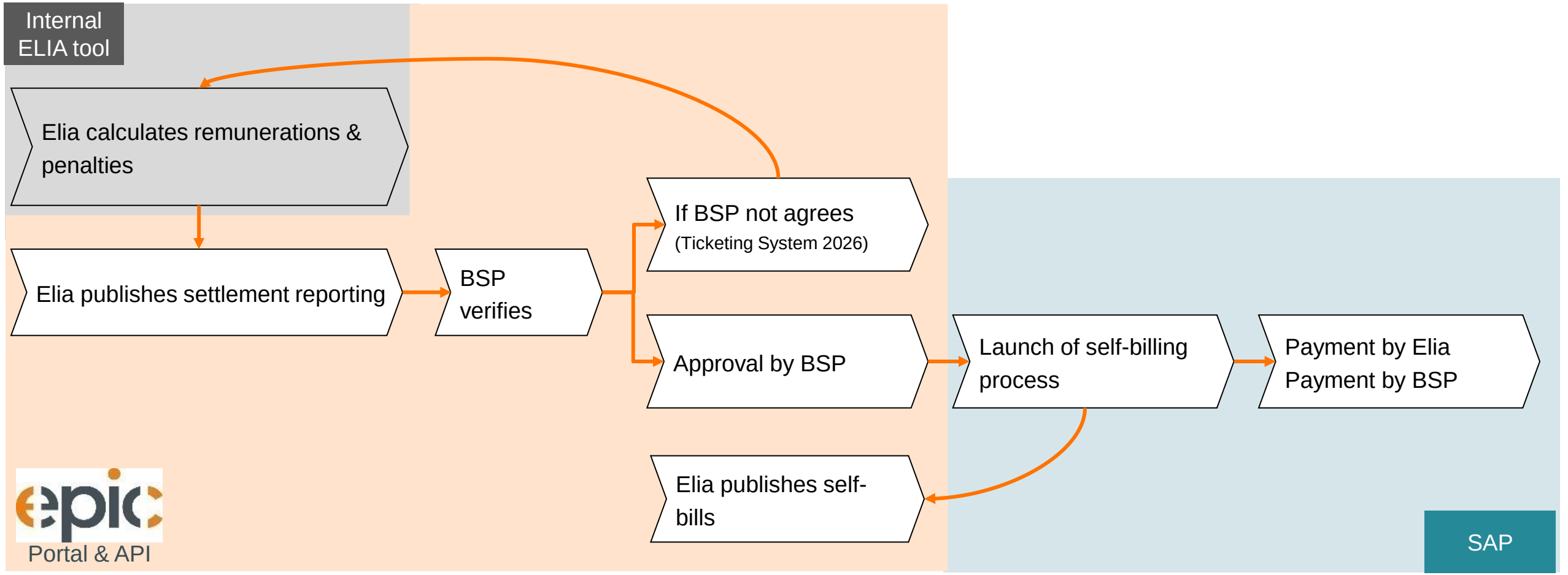
- **Faster processes for the 4 types of settlement reporting for FCR, aFRR and mFRR**
  - Renumeration of awarded capacity
  - Remuneration of activations (*not applicable for FCR*)
  - Penalties for availability/obligation control
  - Penalties for activations control

- **Proposed improvements**
  - An accelerated calculation and provision of the settlement reportings to the BSP (at the latest end M+1)
  - The publication of the settlement reportings and invoices on a unique communication platform (= EPIC)
  - The switch from traditional billing process to a self-billing process (i.e. self-bills for remuneration and invoices for penalties)

- **Deliverables**
  - **Part 1 :** after discussion with BSPs, the following should be provided to CREG by 30.06.2025 :
    - Reports/MoM from meetings with BSPs
    - Implementation plan of 4 types of settlement reporting for FCR, aFRR and mFRR in the go-live window

  - **Part 2 :** a go-live window between mid 2025 and mid 2026
    - with at least the go-live of the settlement reporting for remunerations of awarded capacity and activations in Q4/2025

BSP Faster Settlement – proposed future process



Scope of incentive 2025 “BSP faster settlement & invoicing”

final decision CREG October 2024

	FCR	aFRR	mFRR
Remuneration awarded capacity	< 31/12/2025	< 31/12/2025	< 31/12/2025
Remuneration Activations	n/a	< 31/12/2025	< 31/12/2025
Obligation Control	< 30/06/2026	< 30/06/2026	< 30/06/2026
Activation Control	< 30/06/2026	< 30/06/2026	< 30/06/2026

What has been done already

- Workshop #1 – 5 December 2024
  - Explanation of the scope of the incentive
  - Open discussion on the proposed process and current and future platform

- Workshop #2 – 13 February 2025
  - Recap of the proposed solution, feedback from BSPs, introduction to T&C changes

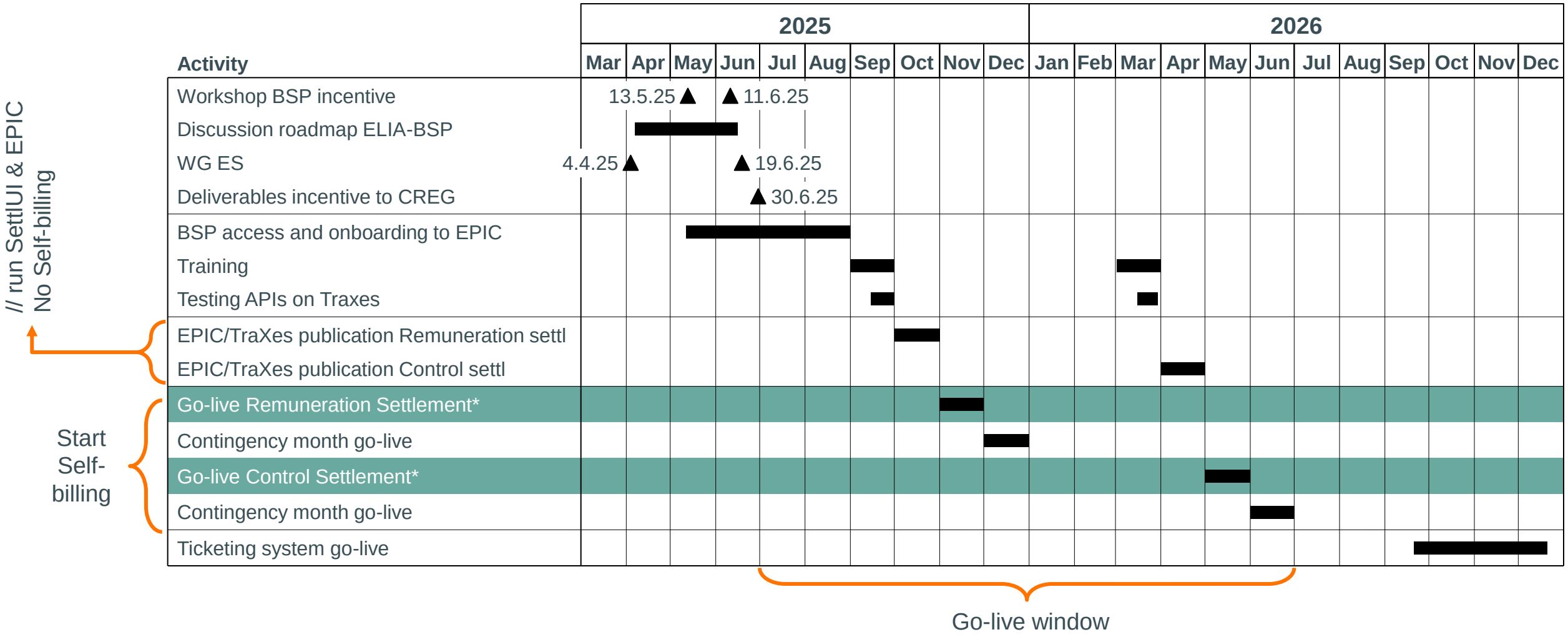
- Workshop #3 – 2 April 2025
  - Presentation and open discussion on detailed financial flows, roadmap and T&C changes

Switch from traditional billing process to self-billing process
General principles

- With the switch to a self-billing process, ELIA will provide the financial documents on behalf of the BSP :

In case the BSP sends now	Elia will provide in the future
an invoice related to a ***capacity remuneration***	***a self-bill*** to the BSP, on behalf of the BSP
a credit note related to ***an availability control***	***a self-bill credit note*** to the BSP, on behalf of the BSP
an invoice related to ***activation remuneration (in case of positive amounts)***	***a self-bill*** to the BSP, on behalf of the BSP
a credit note related to ***activation remuneration (in case of negative amounts)***	***an invoice*** to the BSP (for tax reasons, in case of negative amounts, the financial flow is inverted)
a credit note related to ***an activation control (in case of positive amounts)***	***a self-bill credit note*** to the BSP, on behalf of the BSP
a credit note related to ***an activation control (in case of negative amounts)***	***an invoice*** to the BSP (for tax reasons, in case of negative amounts, the financial flow is inverted)

Roadmap



** Go-live in the month of November means "settlement month of November 2025" for "delivery month of October 2025"*

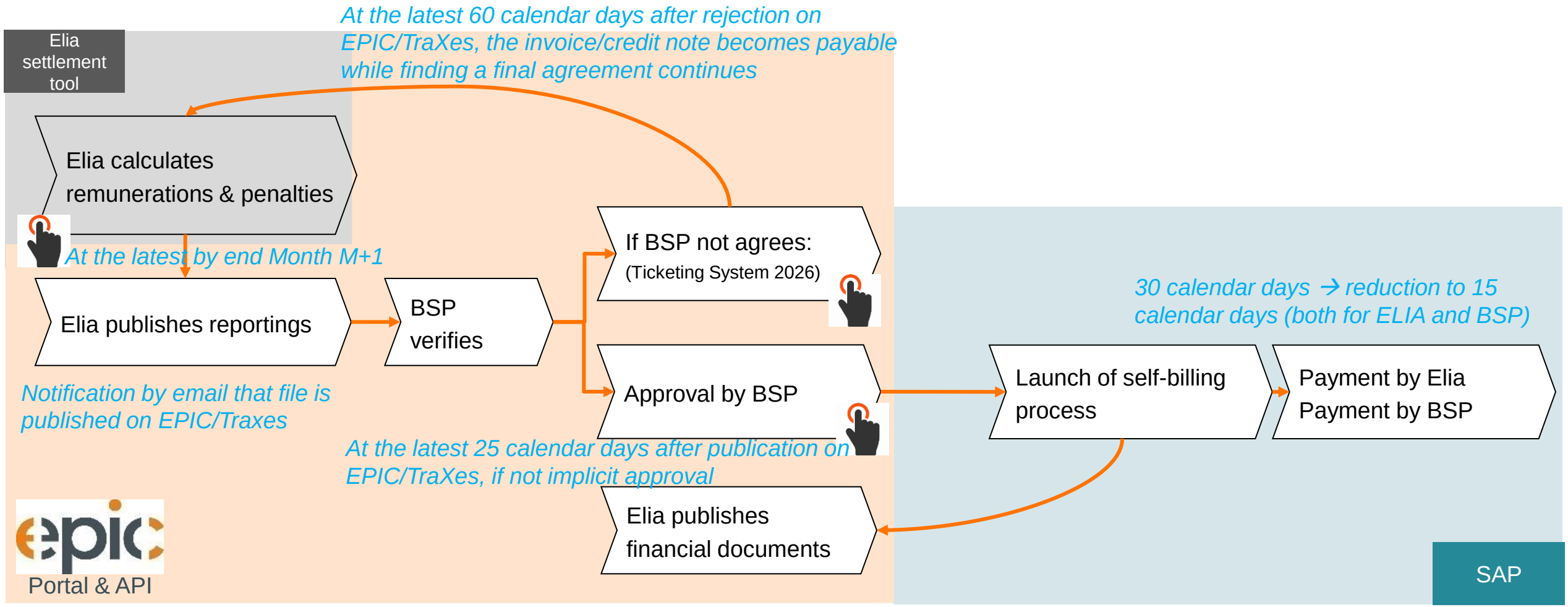
Some engagements requested from the BSP

- BSP should onboard on EPIC (test his access once available) and get used to the environment as soon as possible after the onboarding on EPIC
- It is requested to participate to the training(s) that will be foreseen during the month of September
- BSP should be ready by October to verify and get acquainted with the new screens in EPIC (compared to settlement UI platform)
- BSP should be ready by November to accept the remuneration part of the settlement reporting in EPIC and to validate/reject them in EPIC
- BSP should be ready by November to accept the self-billing process

- For the ones willing to use API, some tests can be performed during specific moments in the course of September
  - Elia will provide the content/requirements/.. related to the APIs to the BSP at the latest by June 2nd
  - Elia will communicate before summer the specific dates when tests can be performed in the course of September

- Regarding the Control Settlement, a similar sequence with take place in March-June 2026

BSP Faster Settlement and invoicing
>> proposed timings in T&C to accelerate the overall process



Next steps & next workshops

Tuesday 13 May 2025 @13h : WS

- Send your questions/feedback by email to your KAM Energy at the latest by Wednesday 30 April 2025
- If no questions received, the WS may be cancelled

Wednesday 11 June 2025 @14h : WS

- Elia will prepare deliverables incentive which will be sent by ELIA at the latest by Monday June 2nd
- Is it requested to provide feedback on this deliverable by email to you KAM Energy at the latest by Friday June 5th
- Presentation of the deliverables & discussion on the received feedback during the WS

Thursday 19 June 2025 : WG ES

- Final presentation of roadmap & deliverables

Go-lives T&C BRP

Simon Serrarens

Go-lives T&C BRP

- Regulatory decision on the T&C BRP is pending

- The BRP perimeter correction will go-live upon entry into force, i.e. 2 weeks after regulatory approval
- Certain changes *can* go-live upon approval, but have other dependencies:
    - xBRP also requires a decision on the Access Contract
    - SDAC
- Certain changes have specific go-live dates:
    - Redesign for external inconsistencies is expected to go live in the week of 09/06/'25 – BRPs will receive a mail 2 weeks before go-live
    - Self-billing is expected to go-live on 01/06/'25 – active BRPs are invited for an info session on 23/04/'25

Evolution of the Working Group

Simon Serrarens

Evolution of the WG ES

- The current format of the WG ES is the result of merging the WG BAL & AS and WG CCMD
- Elia has received feedback from the market parties…
  - Sessions are long
  - Sessions tend to be one way info, with focus on roadmaps
  - Name of the WG is confusing
  - Too little focus on co-creation
  - Target audience not always clear (operational topics, digitization…)
  - Importance to involve DSOs

- … and intends to **redesign** the WG together with you

What could a future WG look like?

WG Balancing Design & Solutions

Morning	Lunch	Afternoon

Co-creation/ solution focused:
- Interactive sessions
- Understanding MP needs / ideas
- Informal / no decisions
- In-person only

Design / decision focused:
- Presentation of design, solutions, upcoming changes
- Slides and agenda upfront, with target audience (design, processes, IT…)

Brainstorm today should translate in solutions tomorrow

AOB

Alexandre Torreele

AOB – Working session

CREG Incentive - Economic optimization of the use of balancing products

- In the frame of this incentive, Elia intends to organize a **dedicated working session** with market parties.
- The hybrid session will take place on **May 21th from 13:00 to 14:30**, at Elia Emperor.
- The invitation was sent on 02/04/2025
- To enhance the topic, Elia is open to have bilateral sessions with any interested market parties on the matter

2025 WG Energy Solutions

- Thursday 06/02/2025 09:00 – 17:00
- Friday 04/04/2025 09:00 – 17:00
- Thursday 19/06/2025 09:00 – 17:00
- Thursday **02/10/2025** 09:00 – 17:00
- Thursday 13/11/2025 09:00 – 17:00
- Thursday 18/12/2025 09:00 – 17:00

Attention: change of date 25/09 -> 02/10