WG Balancing of March 27th 2024

Hybrid meeting

27/03/2024

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

09:00 – 09:30: Overview of the 2023 balancing volumes & costs

09:30 – 10:00: EU & BE Balancing program update

10:00 – 10:45: Flexibility Roadmap (Energy & Grid)

10:45 – 11:15: DFD Report and milestones 2024

11:15 – 11:45: Smart Testing

11:45 – 12:00: Reserve dimensioning

12:00 – 12:45: Incompressibility

12:45 – 13:00: Faster Settlement AS

Minutes of Meeting for approval

Minutes of Meeting of WG Balancing of 07/02/2024

Comments

- **Suggestion to approve:**
- The MoM of 07/02/2024

Customers, Markets & System

James Matthys-Donnadieu
Chief Officer

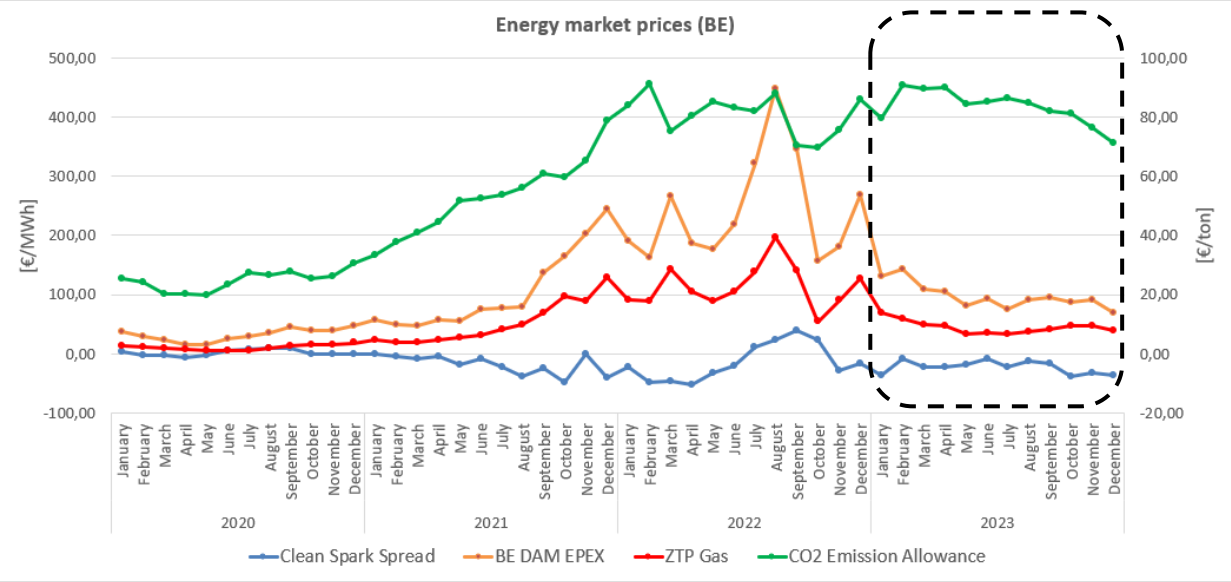
Customers	Market: Energy Solutions	Market: Grids & Offshore Concepts	Grid Development	National Control Center	Transformation, Digital & Data, Implementation
					
Jan Voet	Alexandre Torreele	Benjamin Genêt	Kristof Sieurs	Walter Geelen	Hans Vandenbroucke

Overview of the 2023 balancing volumes & costs

Patrick Buijs

General market evolution

General market evolution:
2023 returns to pre-crisis (=2021) level for electricity and gas prices

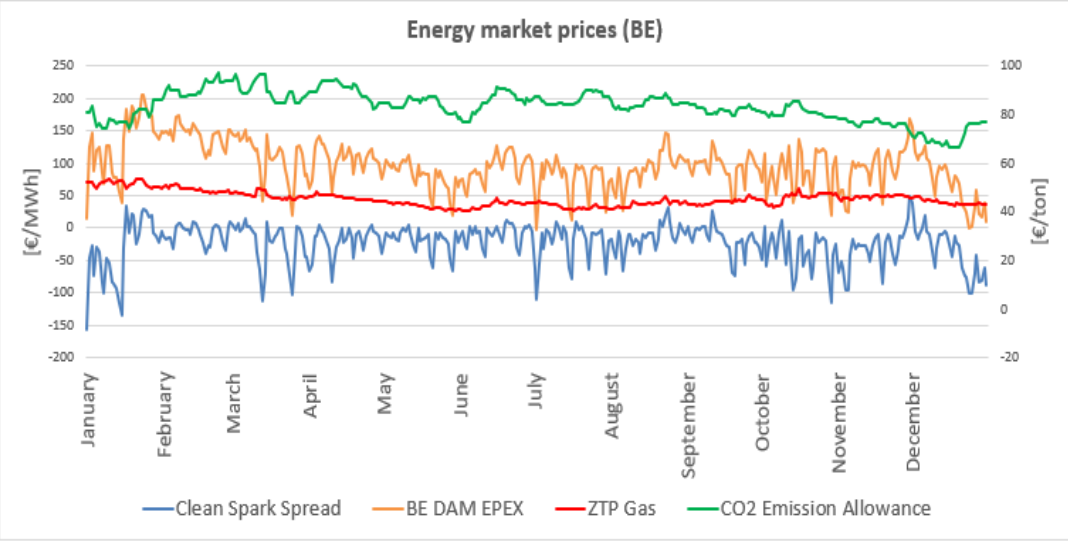


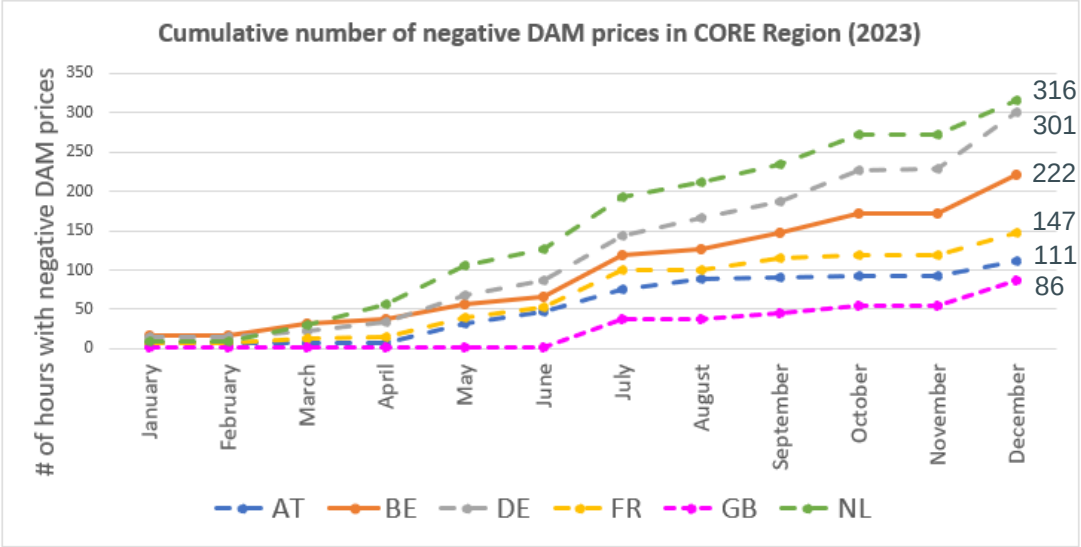
	DAM (€/MWh)	GAS-ZTP (€/MWh)	CO_2 (€/ton)
2020	31,9	10,76	24,77
2021	104,1	51,74	53,01
2022	244,5	114,33	80,87
2023	97,27	44,93	83,38

- 2023 has continued the **downward trend on electricity prices** (observed as of Sep'22)
- **Gas prices are returning to pre-crisis (2021) levels.** They remain the main driver for electricity prices.
  - Compared to 2022, gas prices were also less impacted by macroeconomic events and the volatility has decreased significantly (but not vanished).
- In 2023 **CO_2-prices remained generally stable** compared to 2022 (but the decrease end of 2023 continues more drastically in 2024)
- The **Clean-Spark Spread (CSS) remained generally negative** throughout the year and on average more negative than in 2022 (-23€/MWh vs -13€/MWh).

→ In the context of these evolutions, AS Balancing costs have evolved accordingly. This results in a cost decrease, but with nuances per product.

General market evolution
Belgian average DAM price was rather close to its direct neighbours





- Electricity market prices were characterized in 2023 by “Back-to-pre-crisis level” on the wholesale electricity market
- Clean Spark Spread (CSS) mainly negative throughout the year.
- 2023 picks up on the trend of **increasing amount of negative prices**
- Notwithstanding price differences, **Belgium DAM price was in the same price range as its direct neighbours**

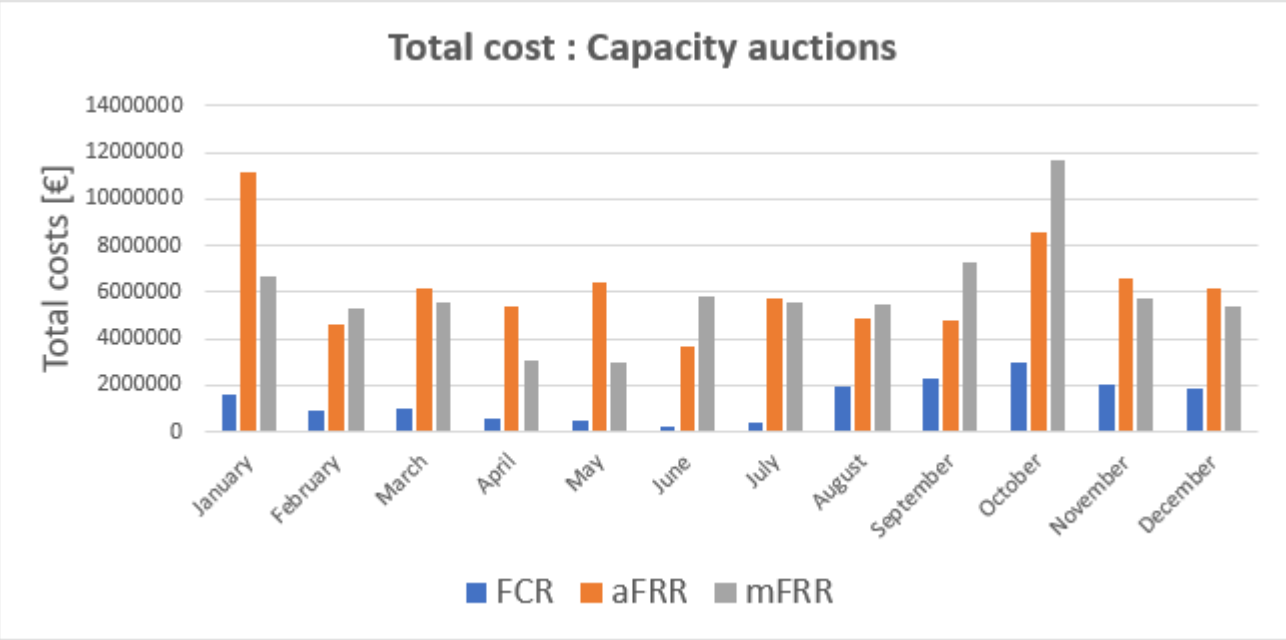
Yearly average DAM (€/MWh)	AT	BE	DE	FR	GB	NL
2021	106,5	104,1	96,6	108,8	136,4	102,6
2022	261,4	244,5	235,4	275,8	241,18	241,9
2023	102,1	97,2	95,1	96,8	108,1	95,8

2023: GB > AT > **BE** > FR > NL > DE

Exchange rate £ - €
2021 : 1,16 ; 2022 : 1,17 ; 2023 : 1,14

FCR – aFRR - mFRR

Wrap-up of capacity costs in 2023: net recovery compared to 2022, especially thanks to lower aFRR capacity costs.



Total capacity costs in 2022 & 2023

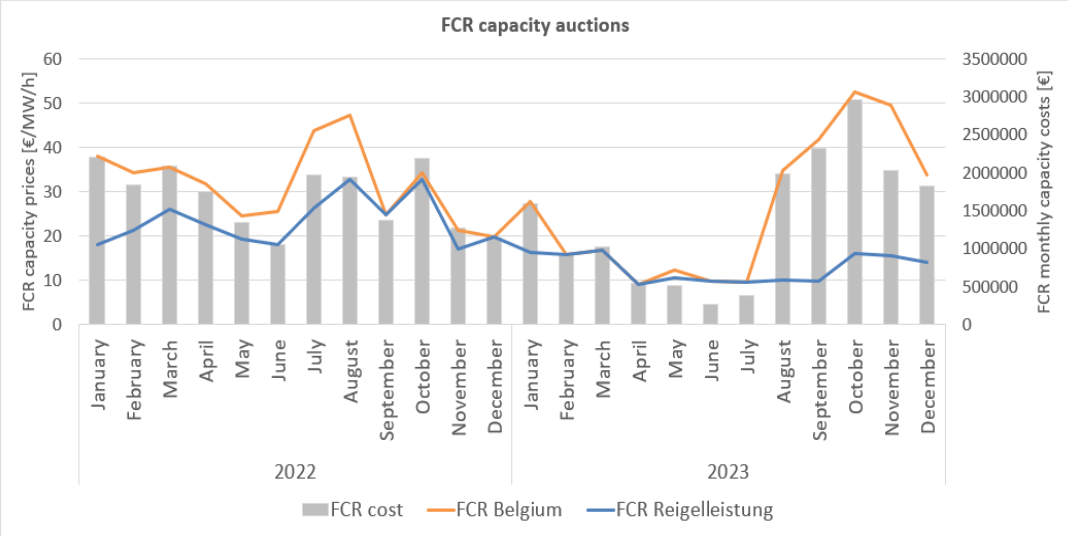
Costs in M€	FCR	aFRR*	mFRR
2022	20,1	174,7	78,0
2023	16,4	74,2	70,9

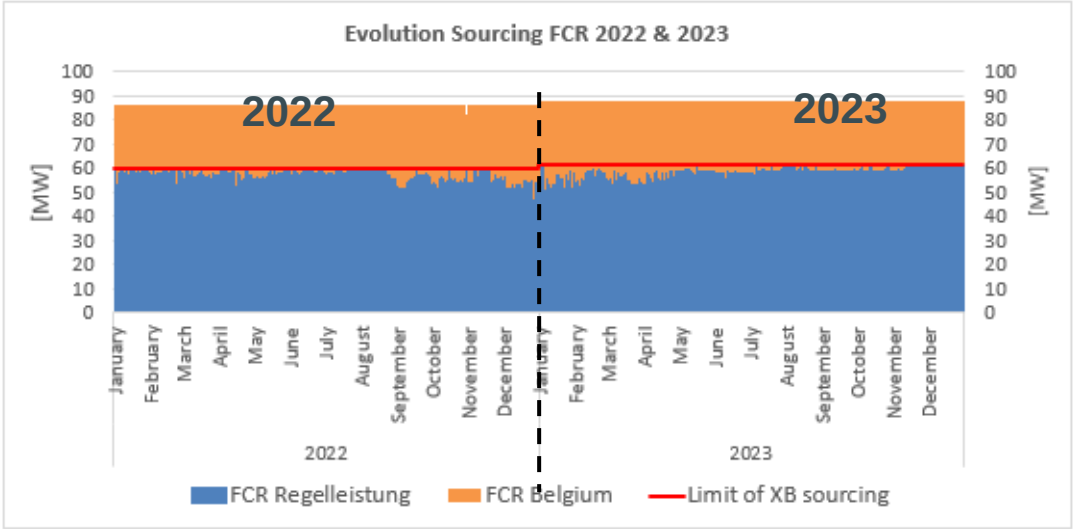
(*) Note: In 2023, the volume to procure for aFRR was 117 MW during the entire year, while 145 MW were contracted until 20th of Jul'22 before being reduced to 117MW. The volume difference (145-117=28 MW) has been procured as mFRR instead.

Overall, balancing capacity costs dropped in comparison to 2022 (- 40%), explained by several factors:

- General market evolution: underlying (partial) correlations with electricity, gas and CO2-prices.
- Technology mix diversification continues and contributes to lowering capacity costs

FCR capacity auctions



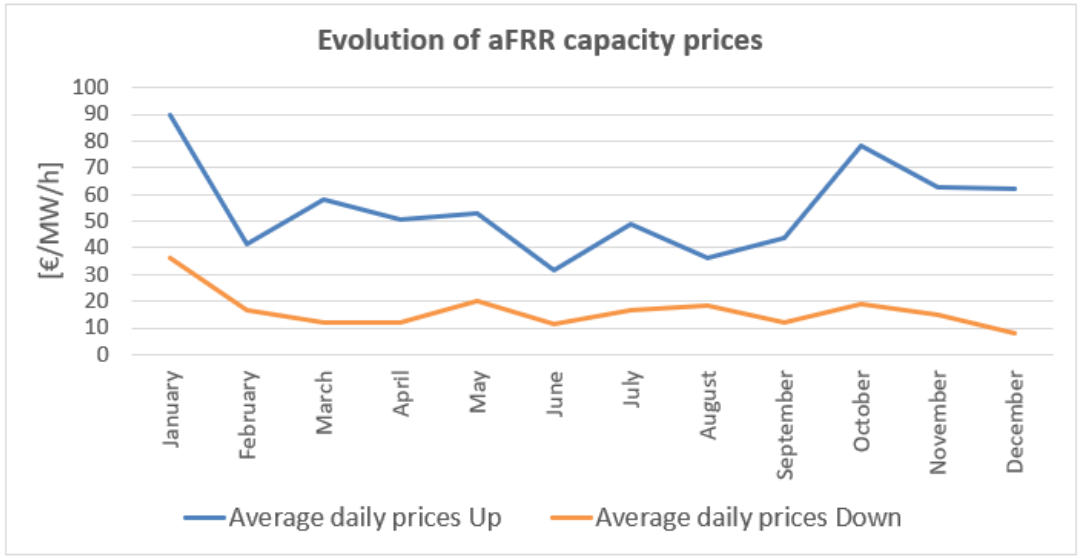


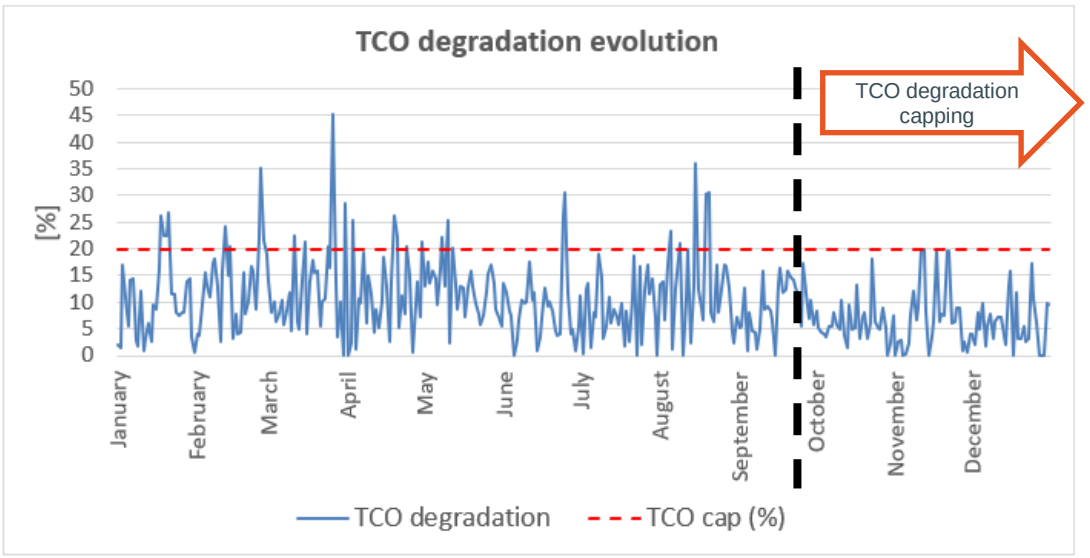
- Belgian FCR capacity coupled with the cross-border price about half of the year.
- Liquidity remained very tight the entire year
  - Resulting in a number of Gate 2 auctions (11) for Belgium to cover the core share.
  - Following limited liquidity, the largest part is delivered by XB volumes.
  - FCR capacity in 2022 & 2023 has generally been delivered by DPpg for the Core share
- The prequalified volume also evolved throughout the year: new volumes entering in the market while others have left, resulting in a new change of -57 MW.

Year	FCR to procure BE (MW)	Core Share BE (MW)	Avg BE price (€/MW/h)	Avg XB price (€/MW/h)	Total FCR capacity cost (M€)
2022	86	26	31,8	23,3	23,9
2023	88	27	26,2	12,8	20,2

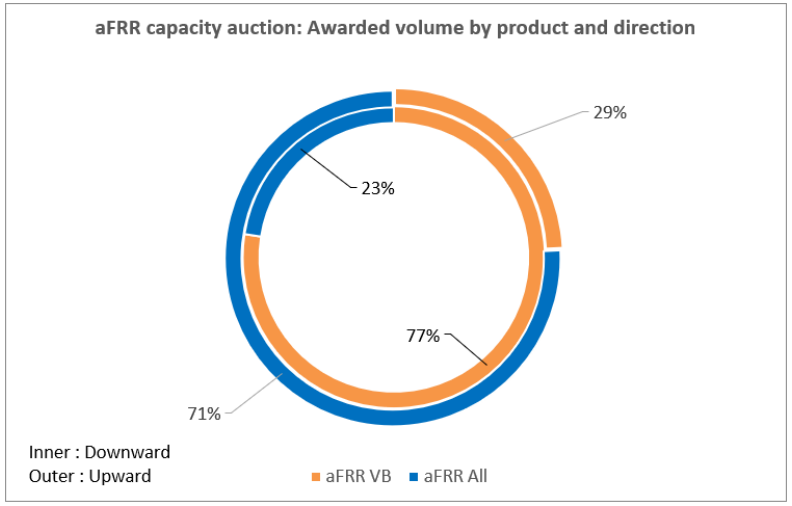
Excl. “FCR congestion rent impact”

aFRR capacity cost: Clean Spark Spread (CSS) still appears the main cost driver, but it is evolving.

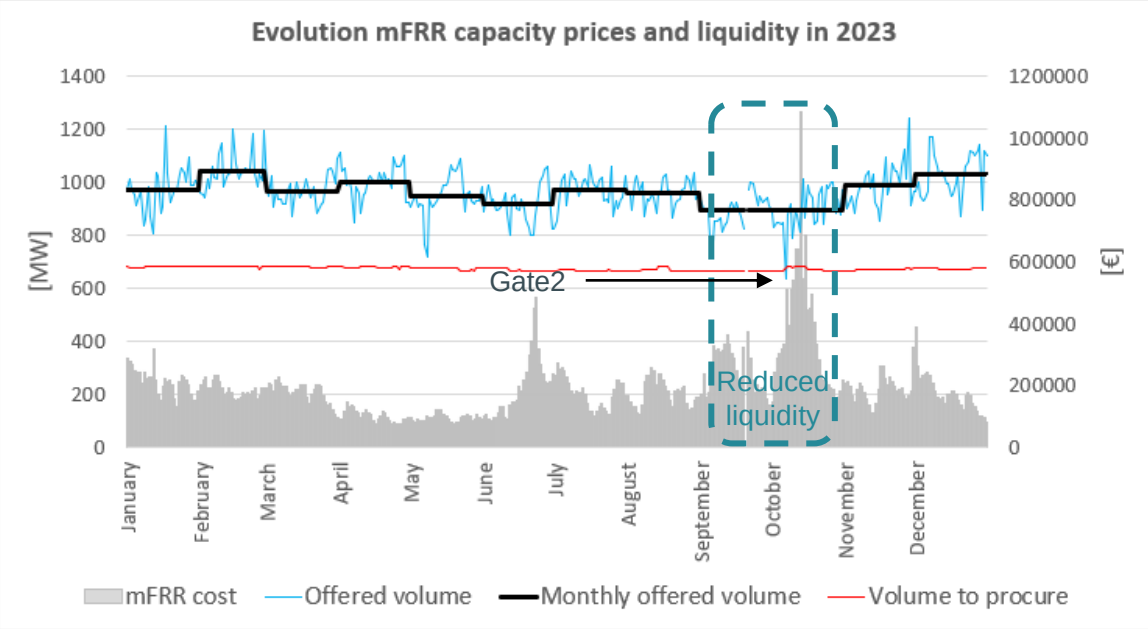


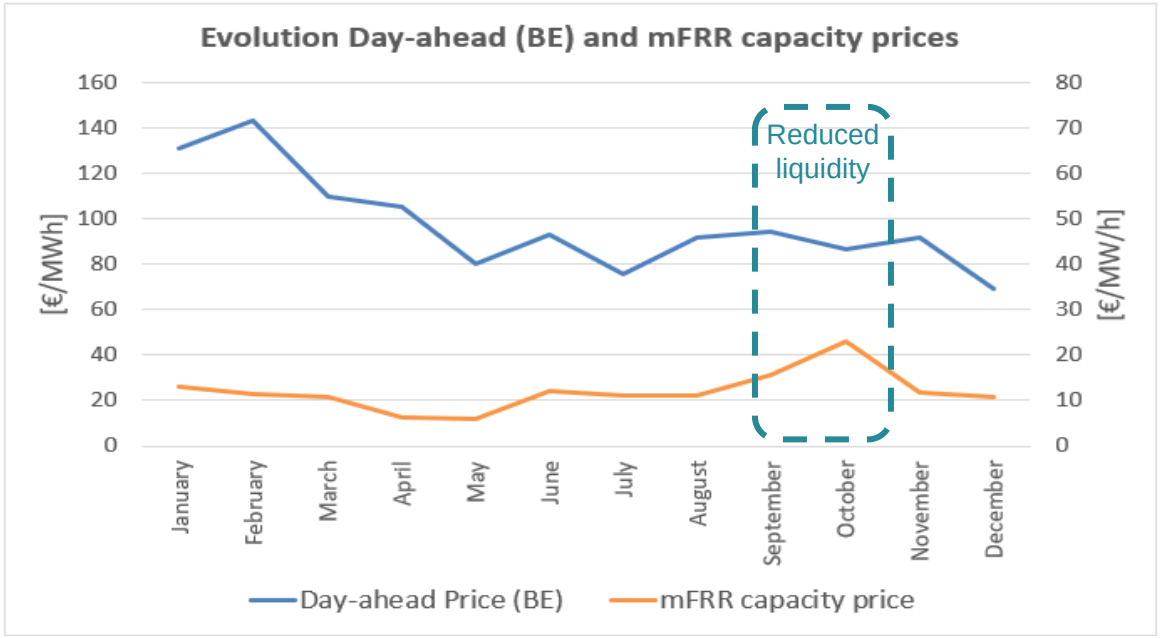


- The **relative share of downwards capacity cost is decreasing**
  - 2022 (173 M€) : 59 % Up / 41 % Down
  - 2023 (74 M€) : 77 % Up / 23 % Down
- **CSS remained the main driver** of the evolution of aFRR capacity costs **but diversification of the aFRR technology mix** introduces alternatives towards decoupling from CSS.
- Share of **volume awarded in single-CCTUs increased**: 29% awarded in Virtual Bid (VB) Up and 77% awarded in Virtual Bid (VB) Down
- **TCO degradation capping** was triggered 3 times since its go-live in September'23.



In 2023 mFRR capacity costs remained linked to DAM, insofar there is high liquidity

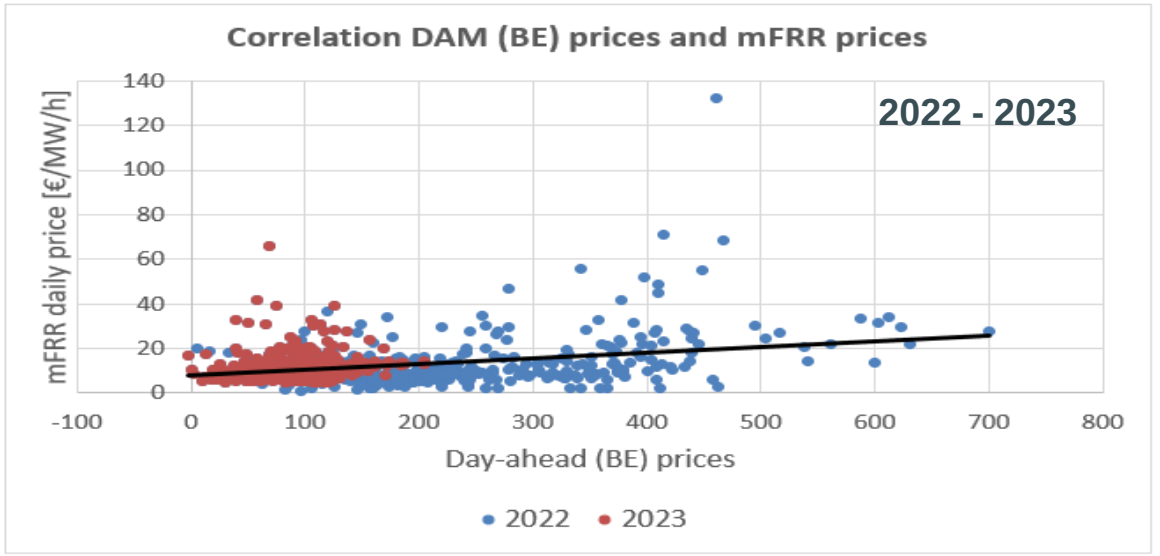




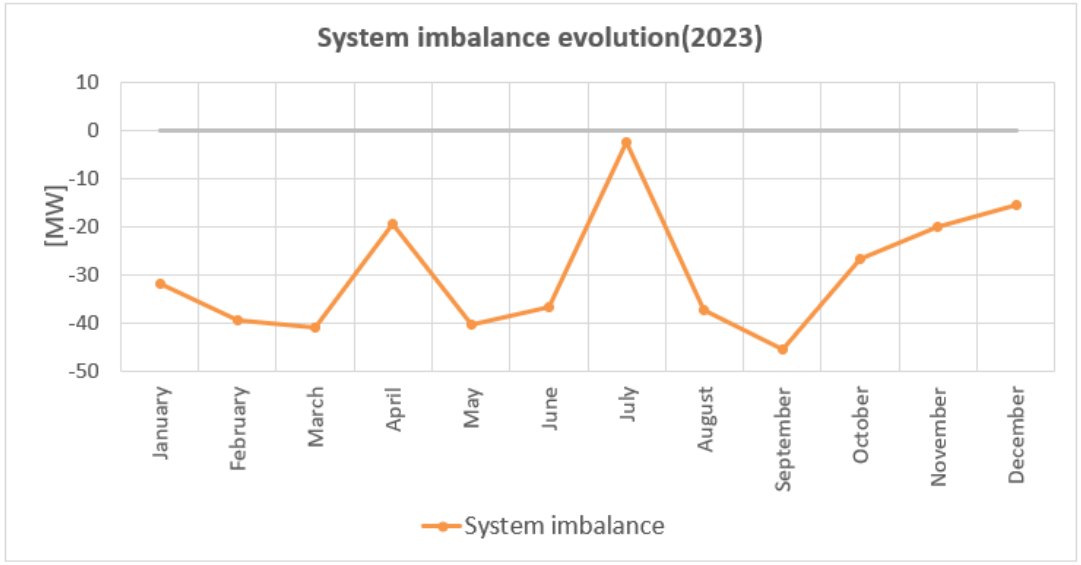
- **DAM prices remained a main driver of mFRR capacity prices**, **but** increasing number of outliers smoothens the relationship. Outliers are mostly linked to periods with **observed lower liquidity**.

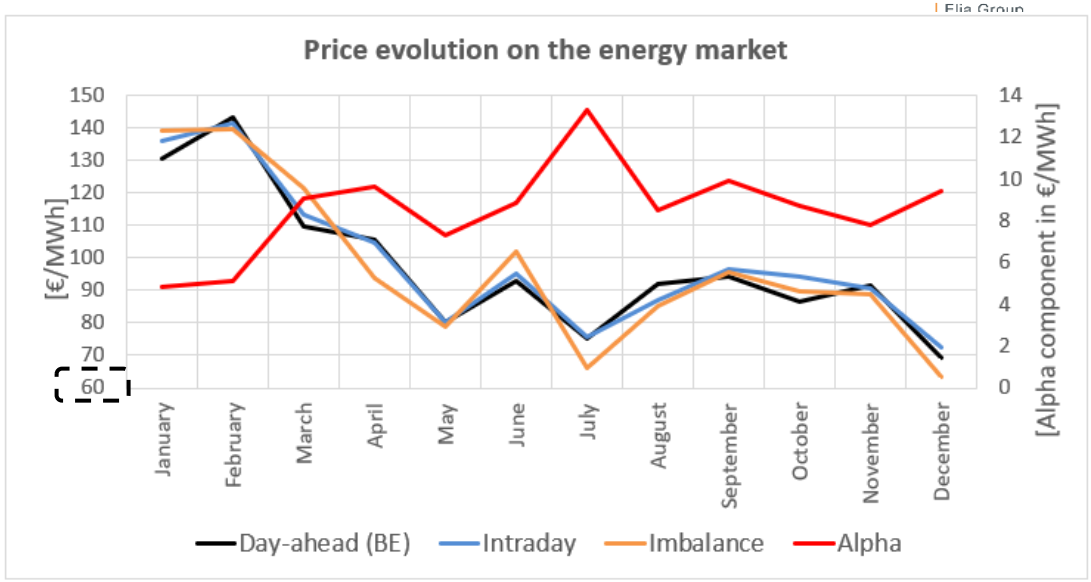
- As a consequence, **mFRR costs increase in tighter liquidity situation**, although the impact was less pronounced in 2023 than in 2022.

- In comparison to 2022, **the occurrence of Gate2 auction due to lack of liquidity was very limited**, only 2 occurrences in October'23 compared 18 in 2022.



System Imbalance (SI) mainly short and imbalance prices followed the DAM evolution.





- **System imbalance (SI) was on average negative** throughout the year, i.e. -29,4 MW in 2023 compared to -26,3 MW in 2022.

- **Imbalance price followed the average (DAM) electricity price** trend. Volatility was nevertheless higher and some spike prices (> 1000 €/MWh) were observed.

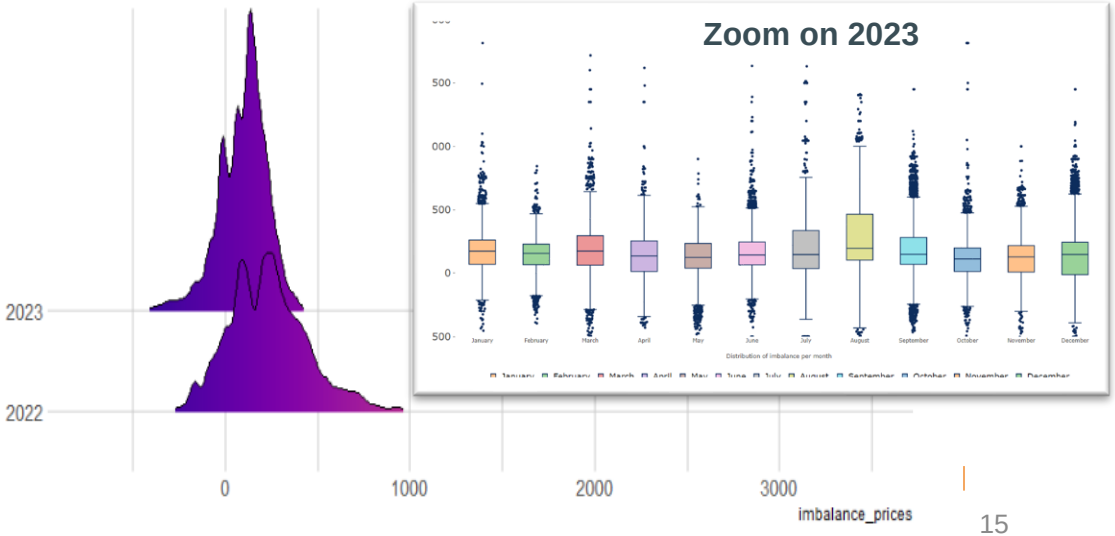
- **Imbalance prices mainly driven by aFRR prices** (78% on a qh basis).

  - In comparison to 2022, the imbalance prices in 2023, in case of long SI, migrated into the negative side, mainly driven by aFRR.

  - The alpha parameter triggered more frequently (9371 qh, 26 % of time) in comparison to 2022, a.o. since due to structural high prices in 2022 the alpha parameter was less activated in 2022.

- Summer period faced **incompressibility risks** but overall the impact remained limited

Imbalance price distribution in 2022 and 2023



Transfer of Energy

Statistics 2023

ToE statistics – mFRR DP_{PG}

	ToE		Opt-Out		Pass Through		Total	
	2022	**2023**	**2022**	**2023**	**2022**	**2023**	**2022**	**2023**
# Delivery Points	25	28	223	297	0	0	248	325
Sum DP $_{mFRR,Max,Up}$ (MW)	128	132	1292	1805	0	0	1420	1937
% Sum DP $_{mFRR,Max,Up}$	9%	7%	91%	93%	0%	0%	100%	100%

Situation December 2023:

- Number of BSPs with mFRR DP_{PG}: 5
- Number of Suppliers: 16

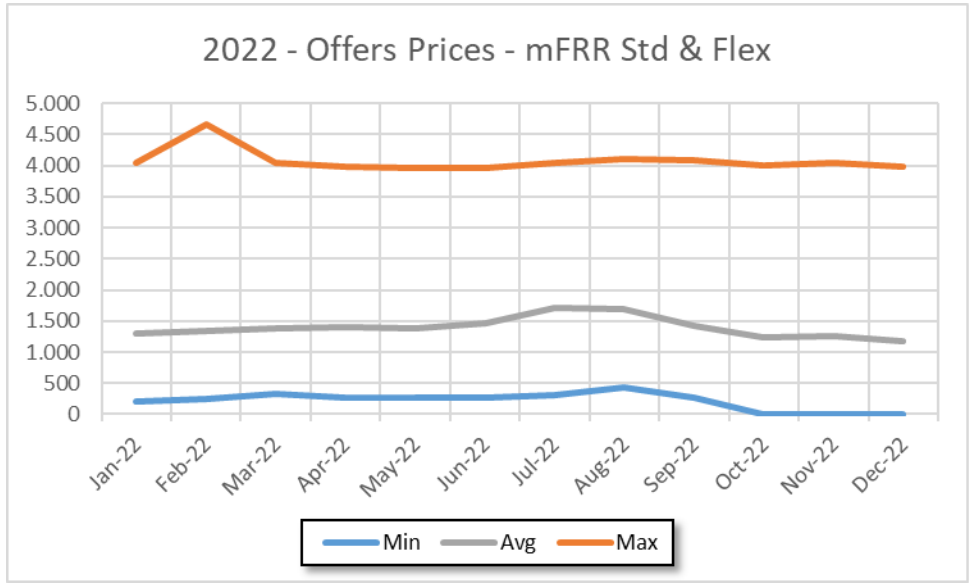
mFRR DP_{PG} PQ Volume	mFRR Standard & Flex	mFRR Flex only
Dec 2022	604 MW	7 MW
Dec 2023	681 MW	1 MW

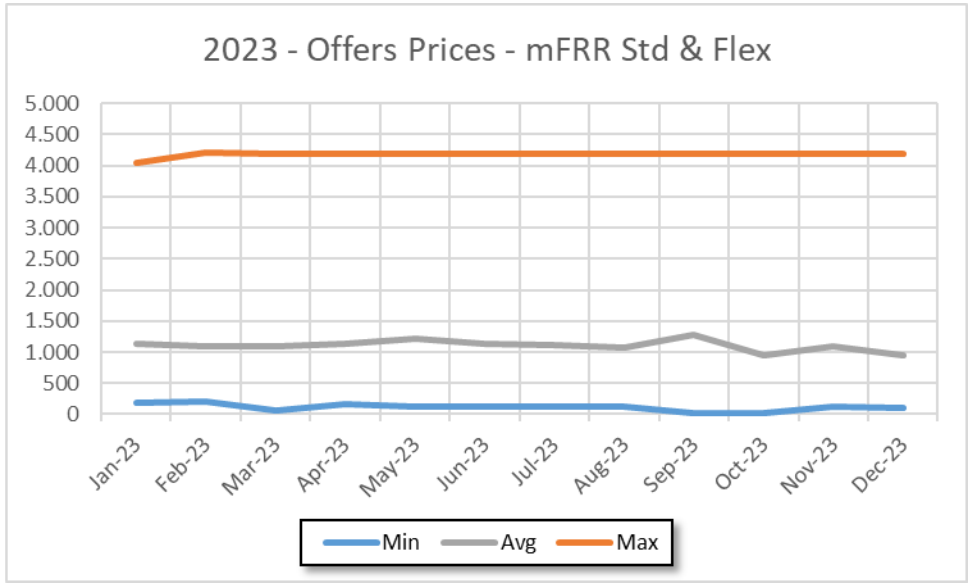
➔ Compared to 2022 we observe a slight increase of ToE DPs. Over the past years we observe more Opt-Out agreements provided by the BSP.

Balancing energy

Statistics 2023

Contracted mFRR Standard & Flex Energy Bids (offered)





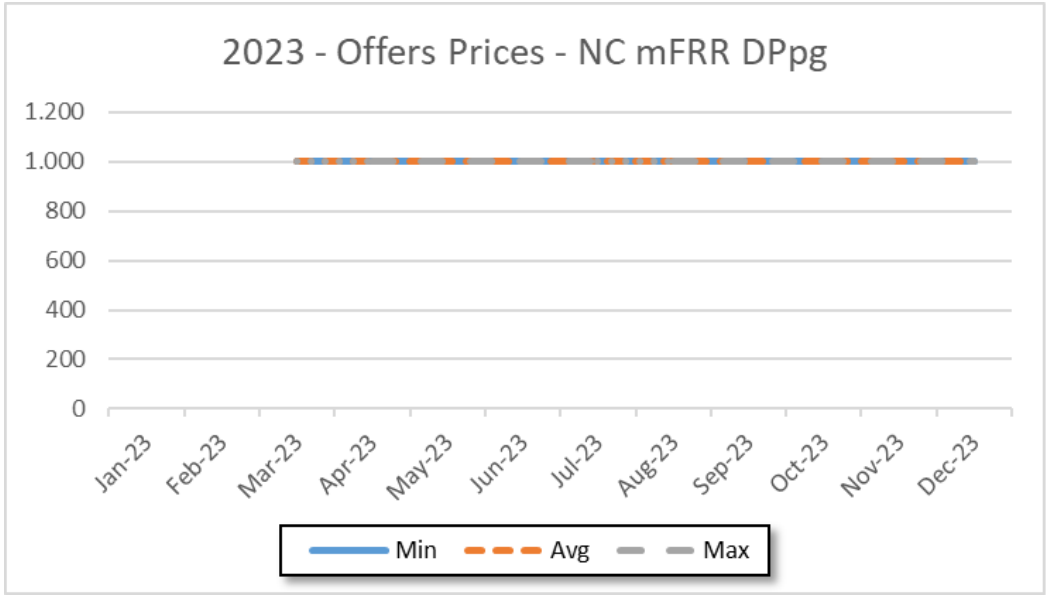
mFRR Std & Flex	Min (€/MWh)	Average (€/MWh)	Max (€/MWh)
2022	0	1.400	4.670
2023	10	1.103	4.206

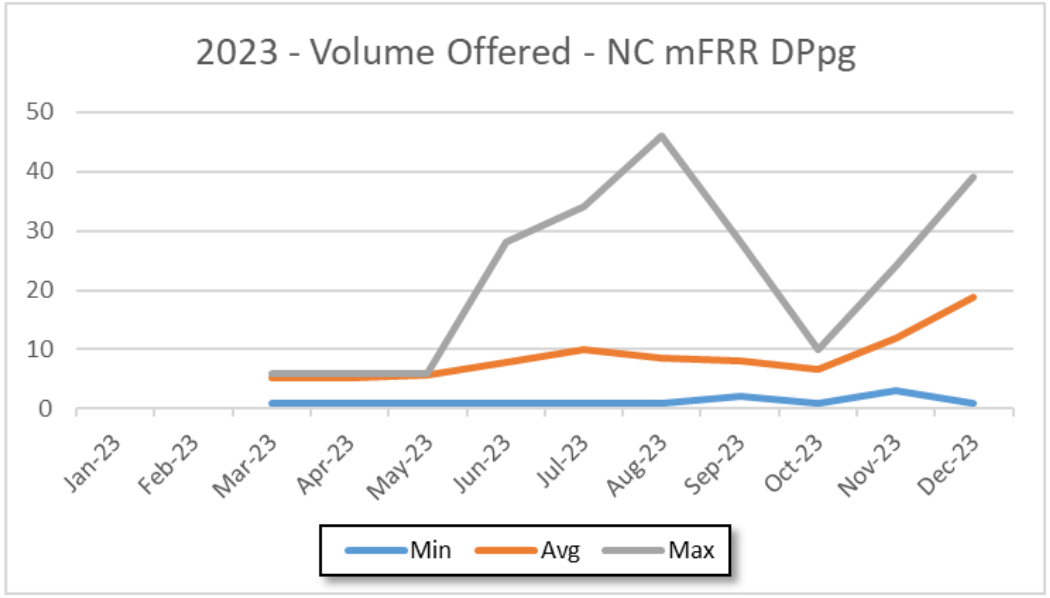
- Important decrease of average price for mFRR

Non-Contracted mFRR - Energy Bids DP_{PG}

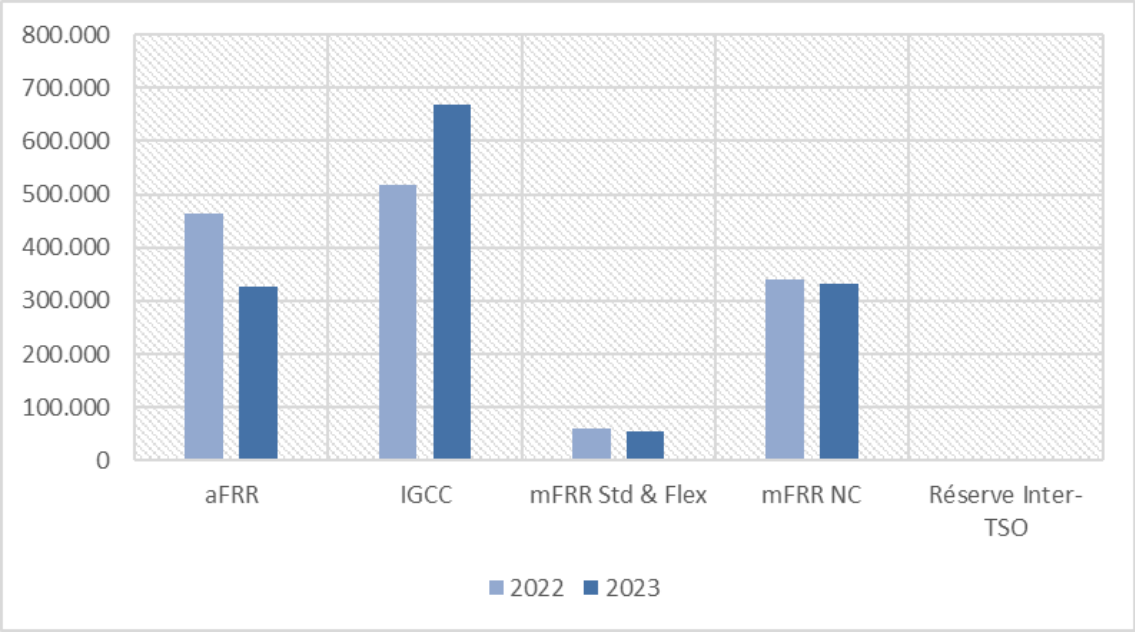
No energy bids mFRR NC submitted in 2022 from delivery points DP_{PG}.

mFRR DP_{PG} NC submitted as from March 2023





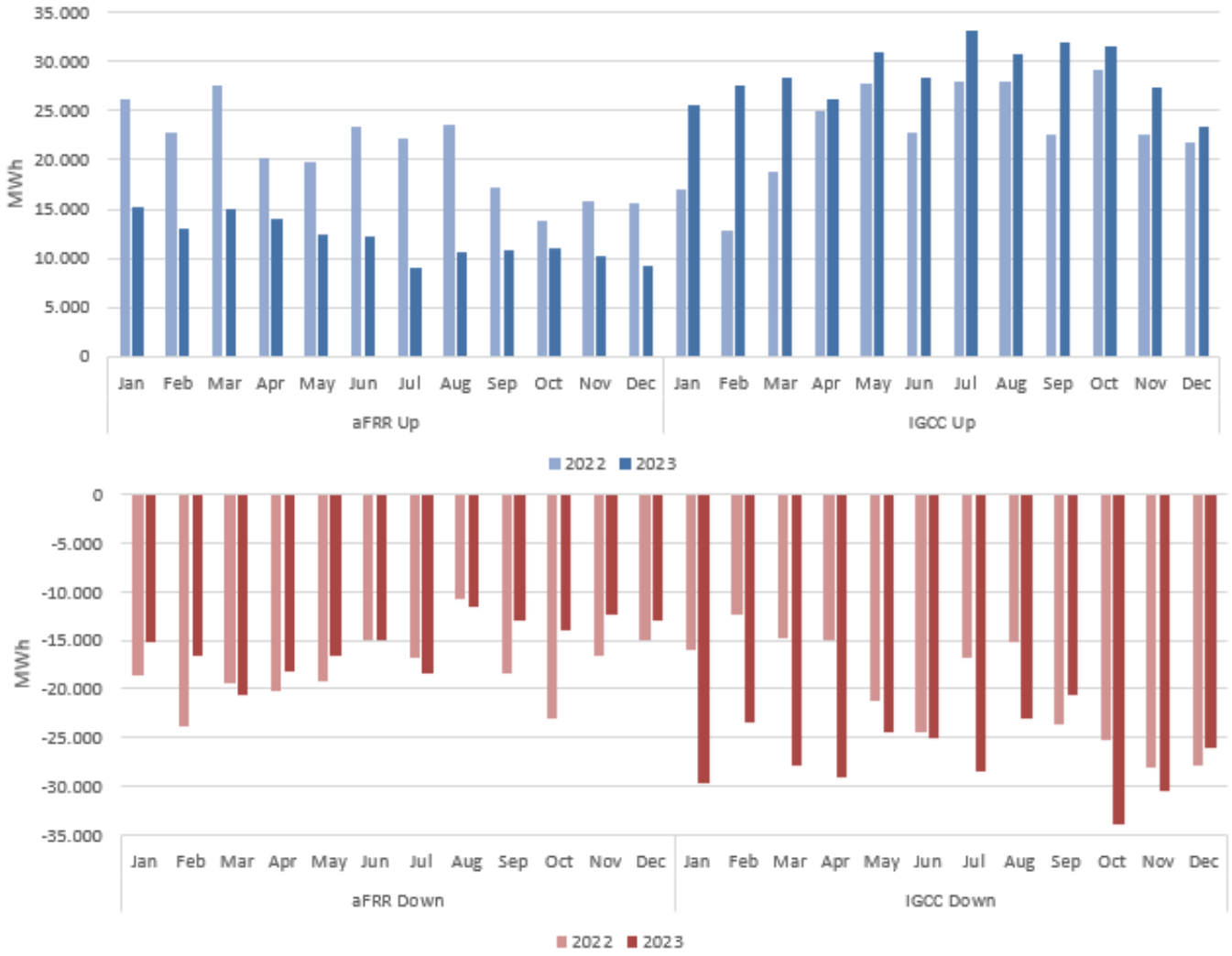
Balancing Energy Activated



Total balancing energy activated or satisfied via IGCC [MWh]	
2022	**2023**
1.383.441	1.383.031

Total balancing energy activated (incl. satisfied volume via IGCC) remains similar to previous year

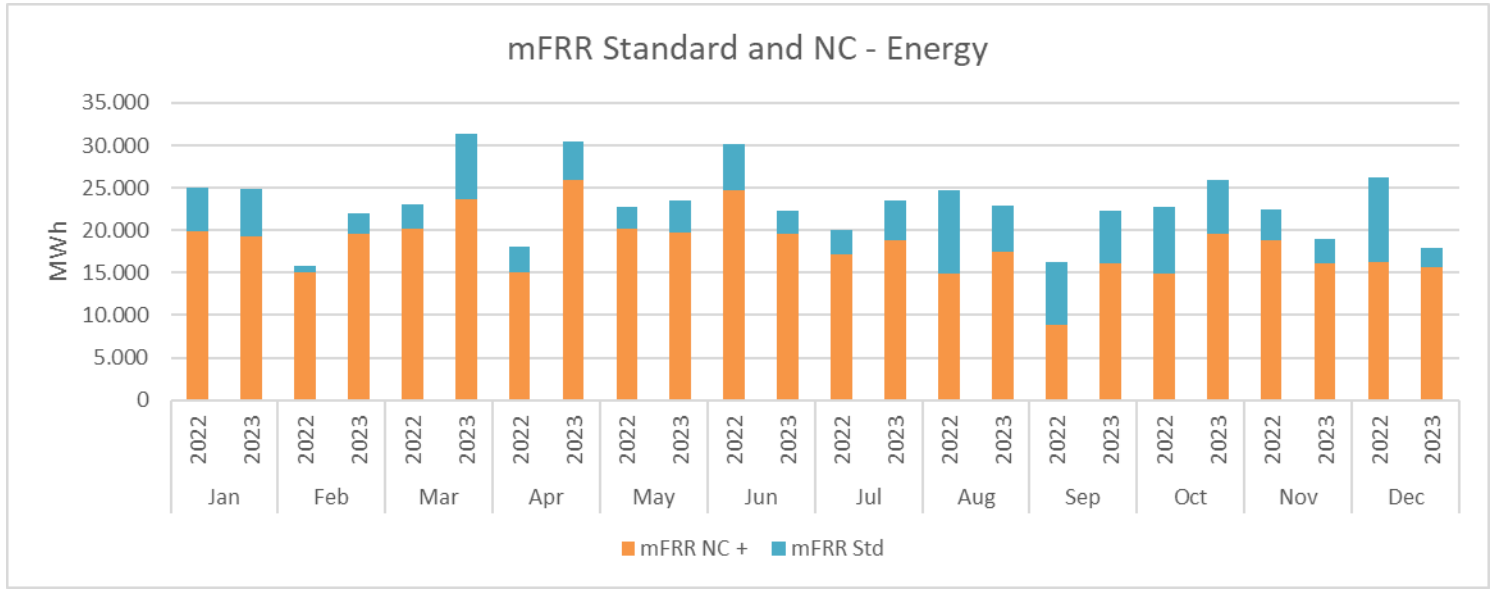
Balancing Energy - automatic activation



Balancing Energy [MWh]	aFRR +	aFRR -	IGCC +	IGCC -
2022	248.308	-216.886	276.154	-240.505
2023	142.896	-184.195	344.908	-322.276

- **Lower aFRR activated volume than previous year.**
- **Higher volume satisfied with IGCC**

Balancing Energy - Manual activation Upwards (mFRR UP)

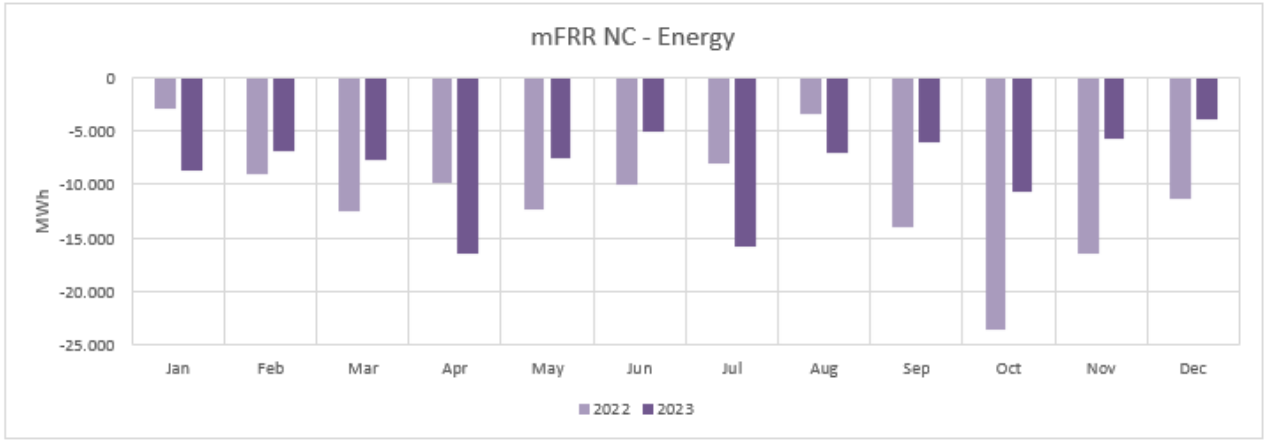


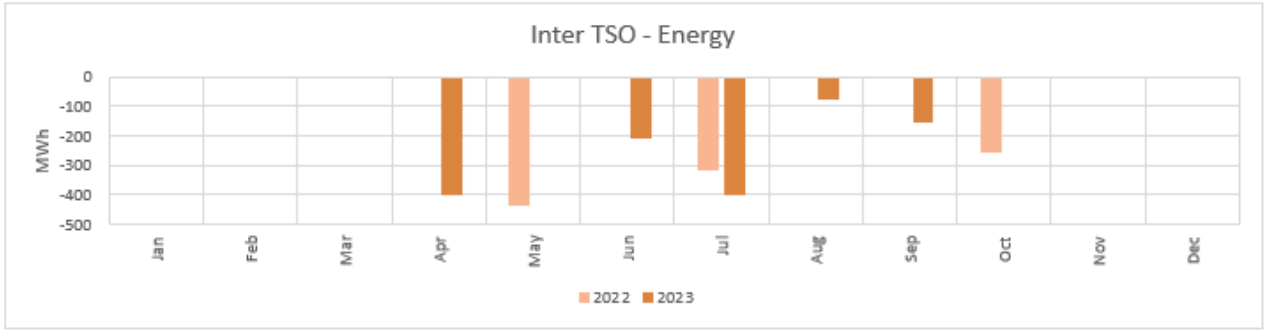
Balancing Energy in MWh	mFRR NC +	mFRR Std
2022	205.906	61.564
2023	231.497	54.590

➢ **No mFRR flex and InterTSO activated upwards in 2023.**

NC = non-contracted

Balancing Energy - Manual activation Downwards (mFRR DOWN)





Balancing Energy in MWh	mFRR NC-	InterTSO Export
2022	-133.107	-1.011
2023	-101.427	-1.242

- **On average lower volumes activated downwards, especially at the end of 2023 with respect to previous year.**

NC = non-contracted

FCR Activation Control

- Maximum 6 controls and 2 controls per CCTU per month
- Failure factor = (FCR Requested - FCR Supplied) / FCR Requested
- Criteria of classification in table below:
  - If failure factor ≤ 0% → Sufficient
  - If 0% < failure factor ≤ 30% → Lightly insufficient
  - If failure factor > 30% → Largely insufficient

	Sufficient reaction		Slightly insufficient reaction		Strong insufficient reaction		Total	
Year	2023	2022	2023	2022	2023	2022	2023	2022
FCR controls	**168**	**200**	**21**	**4**	**21**	**7**	**210**	**211**
%	**80%**	**95%**	**10%**	**2%**	**10%**	**3%**	**100%**	**100%**

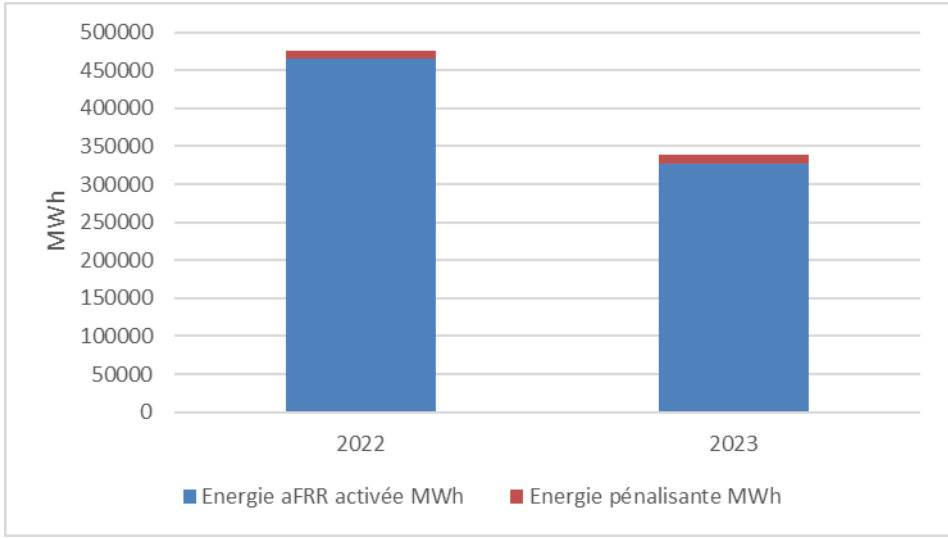
- Most of the controls are performed on BSP providing FCR with pool of DP PG
- Decrease of performance compared to last year

aFRR Activation Control

- Continuous control based on telemeasures

- Penalized energy equals to the difference between the aFRR Supplied and aFRR Requested taking into account a tolerance of 15% of energy bid volume

Penalized energy MWh		Total
2023	Penalized energy MWh	11.734
	aFRR energy activated MWh	327.092
	% Penalized energy / energy activated	3,6%
2022	Penalized energy MWh	10.903
	aFRR energy activated MWh	465.193
	% Penalized energy / energy activated	2,3%

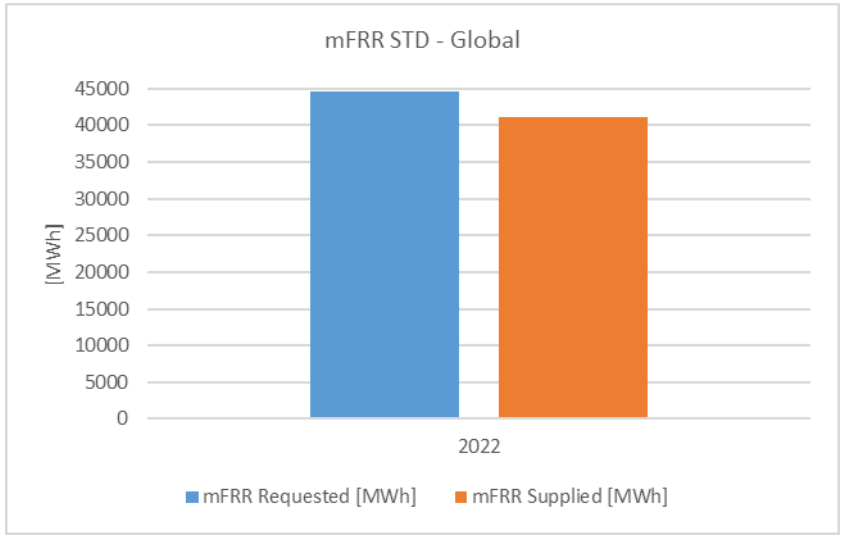


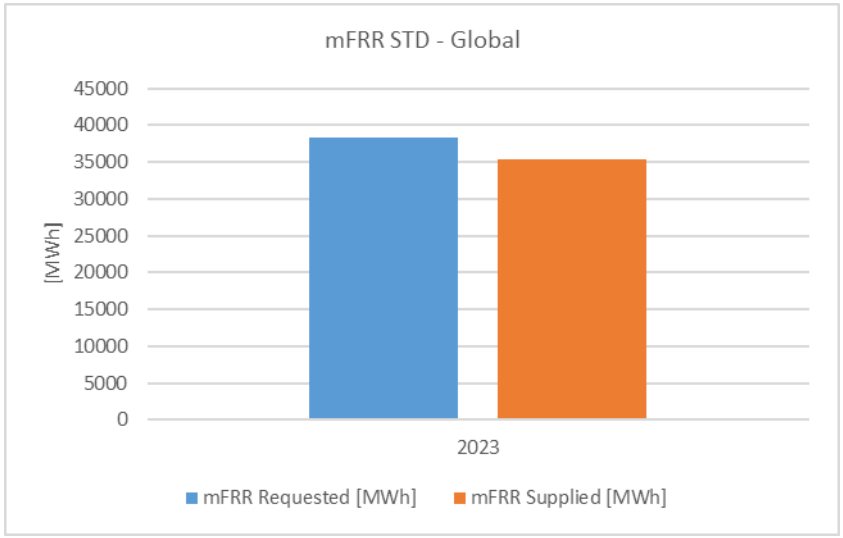
- **Situation Dec 2023: Increase of penalized energy compared to last year**

mFRR Activation Control

- Control based on metering data.
- Missing energy equals to the difference between the mFRR Supplied and mFRR Requested.

mFRR		Total
2023	Energy Requested MWh	38.369
	Energy Missing MWh	2.977
	% Energy Missing / Energy Requested	7,76%
2022	Energy Requested MWh	44.546
	Energy Missing MWh	3.483
	% Energy Missing / Energy Requested	7,82%



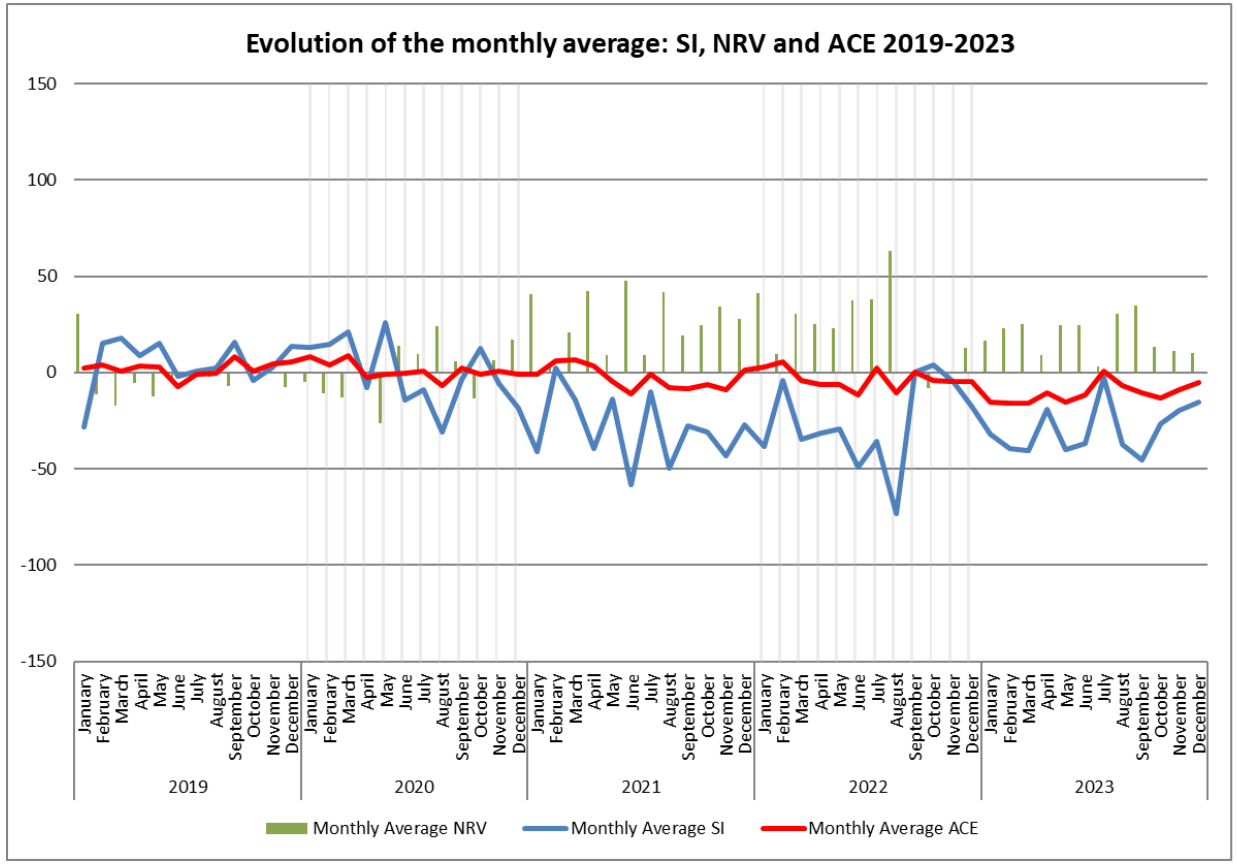


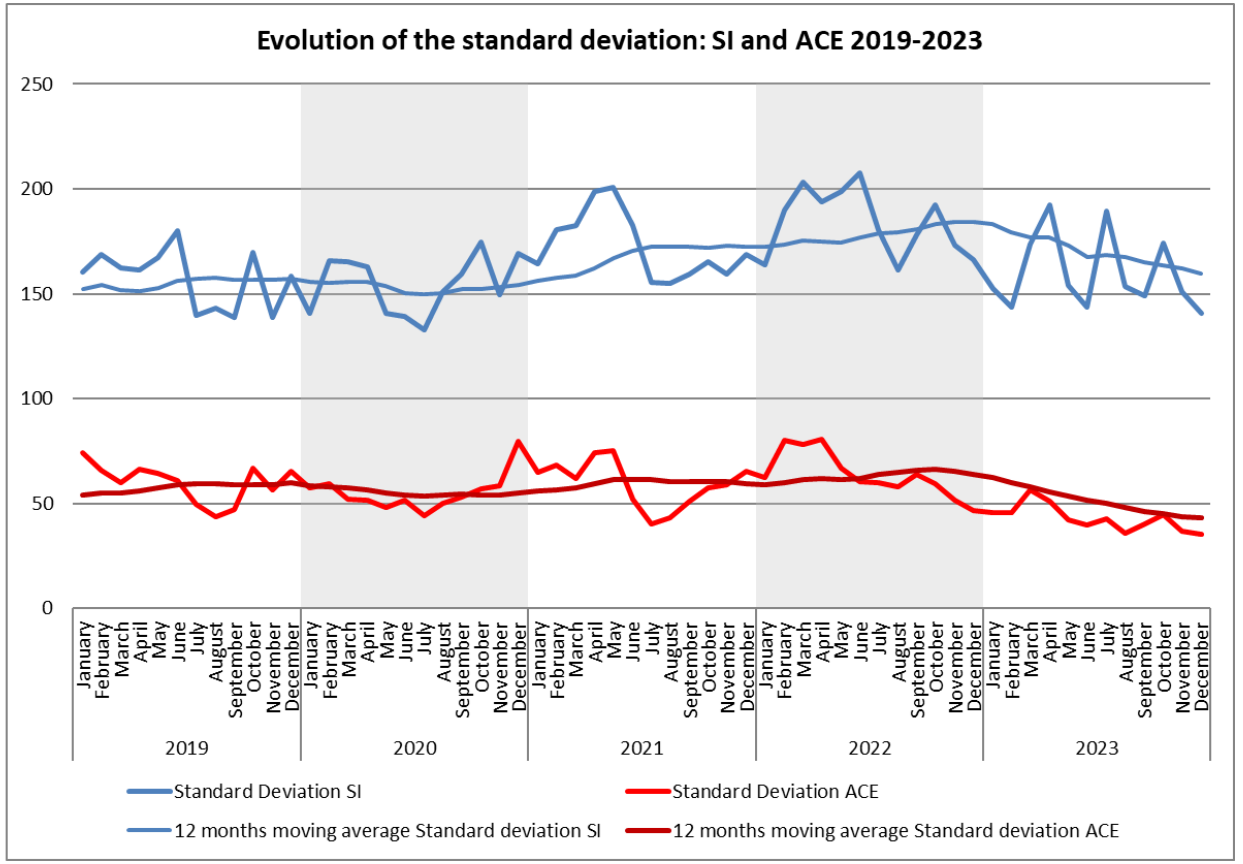
In order to accurately represent the service delivery and to prevent any overlap in the reaction between BSPs, the following way to show the performance is applied:

- To prevent over-delivery, we limited the energy supplied to match the energy requested.
- To prevent under-delivery, we ensured the energy supplied never dropped below 0.

Quality
Statistics 2023

Evolution System Imbalance (last 5 years)





Quality Results

- Limits established in SOGL for FRCE (or ACE)
- Level 1 is similar to prior ACE Std Deviation indicator
- Level 2 is used for the extreme values (prior sigma 90, 99)
- For 2023, we are below the 30% and 5% required for Level 1 and Level 2 respectively

Monitoring FRCE Levels 1 & 2		Niveau 1		Niveau 2	
		Ref Niveau 1 (MW):	85	Ref Niveau 2 (MW):	160
Period	# QH	Target % Ref	30%	Target % Ref	5%
	Period	# QH > Ref Niveau 1	% Ref	# QH > Ref Niveau 2	% Ref
JAN	2.976	127	4,3%	33	1,1%
FEB	2.688	129	4,8%	21	0,8%
MAR	2.972	172	5,8%	48	1,6%
APR	2.880	160	5,6%	44	1,5%
MAY	2.976	154	5,2%	32	1,1%
JUNE	2.880	114	4,0%	30	1,0%
JULY	2.976	146	4,9%	37	1,2%
AUG	2.976	107	3,6%	22	0,7%
SEPT	2.880	132	4,6%	28	1,0%
OCT	2.980	162	5,4%	35	1,2%
NOV	2.880	102	3,5%	14	0,5%
DEC	2.976	81	2,7%	18	0,6%
YEAR	35.040	1.586	4,5%	362	1,0%

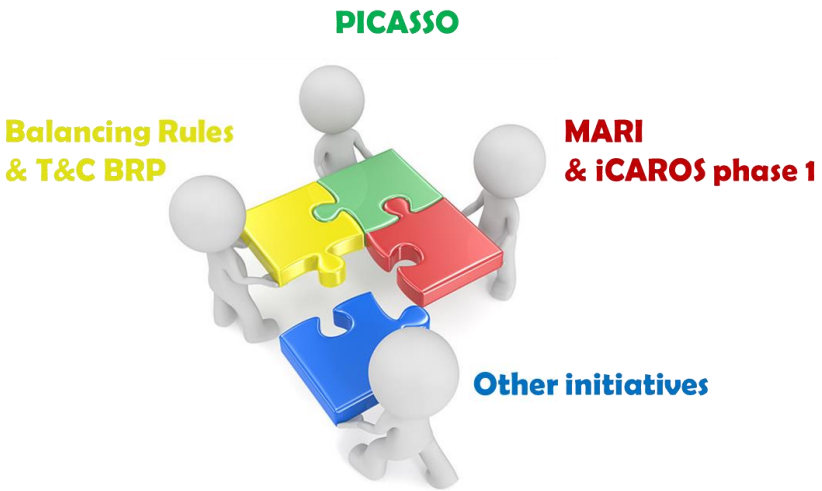
– **Respect in 2023 of limits of SOGL requirement for FRCE levels 1 and 2**

EU & BE Balancing Program Update

Cécile Pellegrin

Agenda of today's presentation

- MARI & iCAROS phase 1
- aFRR Design Evolutions
  & Connection to PICASSO
- Coming stakeholder management interactions



Update of the Roadmap

- **Local go live** of the new mFRR bidding and iCAROS phase 1 **Mid May 2024**
- Connection to **EU mFRR balancing energy platform June 2024**
- Connection to **EU aFRR balancing energy platform October 2024**

MARI & iCAROS phase 1

- As indicated in the WG BAL of 18th of December, the new local go live remains conditioned to:
  - The effective approval of these regulated documents before end of February 2024
  - The approval of the Amended T&C BRP
  - The readiness of the market parties (i.e. successful testing end of March 2024 for Mid-May 2024 go live)

⇒ A go/no go check will be done end of March 2024 in order to ensure the Local go live of the new mFRR bidding and iCAROS phase 1 Mid-May 2024

⇒ On the side of the regulated document, the **CREG has approved 5 out of the 6 regulated documents** of the contractual framework for mFRR, outage planning, scheduling and redispatching required for these go lives:

- the T&C BSP mFRR,
- the Balancing Rules,
- the T&C OPA,
- the T&C SA
- the Rules for Coordination and Congestion Management.

⇒ A **decision on the T&C BRP is still expected before the end of this month**.

BUSINESS TESTING PROTOCOLS WITH MARKET PARTIES

13/02 + 22–23/02 iCAROS & MARI Ind.Test 1&2

26/02 Back-up iCAROS & MARI Ind. Test 1&2

4-8/03 Common testing week 1

End March Go/No-Go MP readiness

February

- Re-do ICAROS & MARI 1&2 tests not completed (unchanged scope)
- Re-do ICAROS & MARI 3 tests (call) not completed (unchanged scope)
- Ad-hoc request of BSP for specific activations
- Ad-hoc sessions with BSP for specific scenarios

March

- Common testing: submission of production-like data (# of units, # and structure of bids, volumes, …) for bids, schedules, outages, … for all MPs at the same time and continuously during two weeks.
- Common testing week 1 includes tests generally similar in scope to ICAROS & MARI 2 but spontaneous without specific scenario + scenarios like back-up processes.

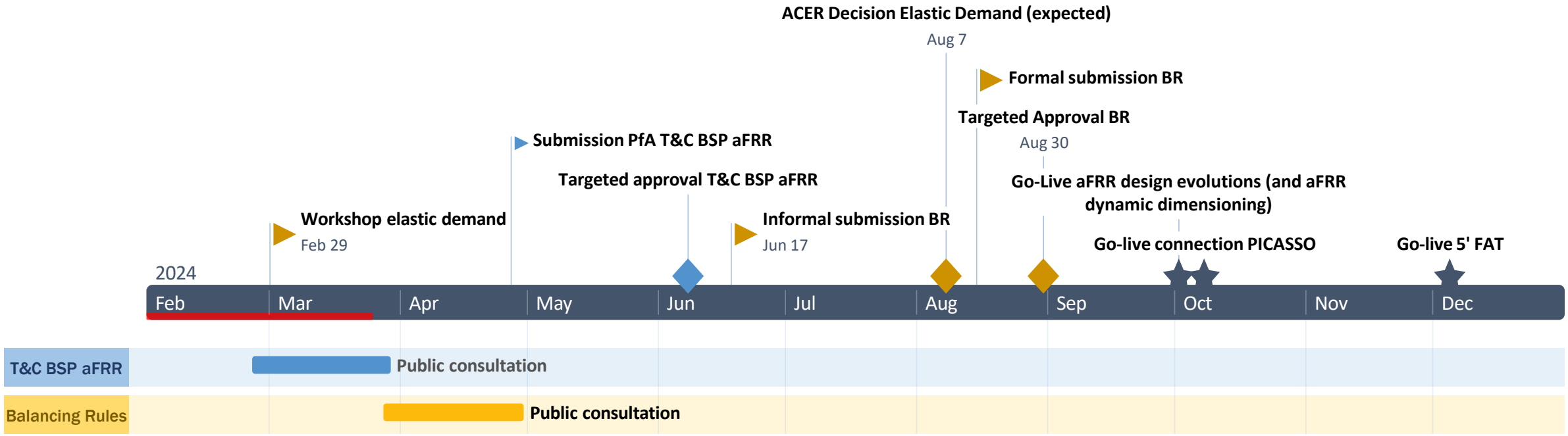
w5 w6 w7 w8 w9 w10 w11 w12 w13

12–29/02 : ICAROS & MARI Ind. Test 3

Pre-Requisite: Success of Test 1&2 (if not already the case in 2023)

18-22/03 Common testing week 2

PICASSO
& aFRR Design evolutions



- **Regulatory trajectory on track:**
  - BE: Public consultation T&C BSP aFRR ongoing and almost finalized
  - BE: Public consultation Balancing Rules foreseen to be launched end this week
  - EU: Proposal for amendments to the aFRR IF and the Pricing Methodology have been submitted
- **Implementations on track:**
  - Implementation of mitigation measures are ongoing at local and European level

Coming stakeholder management interactions

- Next interactions
  - Ongoing & coming consultations
    - Consultation of aFRR T&C [28/02/24-29/03/24]
    - Consultation of Balancing rules updated for PICASSO [End of March till end of April 24] (exact start and end date to be confirmed)
  - Announcements & communication linked to the local go live of the new mFRR bidding and iCAROS phase 1

Contact persons

KAM Energy

Amandine Leroux / Arno Motté / Nicolas Koelman / Sybille Mettens

Implementation ad hoc sessions (on request)

- Q&A sessions dedicated to design and implementation questions
- IT questions & Live debugging sessions with ELIA IT-team

Flexibility Roadmap

Anna Tsiokanos – Amandine Leroux – Nicolas Pierreux

Towards Energy & Grid Solutions 2027…

01.03.2024 | Brussels | CMS

Clear ambitions…

2021

FIT FOR 55

Increased decarbonisation

-55%

in 2030 (compared with 1990)

2022

REPowerEU

More renewables

Accelerated expansion of renewable energy resources & infrastructure

2023

Green Deal Industrial Plan

More investments

Anchoring Europe's net zero industry

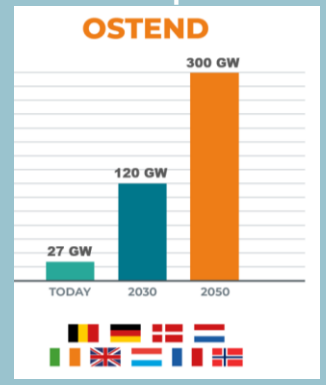
The North Sea Summit

Ostend, 24th of April 2023

2023

North Sea Summit

More offshore development



Leading to a significant increase in expected electricity demand driven by electrification in industry, transport and heating

Leading to an accelerated integration of renewable energy sources in Belgium

Consumption

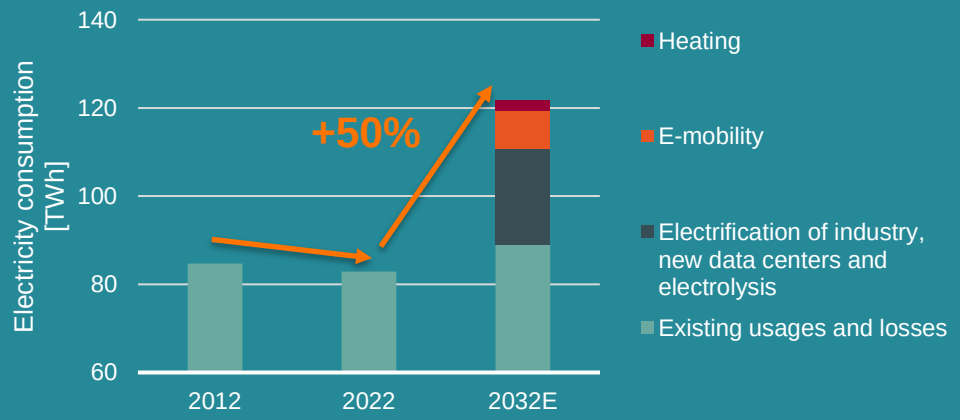

+10TWh


+20TWh


+10TWh

READY FOR **50%** INCREASE **BY 2032**

Expected electricity consumption in Belgium



Production

Solar PV

x2.2

In 2032

Onshore Wind

x2.1

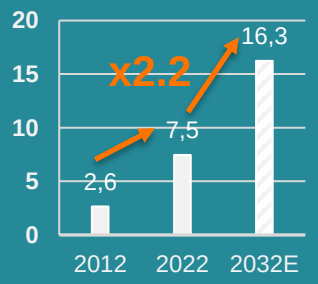
In 2032

Offshore Wind

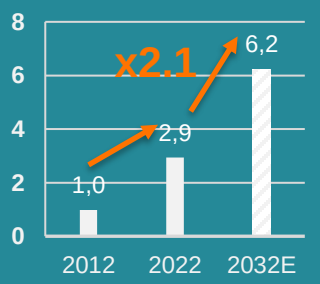
x2.5

In 2032

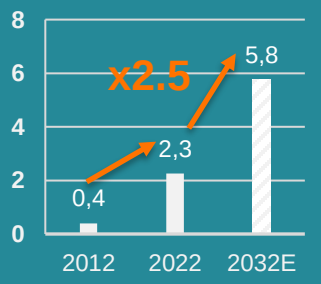
Solar PV capacity in GW



Onshore wind capacity in GW



Offshore wind capacity in GW



Source: Central scenario Adequacy & flexibility study

Our Priorities

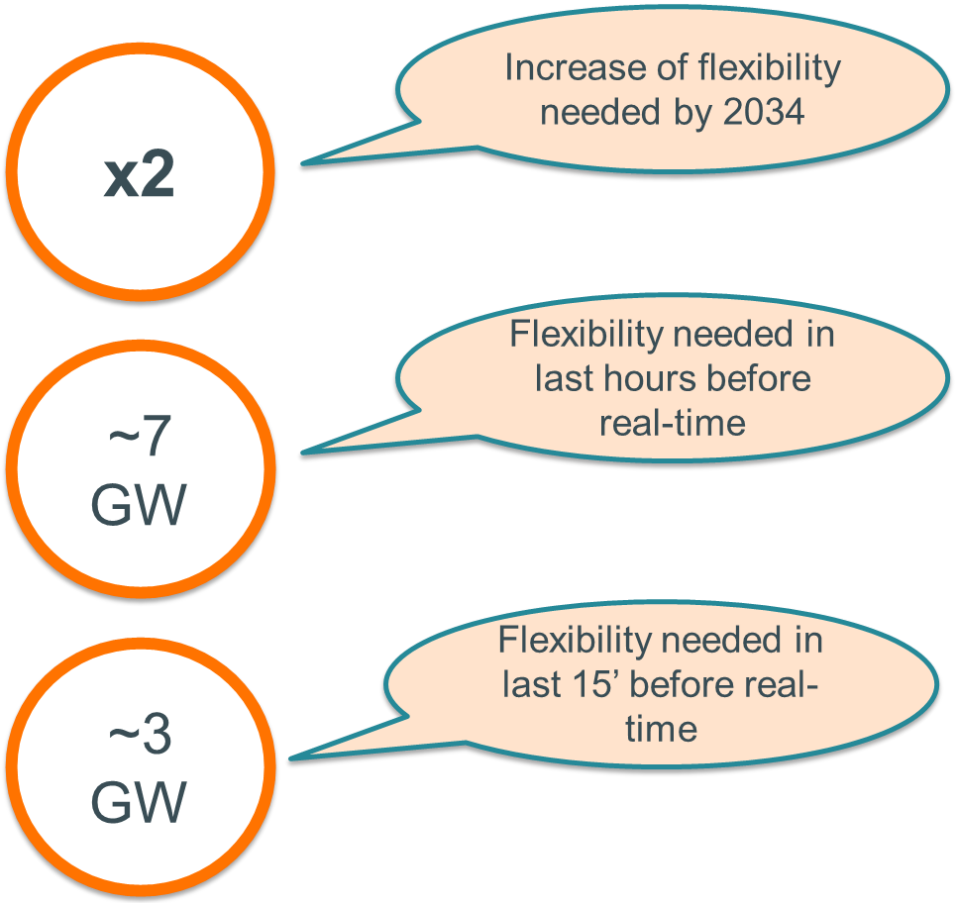
1
Grid Infrastructure
For an efficient and orderly energy transition, the grid needs to be ready on time

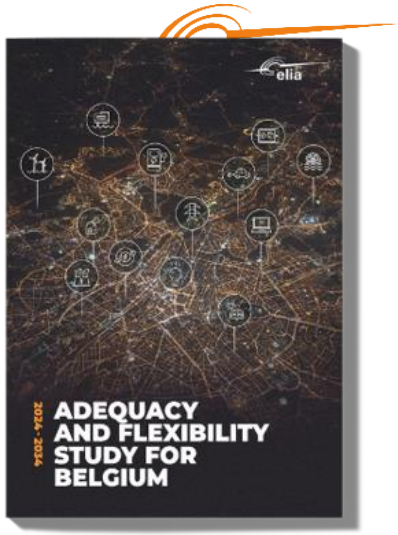
2
Adequacy
Ensure security of supply during the increase of electricity consumption and intermittent production sources

3
Flexibility
Ensure consumers and industry can valorize their flexibility and benefit from the energy transition

FOCUS TODAY

Flexibility outlook: ADFLEX 2023



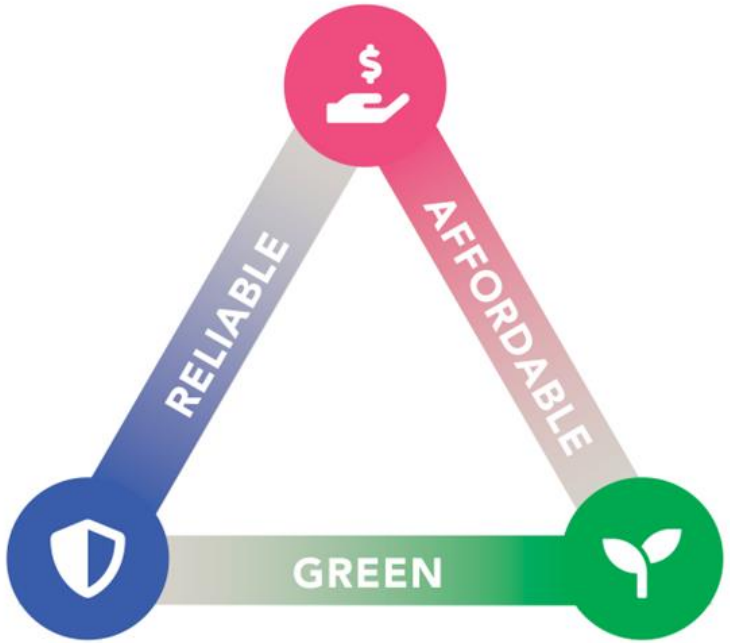


Sufficient flexibility means will be available in the system…

… the **challenge is to unlock this flexibility** (industrial flex, end-user flex such as electric vehicle, heat pumps, home batteries & solar panels,…). Development of downward flexibility will become increasingly important.

Flexibility challenges: affordability

- The **energy transition** should not endanger the **reliability** of the system but also be **affordable** for consumers
- Elia will therefore strive for an **efficient system management**, with regards to both **energy solutions** and **grid solutions**



Towards Energy Solutions 2027…

Efficient balancing model combines Implicit and explicit flexibility

Increasing flexibility needs

Covered by flexibility means

Driven by generation mix

Price-based (implicit)

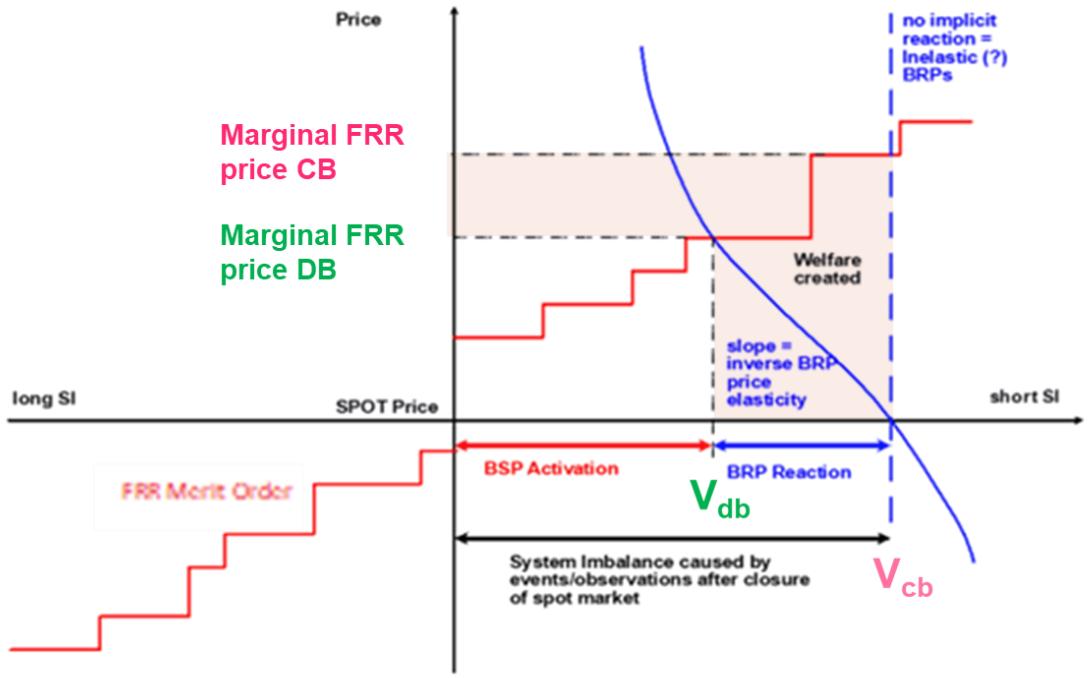
Volume-based (explicit)*

** SOGL minimum = dimensioning incident*

FOSTER implicit contribution to system balance

MINIMISE balancing cost (reservation & activation), acting on volumes & prices

Maximize welfare by using the most optimal mix of implicit and explicit



Energy Solutions 2024-2027: Initiatives to minimize balancing costs

Flexibility Needs and Means: efficient reserves dimensioning

2024 2025 2026 2027

Deepen the understanding on the market: FLEX TRACK & TRACE

Dimension precisely:
aFRR DYNAMIC DIMENSIONING
(Oct 2024)

Procure efficiently:
PARTIAL PROCUREMENT FRR
(Robustness check)

Energy Solutions 2024-2027: Initiatives to minimize balancing costs

Increase liquidity and competition in Balancing Products

2024 2025 2026 2027

XB liquidity & competition:
MARI (Jun 2024)
PICASSO (Oct 2024)

aFRR evolutions:
AUCTION IN D-1,
RT BASELINE, ACTIVATION METHOD, OPENING TO LV

Value stacking:
Further facilitate COMBOS

Continuously improve design: CRI FILTERING, FRR ACTIVATION TRIGGERS, ASSESS AUCTION PROCESS,…

FCR DECLARATIVE BASELINE & CONTINUOUS MONITORING

Facilitation of PQ: PQ WINDOW, aFRR ASYMMETRIC PQ, ALLOCATION OF PQ VOLUME TO GU

Foster participation of LV flexibility: CONDITIONS FOR DPs, BASELINE AND PQ, BID SUBMISSION,…

WILL LARGELY DEPEND ON NC DR

Increase processes robustness & user friendliness: IMPROVE BIDDING TOOLS , …

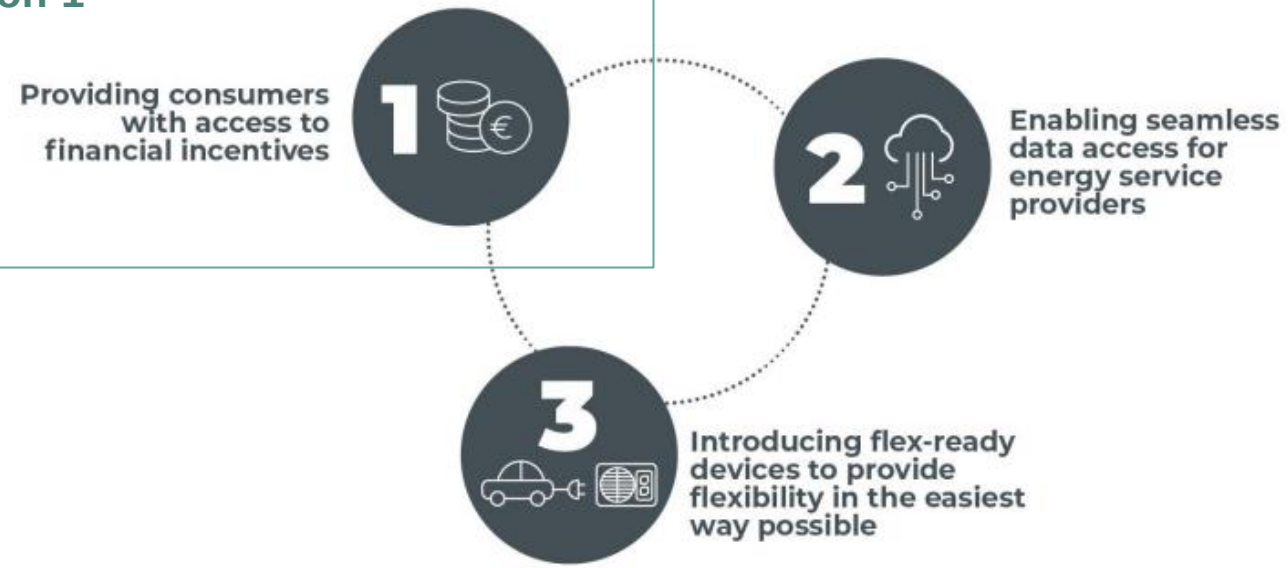
Improve market parties' risk management: FACILITATE SETTLEMENT BSPs

Energy Solutions 2024-2027: Initiatives to minimize costs
Increase competition

Customers want to be in control of their energy costs

We develop **energy services** to increase participation of flexible assets driven by **financial incentives** (day-ahead, intraday and real-time balancing)

The Power of Flex (Viewpoint 2023)
Action 1



Who is directly incentivized by financial incentives?
The Balance Responsible Party

We want to foster innovative solutions proposed by BRPs to their customers

- ✓ Decrease barriers to access to the role of BRP
- ✓ Increase competition
- ✓ Facilitate & Digitalize the BRP
- ✓ Evolve to Real-Time Price

STEP 1 - Digitalize and facilitate BRP of tomorrow

2024 2025

DiMaX
(Direct Market Access)

Digital BRP of tomorrow

- **Digitalization BRP**
- **Multiple BRP**
- **Additional functionalities**
- **E-Wallet & faster settlement**

2024 Epex/NordPool Discussions

2024 BRP Contract rewriting

2024 Review inconsistence penalties

2025 Role of BRP trader

STEP 2 - Evolve to a Real-Time Price

Game changer for Real-Time Price : large scale batteries!

2024 2025

Smart Balancing Controller

- **Real-Time Price**
- **Simplify**

2024 Second design note (formula)

2024 Parallel run

2024 Campaign European TSOs

2024 Hackathon 2024 & RTP Event

STEP 3 - Remove all “non-related obligations” from the BRP role

2024 2025

EoEB for Explicit Flex

- **mFRR HV & MV & LV**
- **aFRR HV & MV & LV**
- **EoEB**

2024 2025

ToE Rules & related implementation plan

2024

Study on combos (xBRP & explicit flex)

2024 2025

Split BRP/SA

Request from Customers

STEP 4 - Energy Community (on request only)

2024 2025

Energy Community

- TSO only
- Cross-voltage

2024

Prospection on possible POC for Cross-voltage

Towards Grid Solutions 2027…

Grid Solutions RoadMap (1/2)

Improve information and bidding process with all relevant resources and redispatch them in a reliable way in order to optimize usage of existing grid

Icaros: deep review of the process of coordination of assets and congestion management

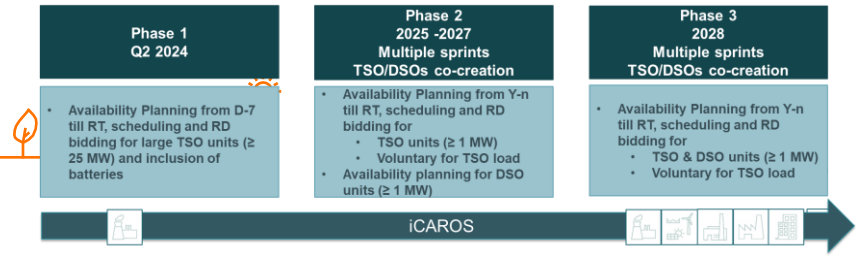
1) Open up outage planning, scheduling and redispatching to
   - **all technologies production-storage and demand** as of 1MW
   - **all parties,** by splitting up the roles of BSP/SA /OPA & BRP and hence providing more choices/empowering the grid user

in line with EU legislation SOGL/EBGL

2) Modernize and facilitate data exchange related to outage planning, scheduling and redispatch

3) Provide more opportunities to market parties in ID while keeping the costs for society under control

Evolutions and implementations are foreseen to be developed gradually, into 3 main phases



Grid Solutions RoadMap (2/2)

Develop a grid that can host the increase of RES and demand <u>in time</u> while rationalizing the (investment) costs for society

Flexibility will allow to:

- connect grid users ahead of realisation of grid investments;
- rationalise grid investments (CAPEX) in particular cases.

G-Flex product (as is): win-win for grid user (early connection) and society (efficient incentives, costs borne by GU…)

Framework for flexible access must be further elaborated given strong increase of EOS/EDS (RES, storage, electrification,…)

- ***<u>Grid planning:</u>*** methodology, applied criteria to propose flexibel access, capacity reservation process,…
- ***<u>Operational aspects:</u>*** activation principles,…
- ***<u>Product design:</u>*** integration with balancing, ROSC,…

Grid Solutions 2024-2027: GUFlex4CM - *Develop a grid that can host the increase of RES and demand in time while rationalizing the (investment) costs for society*

2024 | 2025 | > 2026…

INCENTIVE study

Clarify methodologies for grid development and connection :

- Methodology & criteria for connection studies
- Review capacity reservation process (EOS/EDS)
- Cost-allocation (who bears the costs)
- Guaranties that can be provides

Public consultation design note

Code of Conduct

Clarify operational aspects (focus short term):

- Activation principles for "as is" Gflex contracts in federal grid
- Monitoring of activations

Coordination rules

Define & implement long term vision:

- Legal framework in all regions
- Activation principles
- Product design (new # products ? per technology? / per time step ? DA/ID/RT …)
- Combination with other products (e.g; redispatching, balancing…
- …

Grid Solutions 2024-2027: iCaros - *Develop a grid that can host the increase of RES and demand in time while rationalizing the (investment) costs for society*

2020- 2023 | 2024 | 2025 | > 2026

Icaros phase I

Go live in Q2 2024

- ✓ Focus on PGMs & storage ≥ 25MW
- ✓ Modern data exchange as of W-1
- ✓ Explicit RD bidding
- ✓ CRI filtering

Important note: timings phase II are provisional

- Delayed effective go-live of Icaros phase 1 → consulted timings phase II is delayed
- The focus put in 2024 on addressing flexible connection design might raise impacts on design for iCAROS phase II

Icaros phase II

Step 1: Extend OPA to all timeframes

- ✓ focus on tools and operational facilitation for units ≥ 25MW

Step 2: Studies to prepare next evolutions

(ex. compliancy with ROSC, design demand, design small PGM…)

Step 3: Extend OPA, SA and RD

- ✓ to PGM and storage < 25 MW
- ✓ to demand facilities

Preparatory discussions with DSOs for Icaros phase III

- ✓ Bid filtering principles
- ✓ Common outage planning platform (JOPA)

Grid Solutions 2024-2027: Non-frequency Ancillary Services

Ensure liquidity, foster competition and ensure cost effectiveness

2024 2025 2026 2027

Foster competition by allowing more time to plan investments: INTRODUCTION OF COMPETITIVE DIALOGUE in T&C RSP

Increase transparency: SUPPORTING DOCS & MVAR NEEDS MAP

Consider all technologies: IMPLEMENT INCENTIVE 2023 IN T&C VSP & IT TOOLS

Improve communications with MVAr service providers: UPDATE IT COMMUNICATION TOOLS

Optimize MVAr activation, to better regulate and lower the costs: VOLT CONTROL

DFD

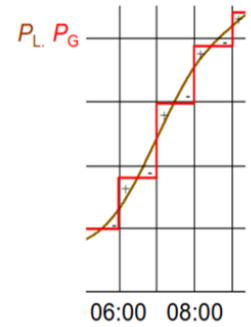
Feedback on report and milestones 2024

Aline Mathy

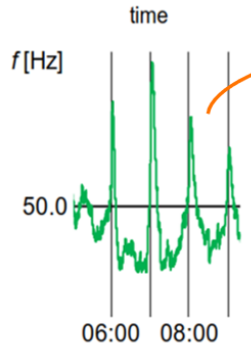
Reminder on incentive

Definition

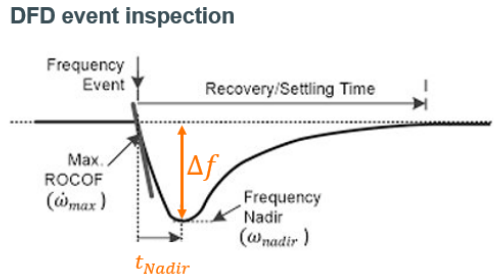
DFDs are phenomena occurring on a **regular basis** resulting from a **load and generation difference during a change of market time unit** which generate a **frequency deviation > 75mHz**



Load and generation difference during a change of Market Time Unit (MTU)



Generates a frequency deviation of more than 75mHz



The frequency nadir is defined as the the instantaneous ACE at the moment the frequency reaches its extremum

Scope

The incentive consisted in:

- the development of **2 forecasts** (DFD + ACE contribution)
- the definition of the best **mitigation measure** (aFRR, mFRR, aFRR+mFRR) to apply in case a DFD is forecasted, and the ACE forecasts indicates a potential contribution by Elia.

Planning

Alignment with CREG

2023

CREG

WGBal

Initial report with offline analysis

CREG

WGBal

Final report with POC result

WGBal

Model performances in POC

DFD

Model	Optimal parameters	Test Period	F1-score			
			Downward DFD	No DFD	Upward DFD	Macro average
Random forest classifier	Depth: 16	AVR 2021 – AVR 2022 (offline)	0.334	0.977	0.348	0.553
		NOV 2023 (POC)	0.272	0.987	0	0.420

- Model, data and training set length possibly needs to be adapted for seasonality and yearly variation
- Limited DFD up occurrences during the last 3 months led to very few events for training

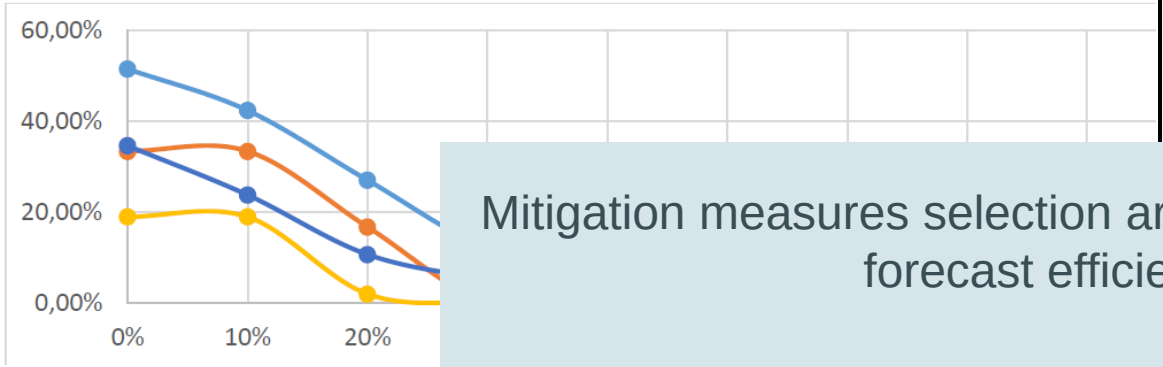
ACE

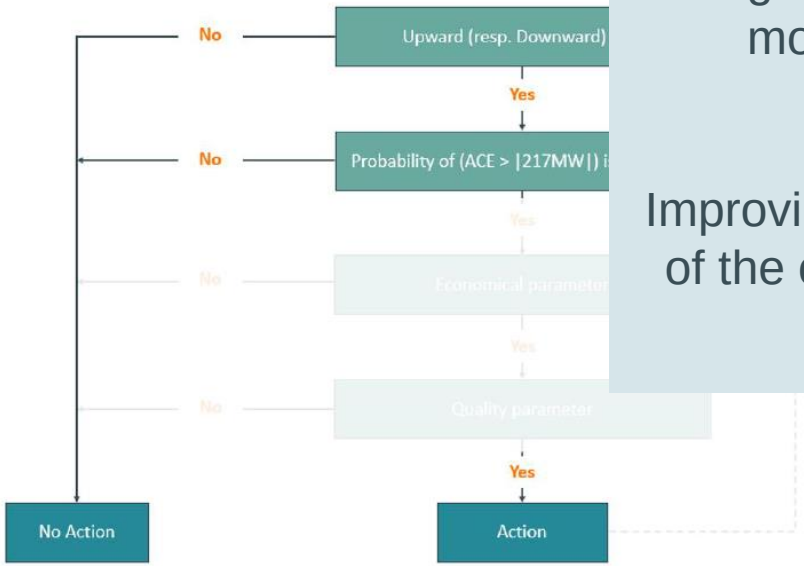
Model	Optimal Parameter	Test Period	R^2	MAE	RMSE
Gardient boosting	Max depth = 15	AVR 2021 – AVR 2022 (offline)	0.171	72.84	102.21
		NOV 2023 (POC)	0.238	123.00	171.21

- Model, data and training set length possibly needs to be adapted for seasonality and yearly variation.

Combined model performances are less good during the POC than during the historical analysis.

Conclusions on mitigation measures





Mitigation measures selection are highly depending on forecast efficiency.

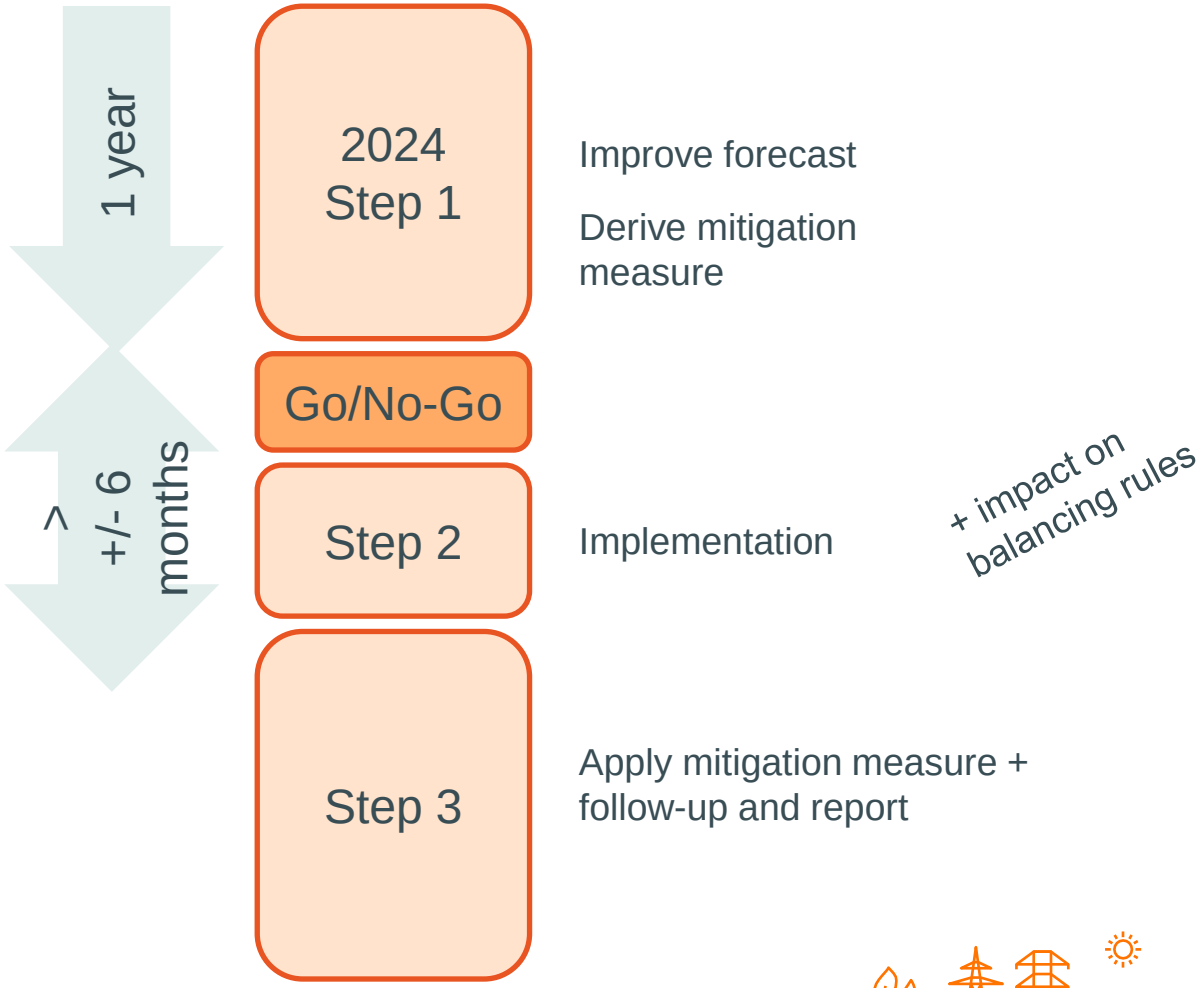
Mitigation measure selection to be reperformed after model improvement based on updated model performances.

Improving forecast efficiency should allow the selection of the cheapest measure and a limited and purposely application of this measure.

	Mitigation	% of Resolution	Additional cost per action taken[12]	Good Action when BE contributes	Action when not needed	Confidence level	% Total action taken	Total cost for all actions
Down	aFRR -7/7	47%	4.619,00 €	13%	1,00%	22%	4%	29.114,68 €
	aFRR -7/5	47%	4.118,00 €	13%	1,00%	22%	4%	25.956,75 €
	aFRR -7/2	40%	3.130,00 €	15%	1,20%	21%	4%	23.315,75 €
	aFRR -5/7	41%	3.212,00 €	15%	1,20%	21%	4%	23.503,99 €
	aFRR -5/5	41%	2.739,00 €	15%	1,20%	21%	4%	20.042,78 €
			€	18%	2%	19%	6%	18.622,55 €
			€	25%	10%	15%	15%	27.080,98 €
				25%	10%	15%	15%	18.097,51 €
				38%	*Not achievable*			
			€	12%	0,80%	22%	3%	-14.698,51 €
			€	12%	0,80%	22%	3%	-18.454,44 €
			€	13%	0,80%	22%	4%	-18.601,02€

	violations based on 4 aken)	Cost[13]
		69.187€
		52.467€
		28.907€
aFRR -5/7	0	45.561€
aFRR -5/5	0	31.038€
aFRR -5/2	0	13.232€
aFRR -2/7	-1	20.621€
aFRR -2/5	-1	10.911€
aFRR -2/2	-1	1.897€

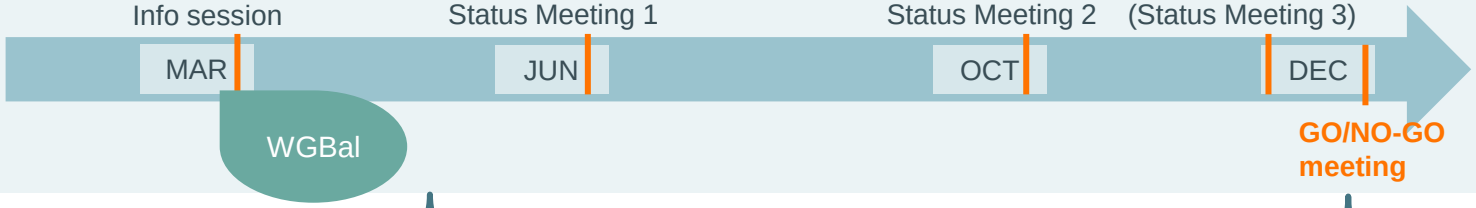
Next steps according to Implementation Plan



2024 Step 1
Detailed Planning

1. Implement changes in forecasting Model according to the conclusions of the study

2. Implement the changes in the mitigation measure code wrt product evolutions in the framework of MARI/Picasso



1. Study Model Improvement:
   - Use more recent set of data
   - Study seasonality
   - Improve training set length
   - Integrate Operational Feedback
   - …

2. Assess changes to be made to mitigation measure code wrt product evolutions in the framework of MARI/Picasso

Go/No-Go meeting might need to be shifted based on:

- the potential need to collect sufficient MARI/Picasso data
- the impact of the SDAC 15min go-live (01/25).

Smart Testing

Analysis of changes to the regulatory framework

Carsten Bakker

Topics

The goal of today is to **present the elements that can have an impact on the methodology** of smart testing that was defined in the incentive from 2020. Before going into the analysis, a short context is given regarding the smart testing methodology:

1. Context smart testing
2. Feedback on the public consultation
3. **Potential impacts** linked to the mFRR design evolutions
4. **Potential impacts** linked to the aFRR design evolutions
5. **Potential impacts** linked to the incentive on PQ & Penalties

Context Smart testing

A small reminder – Smart testing methodology

Smart testing uses **two scoring systems** to select the bids for an availability test:

- A scoring system to **select the CCTU** for an availability test
- A scoring system to **select a bid** within that CCTU for an availability test

The scoring is based on activation control, availability tests and margin control

Additional to the scoring system, **two test regimes** are introduced to limit the impact (in volume) of availability tests:

1. The first test regime **aims to ensure** that a significant part of **the contracted capacities** from a BSP **is compliant**
2. The second test regime aims **to keep in check the compliancy** of a BSP but with a **lower volume of availability tests**

CCTU scoring system determines which CCTU to select for an availability test

The Score per CCTU is based on 3 features:

- **Activation control:** past activations
- **Availability test:** past test
- **Margin Analysis:** ex-post monitoring of contracted capacity

structured data is required (date & time, failure/success, involved bid, DPs and their contribution, off-take metering …)

Calibration to be done

Features	Weight	CCTU 1	CCTU 2	CCTU 3	CCTU 4	CCTU 5	CCTU 6
Activation Control	33%	39	12	34	29	74	73
Availability test	33%	89	86	50	2	12	79
Margin Analysis	33%	30	18	9	82	58	50
Final Score per CCTU		52	39	31	38	48	67

The Score per CCTU ranges from 0 to 100

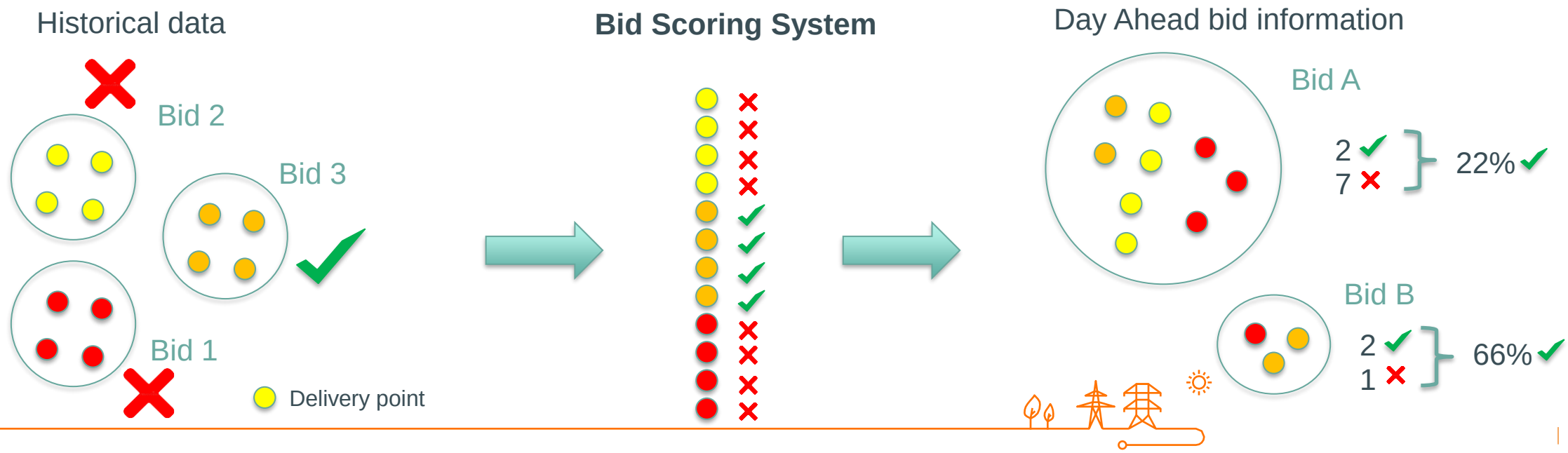
- A low value indicates that the CCTU needs to be tested

Bid scoring system determines which bid to select for an availability test

Calibration to be done

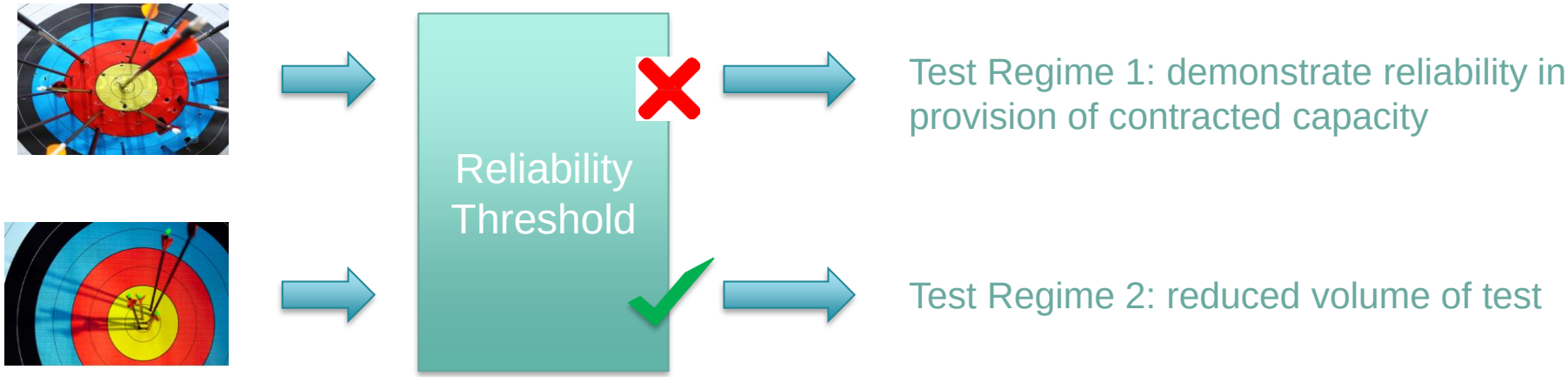
Features	Weight	Bid 1	Bid 2	Bid 3
Volume		60 MW	30 MW	10 MW
Activation Control	33%	39	12	34
Availability test	33%	89	86	50
Margin Analysis	33%	30	18	9
Final Score		52	39	31

- The Score per Bid is based on same 3 features but are adapted to the Bid Scoring System.
- The results of control and test **are disaggregated on a delivery point level**



Test regimes

- In addition to the scoring system, **two test regimes** are introduced to limit the impact (in volume) of availability tests:
    1. The first test regime **aims to ensure** that a significant part of **the contracted capacities** from a BSP **is compliant**
    2. The second test regime aims **to keep in check the compliancy** of a BSP but with a **lower volume of availability tests**



- The principles of Smart Testing should be **applicable for all balancing products**

Feedback on Consultation Report
Smart Testing Methodology

Stakeholders feedback **15 September 2020 – 15 October 2020**

Scoring System - Availability test

As regards the availability test, why a **score of 50** is attributed to the Score ref Availability (CCTU, M) **if no availability test occurred**? What could be the impact on the final score especially for the **CCTU's which are rarely requested for tests** (20:00-00:00h; 00:00-4:00; 4:00-8:00)?

FEBEG

Elia response:

*Regarding the scoring system for availability test, a score of 50 has been chosen to differentiate the situation where there are no test performed and failed tests. A failed test will impact more negatively the score than no test. The **weights are then used to calibrate** and achieve a balanced effect of each component on the final score.*

The impact of this number will also be seen during the calibration phase and possible amendments based on the return of experience will be proposed during a presentation and integrated.

Scoring System - Margin Analysis

From the supplied materials it does not seem clear how ELIA is planning to identify the Unsheddable Margin (UM). Which period of time will be used to determine UM? Will it be based on the lowest quarter hour consumption or lowest average consumption over a certain time ?

Flexcity

Elia response:

*The Unsheddable Margin (UM) is based on the lowest offtake (consumption) value (lowest quarter hour consumption in case of mFRR and lower granularity for aFRR and FCR) for the considered 12 months rolling window. Elia is aware the **underlying hypothesis regarding maintenance**, which drops the UM to zero consumption. The calculation of the UM may be improved with later phases of iCAROS project with the data on outage planning.*

Scoring System - Margin Analysis

From the supplied materials it is not clear to Flexcity how the margin score for a CCTU would be determined based on the Margin QH's of Annex 2. Is one quarter hour with a negative margin in a bid enough to consider the CCTU has a negative margin?

Flexcity

Elia response:

Elia confirms the understanding of the stakeholder. If during one quarter hour a negative margin is identified, the Scoremargin of the CCTU is negatively impacted. Contracted capacity should be available at any time.
Elia will clarify this point in the final report.

Scoring System - Activation Control

Concerning the 2 scoring systems, FEBEG agrees with the general principles but expresses its reservation on their concrete application as the note is not fully clear on the calculation methods:

For the **Failure Factor**, "an activation control is considered failed as defined in the T&C of the relevant product" : **this concept is not defined for aFRR.**

Elia response:

On applicability of the Scoring System for aFRR, Elia agrees that success or failure in aFRR activation control is not defined per se in the T&C BSP aFRR. Based on the current design and available inputs, Elia believes however that the activation control scoring may be computed, in line with the proposed methodology. The implementation details will be sorted out during the implementation phase of the aFRR product.

Scoring System - Margin Analysis

The margin analysis, as described in the note, seems only applicable for mFRR, but not for FCR nor aFRR (symmetrical or down). How is the score computed when a **DP is part of bid that is continuously activated** ?

FEBEG

Elia response:

For downward product, the reference to be used for a generation unit will be the Pmin instead of Pmax. ***For DSM, the maximum measured off-take can be taken as a proxy to calculate the margin****.*

Based on the current designs and available inputs, Elia believes that the margin analysis scoring may be computed for aFRR and FCR, in line with the proposed methodology. The implementation details will be sorted out during the implementation phase of the relevant product.
The final report will contain these additional clarifications.

With Margin Analysis it is very difficult to be **technology neutral** between **Demand Side Management** technology and 'traditional' suppliers of flexibility. There will never be a Negative Margin for the mFRR flexibility delivered by stand-by thermal plants (OCGT operated gas fired power plants, Turbojets, large diesel generators). However it is well known that these plants do have an important 'Forced Outage Rate' and corresponding statistical failure risk at start-up. In this set-up a 95% reliable standby plant will have better scores then a 95% reliable DSM profile.

Elia response:

Smart Testing is technology neutral. However, based upon objective data, the ***methodology may naturally yield score results which may be technology dependent.***
Please note that this should not impact the maximum number and volume of tests that will be performed.

Looking at this from the perspective of an availability test, an asset that does not have sufficient margin available would also have failed the availability test.

Scoring System - Margin Analysis

Flexcity

For sites which use **'high X of Y' baselining the margin score might not be very suitable**. A negative margin in one QH for a site does not mean that, if the site would have been activated in that quarter hour, the site would not have been able to meet the requirements as put forth in the terms and conditions for mFRR.

Flexcity understands the relevance of the different scores (Activation Control, Availability Test & Margin Analyses). However, due to the **complexity** of the formulas, the absence of the weights and the unclarity on the relationship between low scores and the triggering of a test it is very difficult for Flexcity to assess what would be the consequences of this smart testing logic and **whether the derived scores would be a good representation of the reliability of the service and/or a good indication of the need to test** a CCTU or bid.

Therefore we would like to request ELIA to Remain transparent throughout the further process meaning, amongst other things, to give insight in the determination of the weights.

Elia response:

Elia agrees with the stakeholder on the possible impact of the baselining on the $Score_{refMargin}$*. For the sake of simplicity, Elia proposes to not consider such detail for which the added value is questionable. Elia reminds that all scores are designed to provide an indication to Elia on whether to test certain bid(s) or CCTU. It does not impact the success or failure of an activation control. In this case, the indication may be slightly less accurate than if the choice of baselining was taken into account.*

Elia may consider amendments after a return of experience or based on further clarification from the stakeholder on their concerns.

Elia response:

The weights for the scoring systems are subject to ***fine-tuning*** *in the implementation phase and will be made available.*

With regards to the triggering of a test, ***this remains at the discretion of Elia*** *as it is today. Elia does not intend to disclose to the BSP when a test will be performed, nor to let the BSP determine with certainty when it will take place (nor on which bid(s)). Smart Testing does not change this principle and it does not affect the BSP in its obligations.*

Smart Testing only provides additional information to Elia on the selection of the CCTU and the bid(s) to be tested, to give Elia a sufficient comfort on the availability of the bids while reducing the number of tests.

mFRR Impact of Contract Evolution

mFRR Contract Evolution & impacts

1. Energy Bidding → Not relevant for smart testing methodology
2. Bids selection → Not relevant for smart testing methodology
3. Activation → Not relevant for smart testing methodology
4. Remuneration → Not relevant for smart testing methodology
5. Activation control & penalties → **Relevant, no impact on Smart testing methodology**
6. CRI Impacts → Not relevant for smart testing methodology
7. Additional control for Contracted Bids → **Impact on Smart testing methodology**
8. Update of Bids after BE GCT & Baselines after RDGC → **Relevant, no impact on Smart testing methodology**

ELIA deleted the additional control for the Contracted Bids

- **Purpose of this control**: Ensure that the volume offered in a contracted Bid is available & that a lack of volume cannot be compensated through DP offered in a non-contracted bid

  → Availability test aims at addressing that risk too

- **Conclusion**: ELIA proposes to remove the additional control & therefore the obligation to only use DPs listed in the bid*

  → It removes a barrier to entry for the BSPs

  → It simplifies the design as the process for non-contracted bids will apply for contracted bids

  → It avoids unnecessarily complications in the design (and therefore possible issues for BSPs & for ELIA's implementation)

→

- **Given that the obligation to the availability test remain, the methodology of smart testing will also still consider that the bid should be available for margin control.**
- **However, for failures in activation control the source of the error is complex to attribute**
  → modification needed to the current methodology

*The obligations related to the Availability Tests remain !

aFRR Impact of Contract Evolution

aFRR Contract Evolution & impacts

1. Real-time baseline → **Relevant, no impact on Smart testing methodology**
2. 5’ FAT (Full Activation Time) → **Relevant, no impact on Smart testing methodology**
3. Move aFRR capacity auction to D-1 → Not relevant for smart testing methodology
4. Incentive 2022: activation method → **Relevant, no impact on Smart testing methodology**
5. CCMD: ind. correction model, opening LV → Not relevant for smart testing methodology
6. Connection to aFRR-Platform including the mitigation measures: → Not relevant for smart testing methodology
   a) Maintain bid price cap for contracted aFRR Energy Bids
   b) Elastic aFRR demand
   c) Alternative calculation aFRR CBMP based on the global control target
7. Additional control for Contracted Bids → **Impact on Smart testing methodology (same as for mFRR)**

Incentive on Prequalification and penalties

Incentive on Prequalification, Control, and Penalties for the aFRR and mFRR Services

Incentive PQ & penalties Contract Evolution & impacts

1. Onboarding & prequalification → Not relevant for smart testing methodology
2. Penatly MW made available → Not relevant for smart testing methodology
3. Activation control aFRR → Not relevant for smart testing methodology
4. Baseline aFRR → **Relevant, no impact on Smart testing methodology**

Reserve dimensioning

Yearly reporting on FRR dimensioning

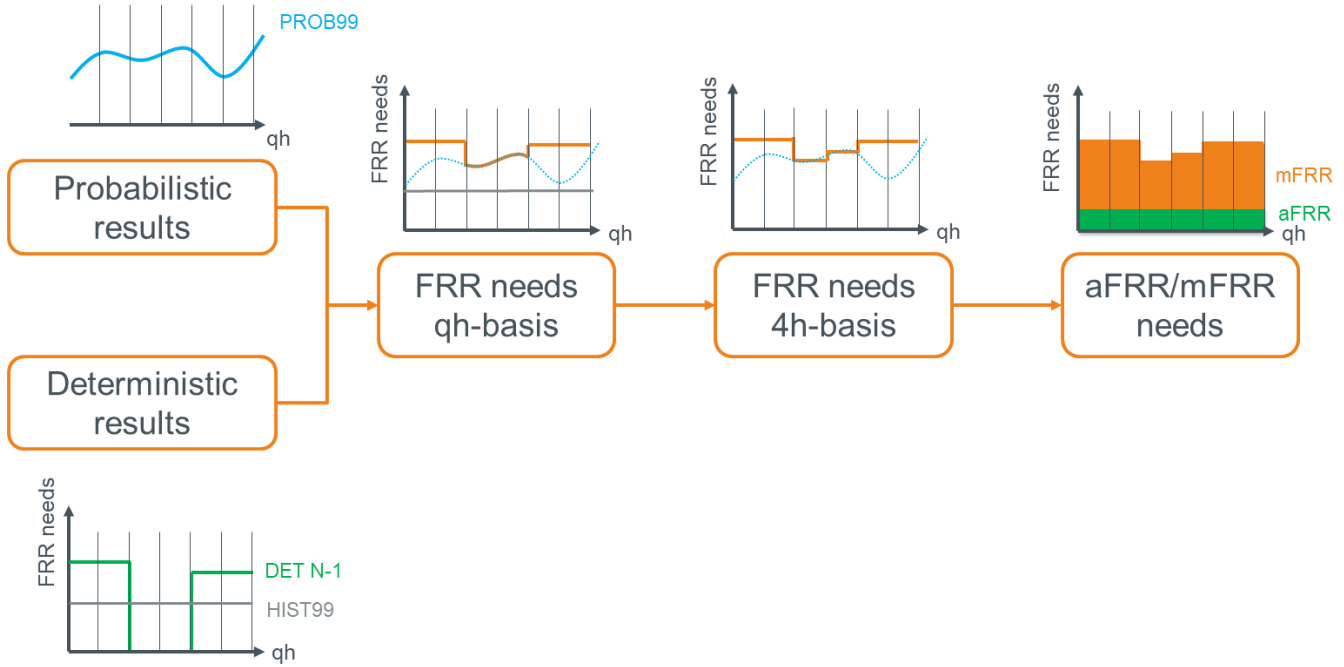
Kristof De Vos

RECAP - Dynamic dimensioning methodology

- FRR reserve capacity is determined based on a probabilistic methodology in line with Article 157(2)b of the SOGL covering 99.0% of the LFC block imbalance risks

- It takes into account two deterministic thresholds :
  - Always larger than the dimensioning incident in line with Article 157(2)e and Article 157(2)f
  - Always covering 99.0% of historic LFC block imbalances in line with Article 157(2)h and Article 157(2)i

- The methodology is specified in the LFC block operational agreement and its explanatory note (*link*)



The required positive and negative reserve capacity on FRR is calculated by Elia each day before 7 AM for every period of 4 hours of the next day

Available information

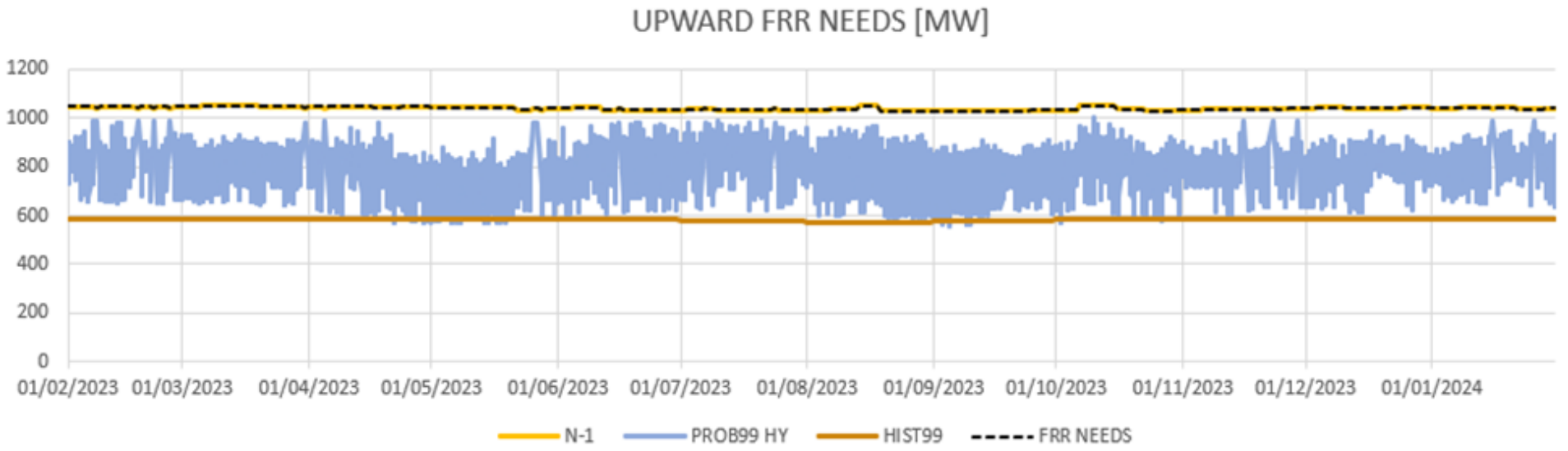
- **Daily publication of the results (before 7 AM D-1**): final FRR needs and mFRR balancing capacity (to be procured)

- **Yearly analysis of the FRR needs and means :** assess whether the positive and negative FRR needs have been sufficiently covered by the resources available.
  - In line with regulatory framework : Article 6 of the LFC Means (link)
  - Results of the analysis presented in the Working Group Balancing (cfr. next slides)

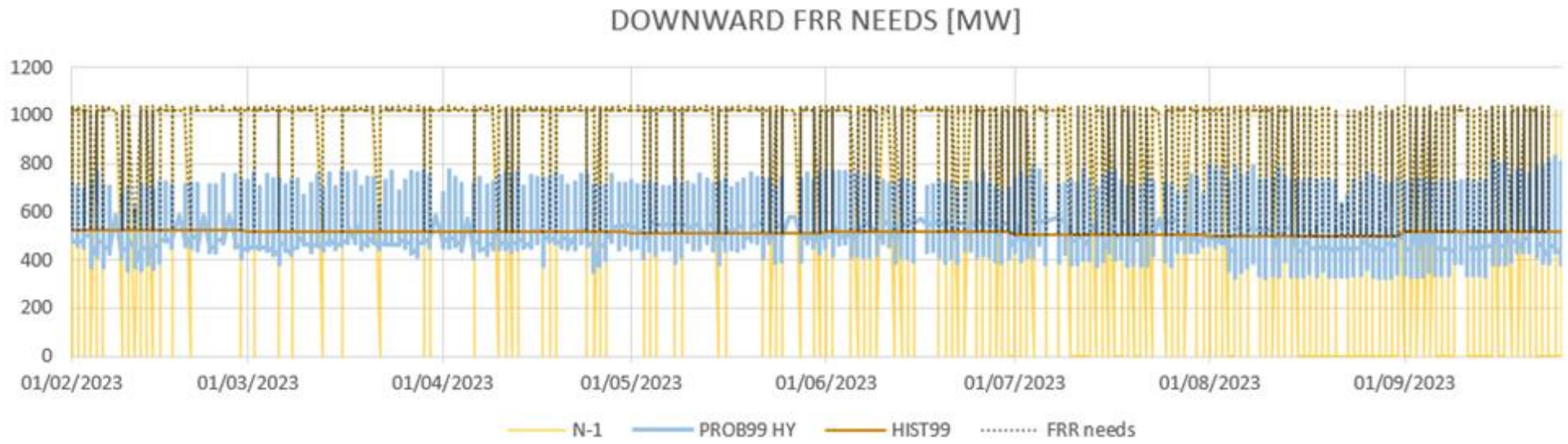
Article 6 of the LFC Means *"Elia will carry out a yearly ex-post analysis in the first quarter of each year based on historical data from the precedent year on and assess whether the positive and negative FRR needs have been sufficiently covered by the resources available. For the purposes of this analysis, Elia will compare the results of the positive and negative FRR needs based on the methodology in the LFCBOA and compare this with the available resources of aFRR (contracted aFRR balancing capacity) and mFRR (non-contracted balancing energy offers and sharing of FRR reserves)."*

FRR needs

Upward FRR needs remain set by dimensioning incident (by largest nuclear generation unit)



Downward FRR needs are pre-dominantly (73% of time) determined by dimensioning incident (by Nemo Link)



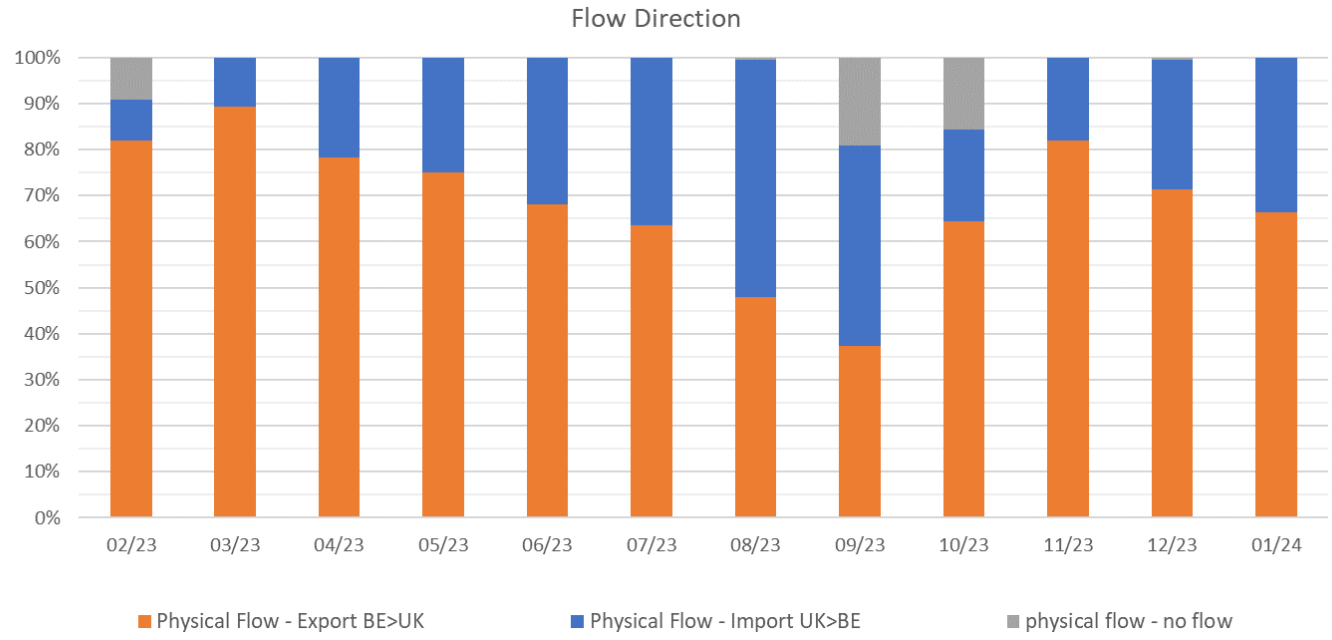
Nemo Link

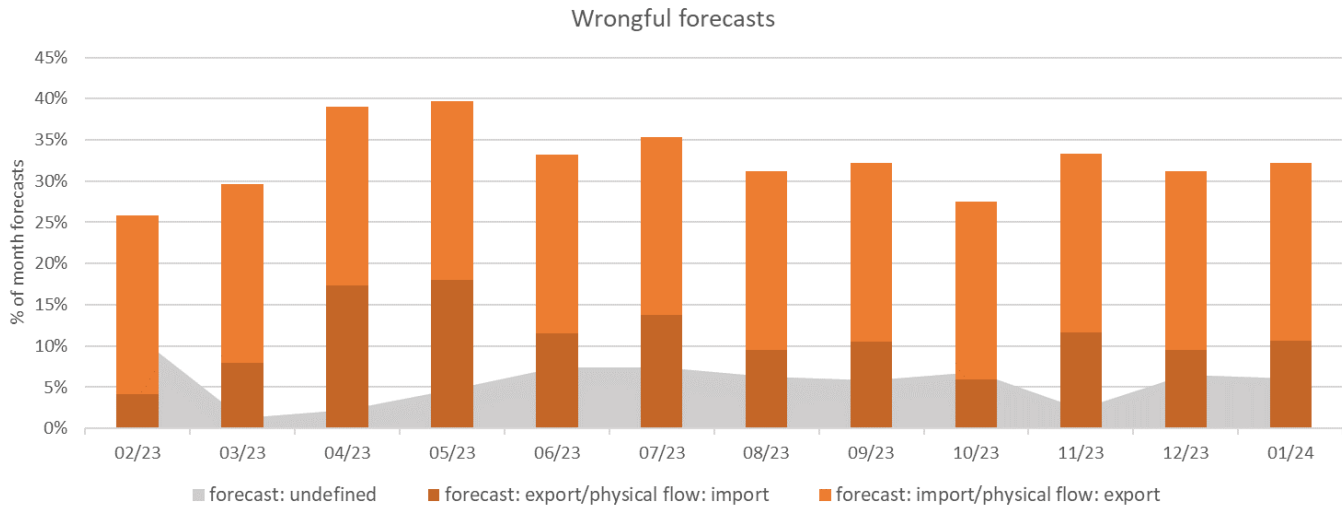
1. The informative forecasts, i.e. a forecast where Nemo Link is not predicted as “undefined” remains stable at 94% (compared to 93%)

2. The wrongful forecasts, i.e. situations where Nemo Link is predicted in import but observed in export or vice versa has nevertheless also decreased to 16% (from 28% in the previous reporting period

The deterioration in previous performance was observed as from November 2021 following increasing price spread between UK/BE

The improvement is due to an improved algorithm during Summer as well as the effect of reduced volatility

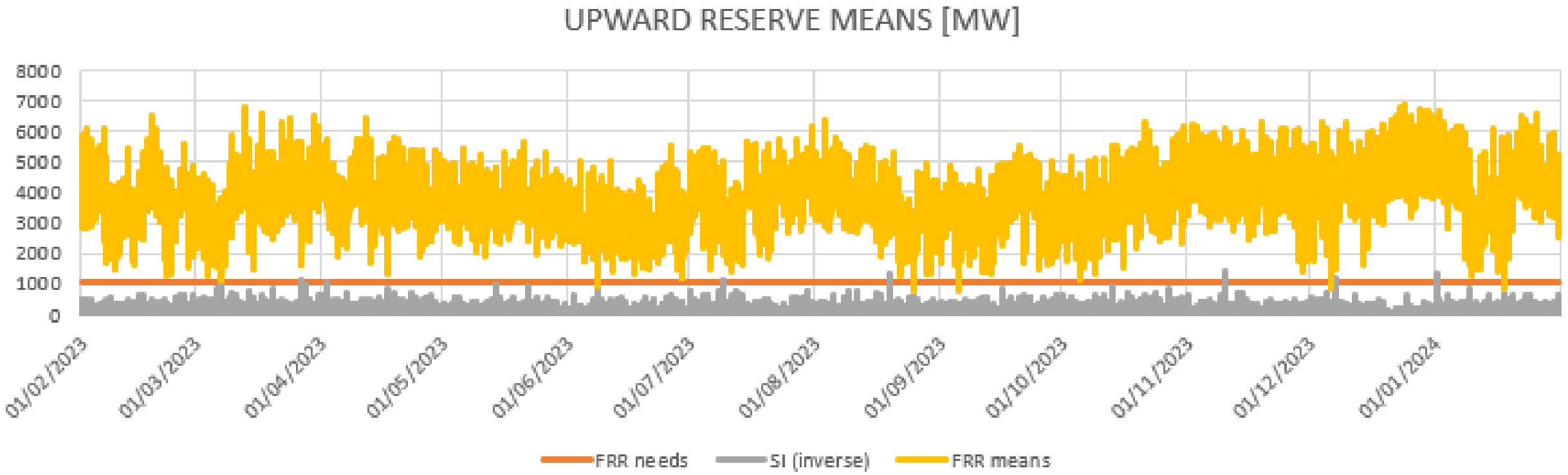




Upward compliance

Reporting Period	2021	2022	2023
FRR means > FRR needs	99,93%	99,80%	99,99%
FRR means > SI	100,00%	99,99%	100%
FRR needs > SI	99,99%	99,99%	99,99%

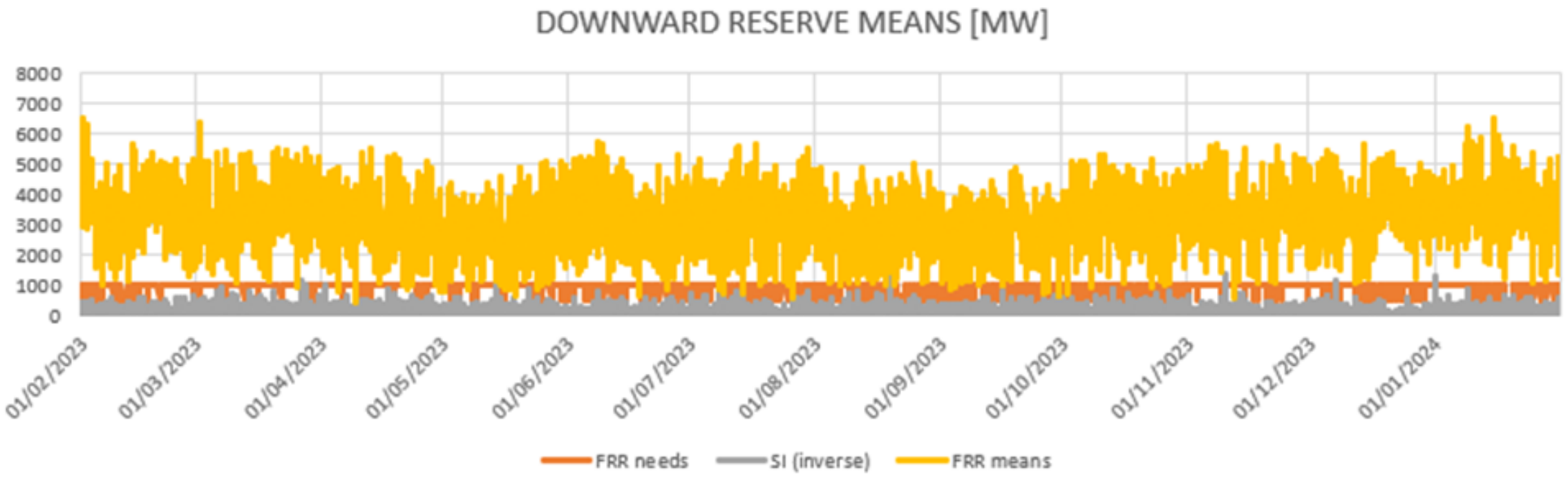
Periods in which the needs were not covered are related to periods with limited sharing availabilities



Downward compliance

Reporting Period	2021	2022	2023
FRR means > FRR needs	97,70%	98,83%	99,46%
FRR means > SI	100,00% (rounded)	99,99%	99,99%
FRR needs > SI	99,93%	99,42%	99,87%

Periods in which the needs were not covered are related to periods with limited sharing availabilities and non-contracted balancing energy bids



Incompressibility

Action plan 2024 and beyond

Kristof De Vos

Context

- In 2023, Elia identified multiple incompressibility events in March and April which triggered an action plan to cover operational risks during the rest of Spring and Summer
  - May 16, 2023 : WG BAL presentation problem and outlook
  - Jun 29, 2023 : WG BAL presentation measure
  - Nov 14, 2023 : WG BAL presentation return of experience
- A measure was installed during Summer based on an incompressibility shut down measure following an incompressibility trigger
  - Alongside short-term actions focusing on customer awareness & transparency
  - Alongside an internal action plan with mid- and long-term actions
- While several incompressibility situations were observed by Elia, the system security criteria to effectively activate the measure in real-time were never reached.
- As this Spring / Summer is expected to face a similar situation, an action plan for Summer 2024 and the Summers thereafter is presented to the stakeholders

Planning WG BALANCING

27/3 Presentation action plan 2024
together with external reporting
on FRR dimensioning

21/5 First return of experience

22/11 Post-Summer reporting

Structure of the presentation

- **Identification of the situation and outlook for Summer 2024, and beyond**
  - Identification of the problem
  - Legal compliancy on FRR dimensioning versus operational risks
  - Outlook 2024 and beyond

- **Action plan Summer 2024**
  - Maintain and improve the incompressibility shut down measure
  - Elaborate understanding of the situation based on monitoring
  - Update on mid-term and long-term actions with positive effect on the situation

Identification of the situation and outlook for Summer 2024 and beyond

Identification of the problem

Day-ahead : incompressibility

- **Low residual demand in the day-ahead time frame translates into low and negative prices typically with :**
  - Large RES with low demand
  - Generation units are off or at Pmin
  - Storage units are in offtake or (almost) full
  - Renewable curtailment (and negative prices)
- **Typically, a regional phenomenon in a well interconnected system (up to 8 GW of export capacity)**
  - Local issue: low price in Belgium (at full export)
  - Regional issue : low price in region (at or below full export)

Probability to have prices <5 €/MWh when prices are <5 €/MWh in Belgium

	DE	NL	FR	GB
2025	90-100%	90-100%	40-50%	60-70%
2026	90-100%	90-100%	40-50%	70-80%
2028	90-100%	90-100%	50-60%	70-80%
2030	80-90%	90-100%	50-60%	90-100%
2034	80-90%	80-90%	50-60%	90-100%

Analysis in Elia's Adequacy and Flexibility study 2023 seems to indicate that low prices are often a regional issue.

Real-time : operational risk

- **During incompressibility, it is likely that the FRR needs cannot be covered with non-contracted balancing means (FRR compliancy).**
  - When all flexibility is offered to the day-ahead market
- **Large positive imbalances during such moments will result in an operational risk**
  - **Sharing : lower sharing opportunities can be expected**
    - Local issue: no remaining ATC
    - Regional issue : no remaining liquidity
  - **Energy bids: no remaining flexibility expected besides renewable generation**
    - Wind-driven situations : no issue
    - PV-driven situations : issue
    - Wind +PV-driven situations : future issue

There is a silver bullet: reduction of solar generation would resolve the FRR compliancy as well as the operational risk (or in general : participation of end-user flexibility on the basis of a financial incentives)

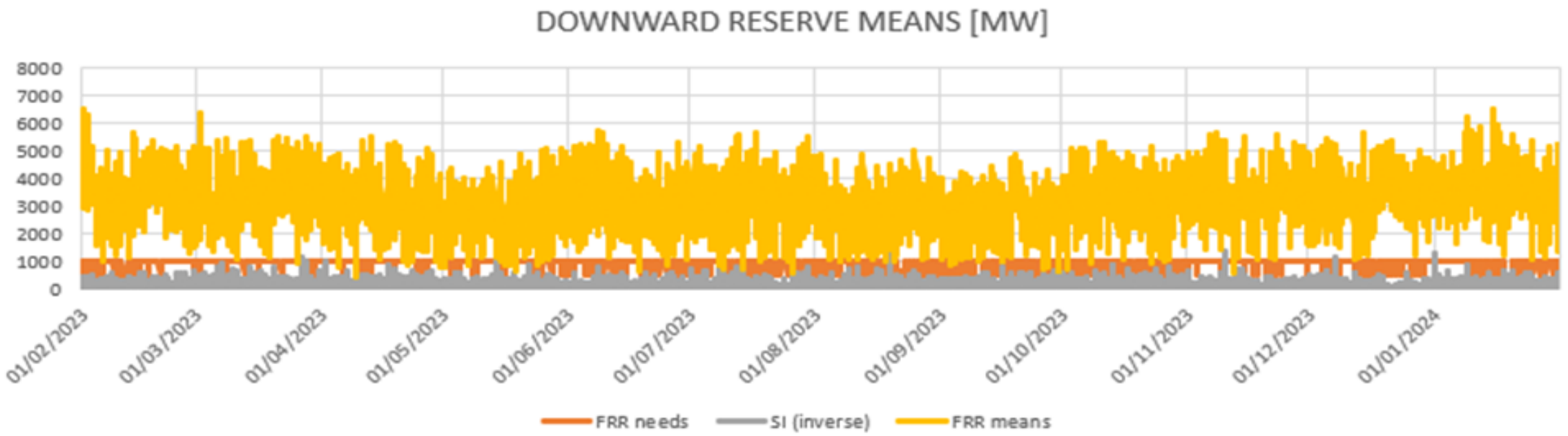
Cf. Presentation on Yearly reporting on FRR dimensioning

A. Compliancy : FRR needs were covered within acceptable limits

Coverage of the downward FRR needs attains similar values as upward FRR needs

Reporting Period	2021	2022	2023
FRR means > FRR needs	97,70%	98,83%	99,46%
FRR means > SI	100,00% (rounded)	99,99%	99,99%
FRR needs > SI	99,93%	99,42%	99,87%

Periods in which the needs were not covered are related to periods with limited availability of sharing and non-contracted balancing energy bids



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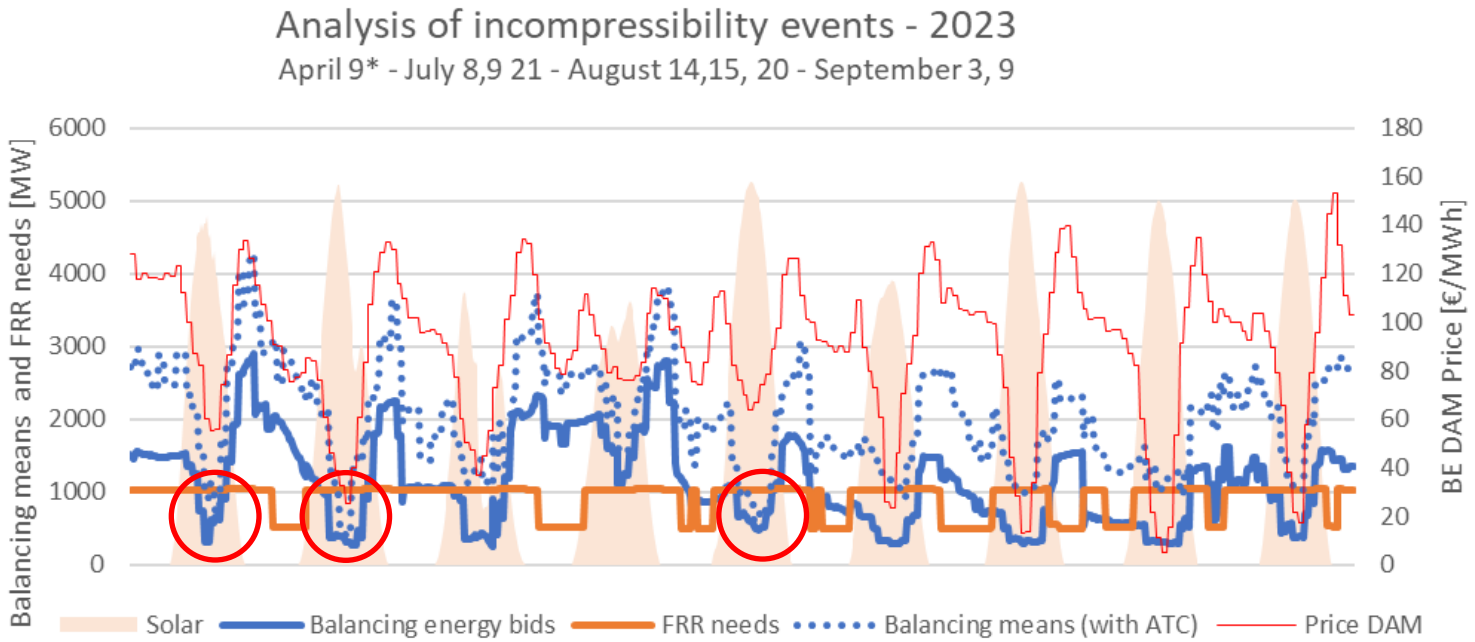
B. Operational risks : risks during periods with incompressibility trigger

Large positive imbalance combined with low market reaction may result in high area control errors



1. **FRR needs are typically not covered by local means alone (ARC without sharing) during triggered events**
   - FRR needs are not necessarily lower during incompressibility issues
2. **But most of the time covered when counting on the availability of sharing**
   - Although the service is not guaranteed and might be set at unavailable by neighbor TSOs (despite ATCs) during regional balancing events.

- A large forecast error or outage of Nemo Link may not always be covered with Elia's available reserve capacity
- The effect on the Belgian system (area control error) depend largely on the ability of the market to react

At this point, the effect on system security is expected to remain acceptable as safety criteria were not exceeded during these events :

- An area control error larger than 375 MW for 15' is needed to cause alert state,
- and 750 MW for 30' to cause emergency state

Situations up to these criteria will be covered by European FCR

Projection 2024 and beyond : no large improvements expected before 2026

ENTSO-E Summer outlook is expected to be available as from May

1. **While renewable generation increases, the amount of hours with low prices and excess generation will continue to increase**
   - Current best estimates a yearly increase of PV of around 900 MW – 1200 MW per year.
   - Also our in neighboring countries renewable generation is expected to increase

2. **This will be partially compensated by additional flexibility in the Belgian system. An amount of batteries have already announced to enter the market after 2024**
   - Substantial capacities are only expected as from Summer 2026/27

3. **The (partial) phase out of nuclear base load and the Summer LTO will create additional room in the system after the Summer of 2025**

The situation with incompressibility is not expected to substantially improve during Summer 2024, nor during Summer 2025. The deployment of batteries and the nuclear phase out (and LTO) is expected to temporarily improve the situations in the years thereafter.

Summary of Elia's understanding of the situation

The concern about incompressibility follows a combination of two separate problems:

A. Ability of the market to manage well 'predicted' situations of high renewable generation. It is related to the ability of market parties to maintain a balanced portfolio during high renewable energy conditions

- As long it does not create operational issues, this remains a market issue and Elia should be very careful to intervene
- No operational issue as long as sufficient renewable generation such as large scale wind can be curtailed, if not exported (currently the case as long as no curtailment of PV is needed)
- Typical indications of difficulties of the market to cope with such situations are negative prices and renewable self-curtailment

B. Ability of the system to maintain sufficient flexibility to manage with unexpected outages or variations. It is related to available downward flexibility in the system

1. Elia aims for a market design where BRPs mitigate system imbalances as much as possible, and reduce balancing capacity needs
2. In line with SO Regulation, Elia only needs to cover 99% of expected imbalances, if it covers at least the dimensioning incident (Nemo Link)
3. The remaining risk is complemented with exceptional balancing measures to manage remaining system imbalances to the extent possible (before being covered by EU FCR)

While FRR reserve needs coverage issues remains acceptable (and even improved over the years) it is observed that in some extreme conditions (low local liquidity, no remaining ATCs, no market reaction) could result in large area control errors when facing large positive imbalances. These situations will need to be managed by European FCR.

It is Elia's key belief is that problem A needs to be solved within the market (CCMD and E-Assets Flex Readiness). If not, curtailment of renewable generation will grow every year linearly with increase of PV and renewable generation. However, solving this problem would also resolve problem B (by liberating flexibility for the balancing time frame, at least from renewable generation). But at this stage, Elia has insufficient comfort that problem A will be solved in due time, which requires us to take implement mitigation measures.

Action plan 2024 and beyond

Action plan 2024

A. Maintain and improve the measures implemented in 2023

- **Main mechanism** : incompressibility shut down (mainly targeting ancillary service providing units),
  - Facilitated by old regulatory framework (until 22/5/2024), and adapted to new regulatory framework (as from 22/5/2024)
  - Maintain efforts to maximize participation of flexibility through awareness and transparency
  - Improvement of forecasting tools (algorithm training data and P10/P90 information)

B. Further elaborate understanding of the situation based on monitoring

- Reporting to WG Balancing after Summer period

C. Continue efforts on mid-term and long-term solutions

- Elia's CCMD proposals
- Elia's proposals on end-user and PV flex readiness (cf. Users Group)
- Solutions on regional level

Context

In preparation of the summer period, Elia investigated the possible procedures that can be activated within the current legal framework

LFCBOA
Art. 7. 2 and 7.3

Balancing Rules
Art. 8.13.17

- Exceptional measures on top of balancing resources to reduce FRCE (cf. SOGL 152.12)
- Activation of units that cannot provide FRR ➔ Units or Volumes with Technical Limitations (~units > 25 MW that have the obligation to put their remaining margin at Elia's disposal) (cf. Code of Conduct 130/131 + T&C SA)
- Activation according to modalities of SA contract (RD bid activated to solve FRCE)
- Activation price (currently free and not cost based) is reflected in MDP and hence in imbalance tariffs

Maintain and improve the incompressibility shut-down

1. What are units targeted by the measure ?

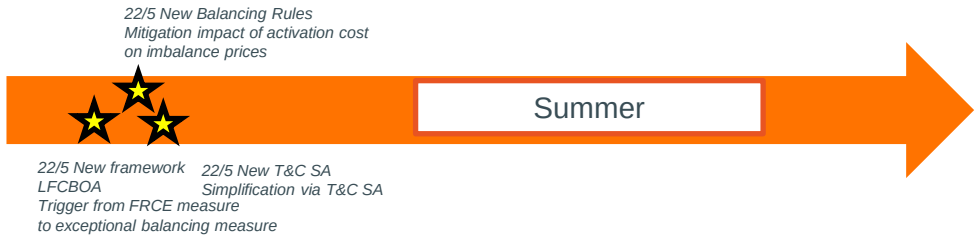
1. Coordinable units (including CCGTs providing ancillary services at that time, e.g. aFRR)
2. Non-coordinable units (at best effort)
3. Nuclear units (practically only as last resort emergency measure)

2. Is the measure ready for the recent modifications foreseen with the LFCBOA, Balancing Rules and T&C SA (as from May 22, 2024)?

1. The method can be implemented according to the new LFCBOA : formulations in the approved regulatory framework are compliant with the mechanism **but operational procedures needs to be adapted to the specifications of escalation procedure (modification trigger, related to liquidity)**

"…activate units that do not provide MW schedules in the context of the Terms and Conditions Scheduling Agent, that cannot be activated via the FRR processes and that offer their available active power on a voluntary basis…"

2. The measure is also compliant with the new balancing rules and the T&C SA but there is an impact on the activation (activation under the form of RD-bids, cost-based pricing) and compensation (activation costs will not be reflected in the imbalance price) which **needs to be clarified to the Working Group balancing**



3. How can the activation trigger be improved in line with the escalation procedure?

From 10 AM to 12 AM D-1 (before day-ahead market closure)

Incompressibility trigger
Based on Elia forecasts

Triggers the potential activation of the measure and calls for additional volumes on top of volumes delivered by units falling under a bidding obligation

If trigger

From 12 AM D-1 to RT

Escalation procedure trigger
FRR needs > FRR means

Confirms the trigger for the potential activation of the measure and calls again for additional volumes

If triggers

RT

FRCE trigger
high and enduring FRCE & large frequency deviation

activation

Revision of the incompressibility shut down measure under the new framework

Existing framework prolonged following delayed mFRR go live (22/5)

Potential activation as from 16/4

Balancing Rules Art. 8.13.17

Activation of Slow Start units (~units > 25 MW that have the obligation to put their remaining margin at Elias disposal and that cannot provide FRR)

Activation price is **reflected in imbalance tariffs**

LFCBOA Art. 7. 2 and 7.3

Exceptional measures on top of balancing resources to reduce FRCE (cf. SOGL 152.12)

Activation at the very end of the merit order (~FRCE procedure)

T&C SA (= old CIPU)

Activation under the form of RD bids - according to modalities of SA contract

- Implicit bidding
- **Free price**
- Simplified guidance for bidding was provided during WG Bal

Framework as from mFRR go live (22/5)

- **Activation of Slow Start units** (~units > 25 MW that have the obligation to put their remaining margin at Elias disposal
- Activation of non FRR means is **not reflected in imbalance tariffs** (Imbalance Settlement Harmonization methodology)
- **New LFCBOA is more explicit on exceptional measures**
  - → **Escalation procedure triggers situations** where needs are not covered by means
  - → Complemented with **the incompressibility trigger** used in 2023
  - → **Activation at the very end of the merit order** (~FRCE procedure)
- Activation under the form of RD bids - according to modalities of SA contract
  - Explicit bidding + shut down activation better described
  - **Cost based price**

Process (until 22/5)

1. Detection

- **1x/week , on Thursday 6pm**
- **UMM 1 :** Market informed of Incompressibility Risk for specific days and time periods
- **D-1 6pm:** if risk confirmed **UMM 2: Balancing Warning** calling for new downward volumes (as usually done when the downward balancing reserve could not be sufficient)

SA sends RD bids

(see next slide)

2. Reception bids & Notification to Market

- After reception of bids at **D-1 8pm UMM 3* Market Results** with the received anonymized volume (MW shut down per MTU block, (Unique) Price €/MWh)
- The volumes (and price) are published in the UMM on the IIP (inside info platform)

3. Balancing

Full MO is followed according to balancing rules (aFRR, mFRR, Reserve Sharing with **UMM 4** as usually done when reserve sharing is activated)

EU Extraordinary procedure for frequency deviation

Follow-up Real-Time evolution

Continuous evaluation

4. Activation of RD bids (shut down)

- Once all balancing means are depleted while there is a significant amount and/or persistent ACE
- Elia may activate concerned RD bids following technico-economic merit order
- **Impact on imbalance price during ramping down** – typical period considered: 2Qh
- **Publication**: Activated Volumes and Marginal Prices will appear on the website in the "INTER-TSO" category

Thursday W-1
+ Bal. Warning D-1

D-1 20h

Real-Time

Long Balancing Activation

Introduction of “shutdown” redispatching energy bid (until 22/5)

Concerned Delivery Points

Production units included in SA Contract
Coordinable (C) : time to shutdown (Pmin to 0 MW) > 15 min
Limited Coordinable (LC)
Non Coordinable (NC)

Trigger = publication on Thursday week W-1

for **each day identified “at risk”** in the publication, process hereunder should be followed

Process = existing SA contractual framework

DA schedule submission process, for period 10:00 to 16:00

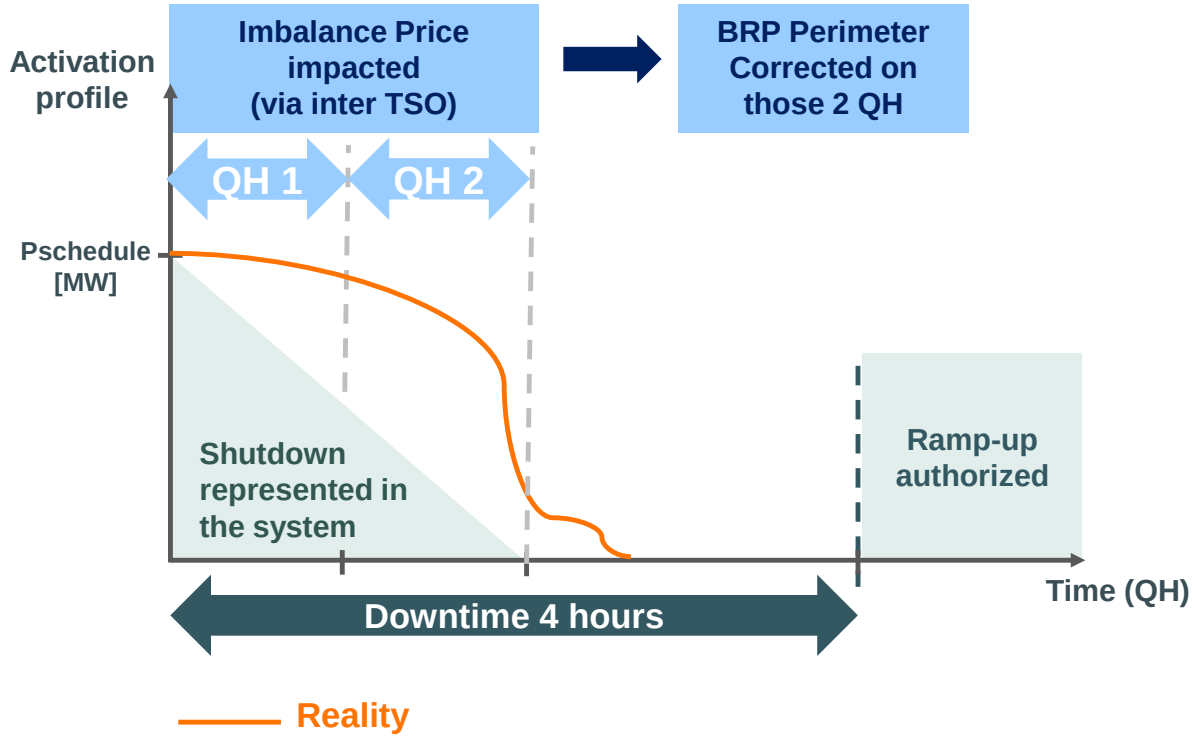
- ✓ Submit prices (≠ 13 499 €/MWh) per quarter hour
- ✓ Volume determined implicitly (difference between schedule and 0 MW)

Activation Profile

Elia will request the shutdown **on 2 QH (30min)**

⇒ **Total cost** should take into account:

- ✓ A stop of 4 hours
- ✓ Start-up cost (if relevant)
- ✓ Total volume to shut down will be divided into two equal part spread over the 2 QH



Process (as from 22/5)

1. Incompressibility Risk Detection

- **10am until 12am D-1 Incompressibility risk (UMM 1)** calling for new downward volumes and triggering the potential activation of the incompressibility shut down measure in next steps

SA sends RD bids (D-1 3pm)

2. Escalation procedure trigger

- **as from D-1 3 pm until RT**, a regular monitoring of **escalation procedure triggers** (FRR needs > FRR means)
- **6 PM Balancing Warning (UMM2)** calling for new downward volumes (as usual) and triggering the potential activation of the incompressibility shut down measure in next steps

3. Balancing

Full MO is followed according to balancing rules (aFRR, mFRR, Reserve Sharing) with as usually (UMM3) done when reserve sharing is activated)

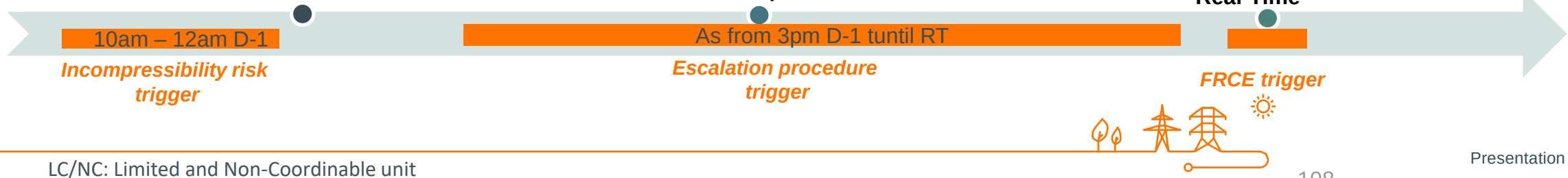
EU Extraordinary procedure for large frequency deviation

Follow-up Real-Time evolution

Continuous evaluation

4. Activation of RD bids (shut down)

- Once all balancing means are depleted while there is a high and enduring FRCE, together with a large frequency deviation
- Elia may activate concerned RD bids according to T&C SA
- **Normal Publication:** Activated Volumes on Elia.be as re-dispatching with reason 'escalation procedure'



Introduction of “shutdown” redispatching energy bid (as from 22/5)

Concerned Delivery Points

Production units included in SA Contract
Coordinable (C) : time to shutdown (Pmin to 0 MW) > 12.5 min
Non-Coordinable (NC)

Activation Profile

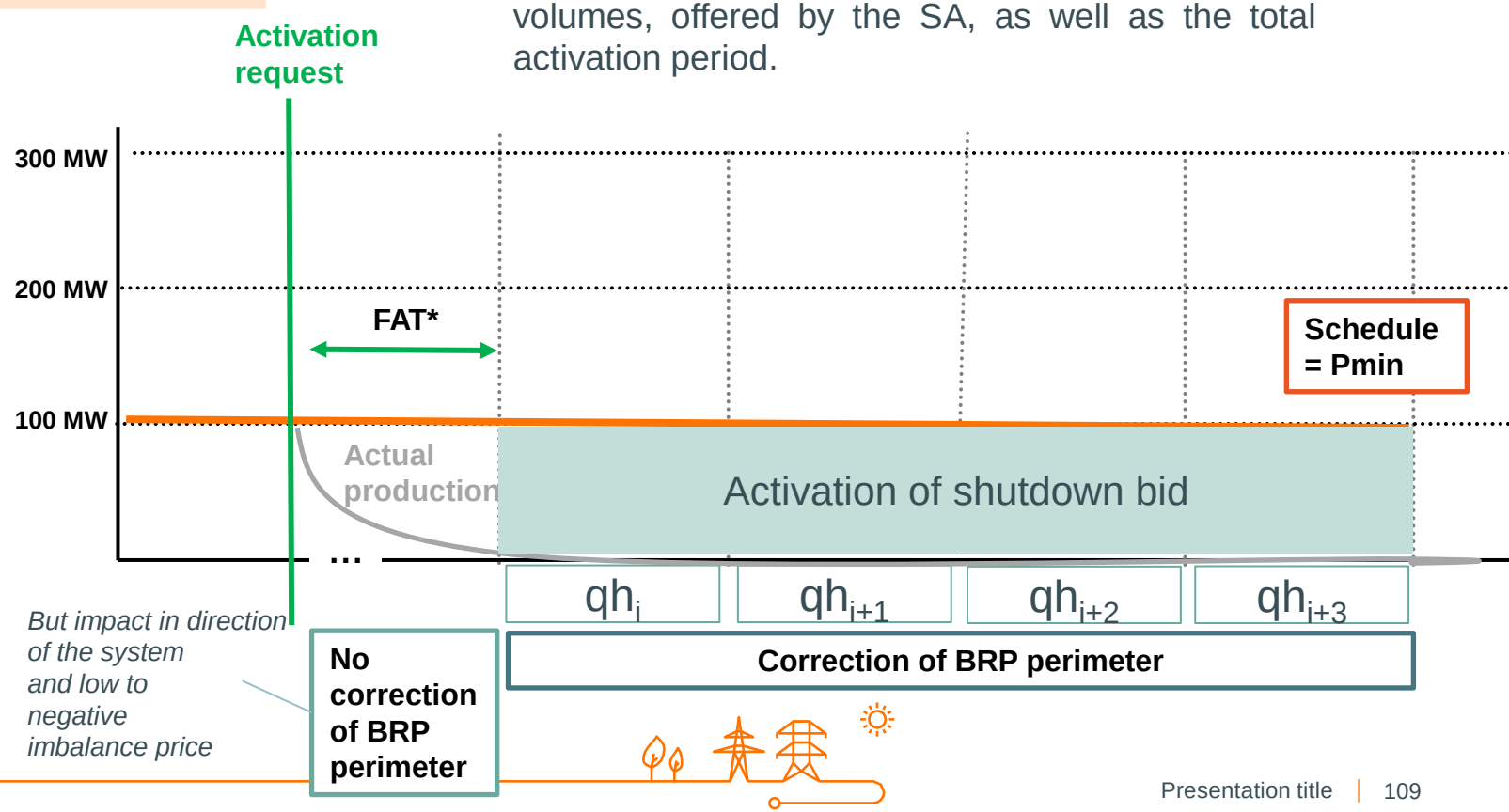
Elia will request the shutdown **according to the re-dispatching bids provided by the SA**

Total cost should take into account price, bid volumes, offered by the SA, as well as the total activation period.

Trigger = cf. previous slide for **each day identified “at risk”** in the publication, process hereunder should be followed

Process = SA contractual framework
RD bids submission process, deadline D-1 3 pm

- ✓ Including prices and volumes per quarter hour



* Full Activation Time as indicated in the shutdown RD energy bid

B. Further elaborate understanding of the situation based on monitoring

Compliancy reporting (Q1 2024)

Yearly FRR dimensioning reporting (assess FRR reserve capacity needs against the means) :

- Upward FRR needs remain set by dimensioning incident (by largest nuclear generation unit). Downward FRR needs are predetermined by dimensioning incident (by Nemo Link)
- The wrongful forecasts, i.e. situations where Nemo Link is predicted in import but observed in export or vice versa has decreased to 16% (from 28% in the previous reporting period
- Upward FRR means cover FRR need for 99.90% of the time (vs. 99.8% in the previous reporting) . Downward FRR means cover FRR needs for 99.46% of the time (vs. 98.83% in the previous reporting)

Operational risk (post Summer reporting)

- Potential to elaborate ex post event reporting with :
  - **Incompressibility indicators** : forecasted wind, solar, load and D-1 prices and complemented with regional indicators (day-ahead export / import conditions)
  - **Available flexibility :** FRR balancing energy bids and availability of sharing (set-off against the needs)
  - **Operational issues:** forecast errors, system imbalance and area control error. Availability of sharing agreement and market performance
- Compile the results to be presented to the WG BAL after Summer.

C. Continue efforts on mid-term and long-term solutions

CCMD market design	Elia is working development of solutions reduce entry barriers, increase competition and provide adequate price signals in order to facilitate and foster access of decentral flexibility to the electricity markets, and this as well via the explicit as via the implicit path (see presentation of Flexibility Roadmap).
End-user and PV Flex Readiness to react on market-based signals	Recommendation UG "... the members of the Elia Users' Group call upon the need for newly installed flexible assets to be 'Flex Ready' (as of 1/1/2025) by means of developing the technically capability to react on market-based signals (e.g., enable reaction of PV installations to negative market prices, enable reaction of heat pumps and electric vehicles to high prices)."
Solutions on ENTSO-E level	Elia is taking part to the ENTSO-E Task Force on "Risks on frequency quality" • TSOs discuss to gain better understanding of the situation and its evolution • TSOs will work towards joint proposals for solutions on regional basis

Summary of Elia's understanding of the situation

The concern about incompressibility follows a combination of two separate problems:

A. Ability of the market to manage well 'predicted' situations of high renewable generation. It is related to the ability of market parties to maintain a balanced portfolio during high renewable energy conditions

- As long it does not create operational issues, this remains a market issue and Elia should be very careful to intervene
- No operational issue as long as sufficient renewable generation such as large scale wind can be curtailed, if not exported (currently the case as long as no curtailment of PV is needed)
- Typical indications of difficulties of the market to cope with such situations are negative prices and renewable self-curtailment

B. Ability of the system to maintain sufficient flexibility to manage with unexpected outages or variations. It is related to available downward flexibility in the system

1. Elia aims for a market design where BRPs mitigate system imbalances as much as possible, and reduce balancing capacity needs
2. In line with SO Regulation, Elia only needs to cover 99% of expected imbalances, if it covers at least the dimensioning incident (Nemo Link)
3. The remaining risk is complemented with exceptional balancing measures to manage remaining system imbalances to the extent possible (before being covered by EU FCR)

While FRR reserve needs coverage issues remains acceptable (and even improved over the years) it is observed that in some extreme conditions (low local liquidity, no remaining ATCs, no market reaction) could result in large area control errors when facing large positive imbalances. These situations will need to be managed by European FCR.

It is Elia's key belief is that problem A needs to be solved within the market (CCMD and E-Assets Flex Readiness). If not, curtailment of renewable generation will grow every year linearly with increase of PV and renewable generation. However, solving this problem would also resolve problem B (by liberating flexibility for the balancing time frame, at least from renewable generation). But at this stage, Elia has insufficient comfort that problem A will be solved in due time, which requires us to take implement mitigation measures.

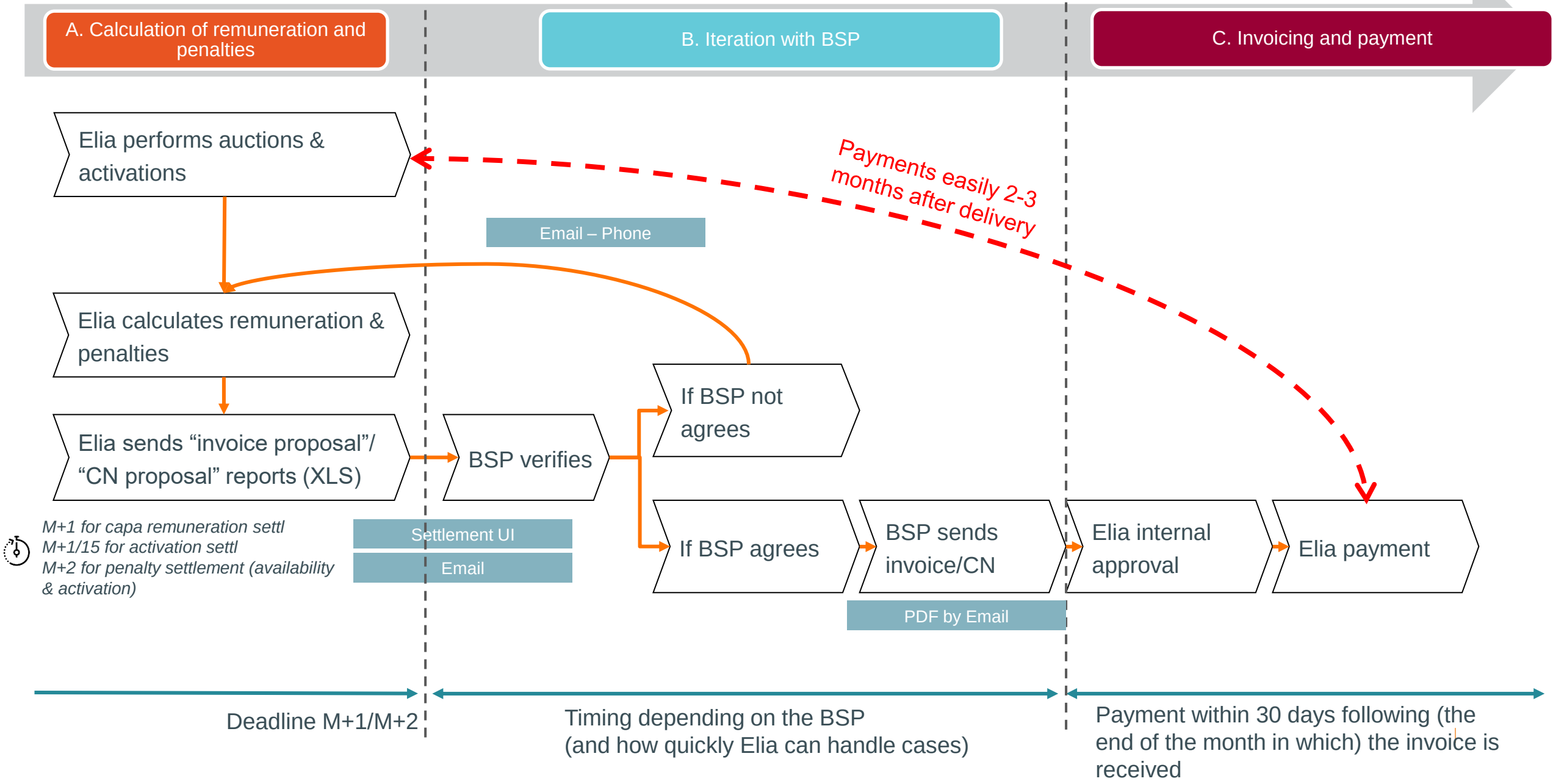
1. **Maintain and improve the measures implemented in 2023 (with incompressibility shut down as main mitigation measure)**
2. **Further elaborate understanding of the situation based on monitoring (based on local and regional indicators)**
3. **Continue efforts on mid-term and long-term solutions (CCMD, Flex Readiness of E-Assets and Regional solutions)**

Faster Settlement for Ancillary Services

Martine Verelst

Current process

Current Ancillary Services settlement process



Goal

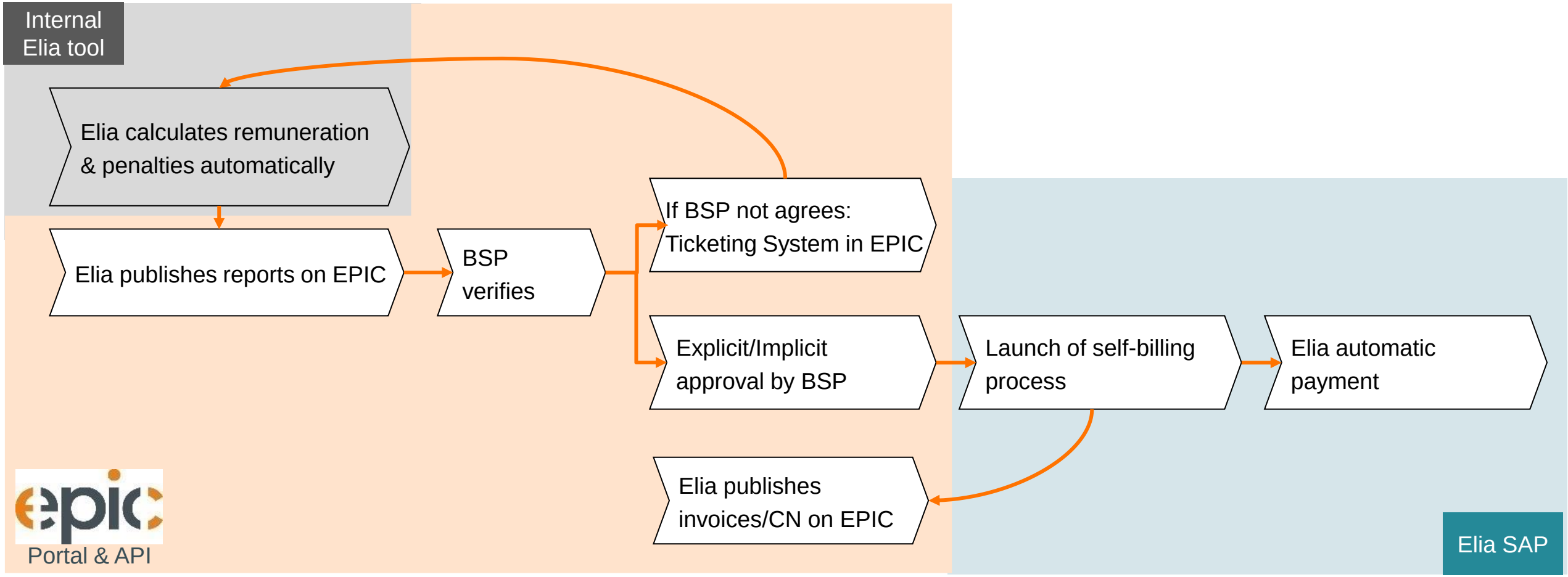
Elia would like to reduce the time between the delivery of the service and the payment of the renumeration and penalty regulation for the ancillary services.

Elia whishes to achieve this through :

- Optimising and automating as much as possible the internal processes and tools
- Improving the way of communicating with the BSP
- Providing additional information pro-actively
- Reducing the administrative burden on both the BSP and Elia side.

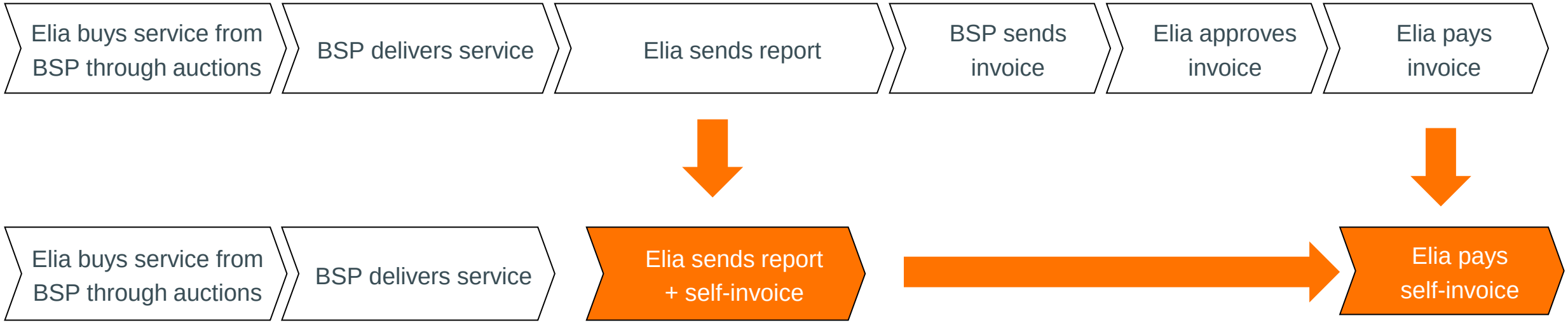
Proposal for the future

Faster Settlement AS – how the future process could look like



Consider the introduction of the principle of Self-Billing

Self-billing is a process in which a buyer prepares its own invoice for the goods and services provided by another party. *Traditionally, the supplier of the goods and services prepares and sends the invoice, and then the buyer checks and pays the invoice. With self-billing, this process is reversed.*



T&C, …

5 main working areas

1. Settlement Tool

- Efficiency gains by automatic and robust operational processes

2. Connection to EPIC

- Publication of settlement reports
- Publication of (self-) invoice /credit note
- Analyse to further improve the customer experience

3. Self-Billing

- Implement Self-billing process in which ELIA prepares the invoices for the services provided by the BSP

4. Contextualization

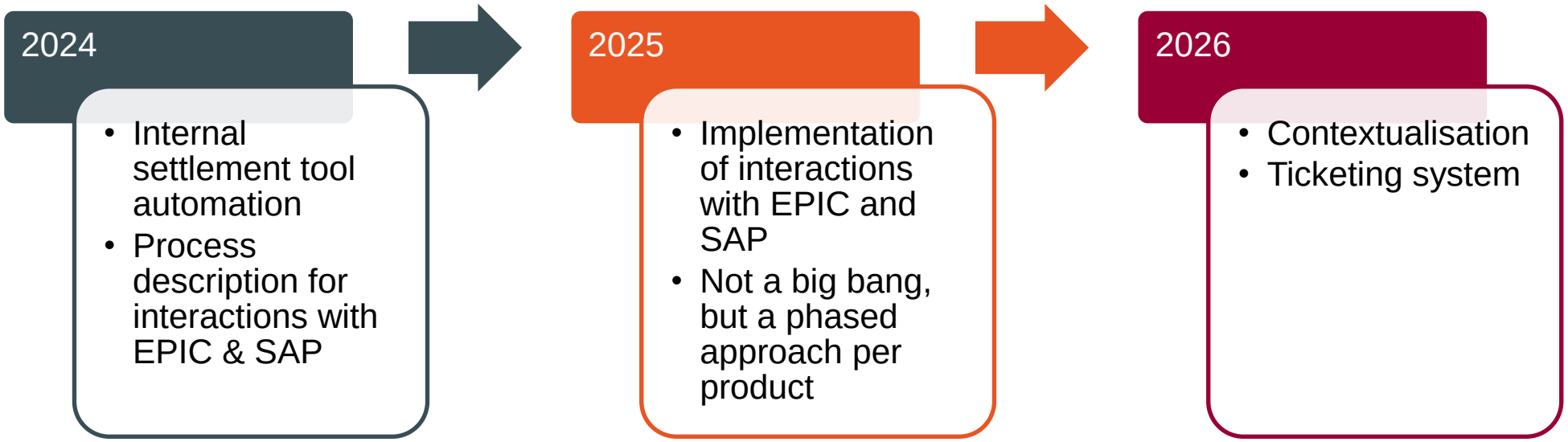
- Provide additional information in reports (reasons for penalty) to avoid questions
- Graphical visualization in EPIC

5. Ticketing system

- Define standard FAQ
- Implement ticketing system for more complex questions on common platform (EPIC)

Planning

Desired high-level planning



- Next steps : organization of a workshop in Q2 with interested BSPs to discuss proposed solution to improve the processes for all parties

AOB – Next WG Balancing

Thomas Van der Vorst

Next WG Balancing

- **Dates for 2024:**
  - WG Balancing 07/02/2024 09:00 – 13:00
  - WG Balancing 02/04/2024 09:00 – 13:00
  - WG Balancing 21/05/2024 09:00 – 13:00
  - WG Balancing 28/06/2024 13:30 – 17:30
  - WG Balancing 30/09/2024 14:00 – 18:00
  - WG Balancing 22/11/2024 13:30 – 17:30
  - WG Balancing 19/12/2024 14:00 – 18:00