Procurement strategies for a dynamic allocation of FRR Means

1st stakeholders' workshop

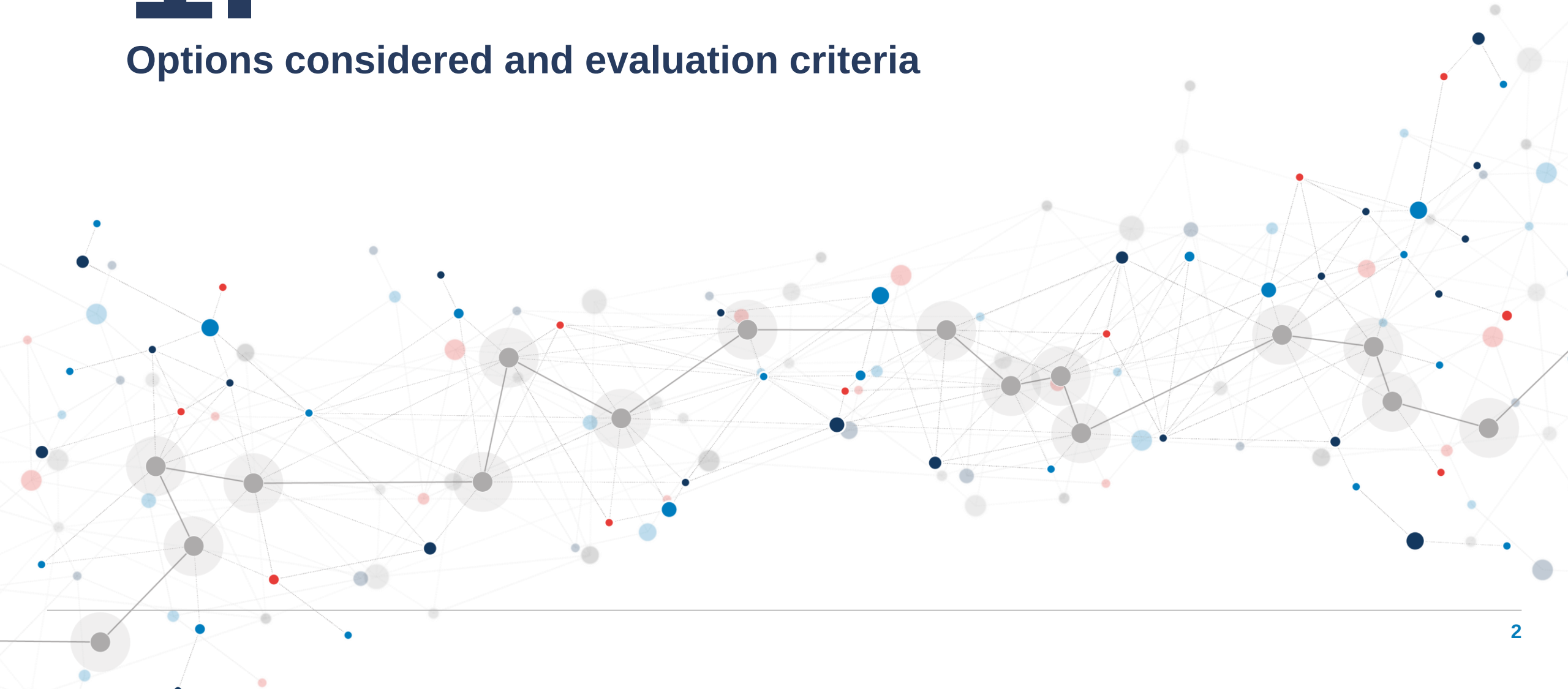
April 21st, 2022

elia group
Elia | 50Hertz | EGI

COMPASS LEXECON

1.

Options considered and evaluation criteria



Elia recently showed that upward mFRR non-contracted bids could be predicted, creating a potential to optimise balancing capacity procurement but with many uncertainties following upcoming system evolutions

Elia is investigating the possibility to optimize the allocation of the required reserve capacity needs to contracted and non-contracted balancing means trough a dynamic calculation of the available balancing means.

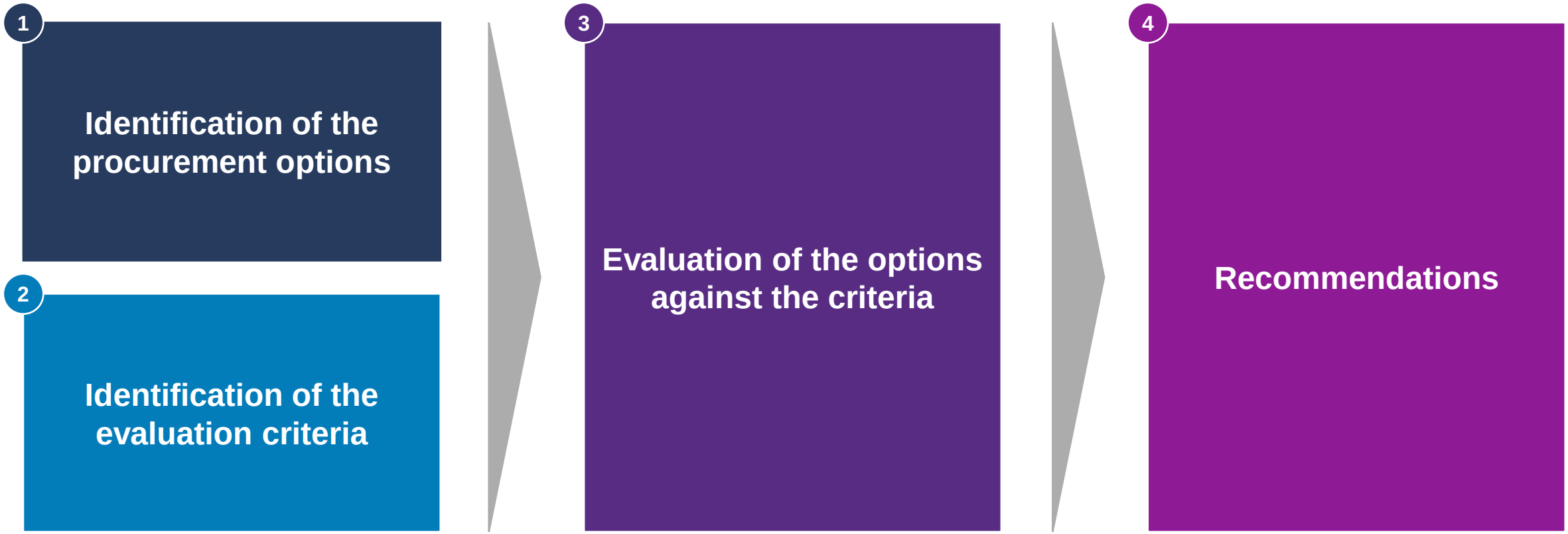
In December 2021, Elia published a study testing whether non-contracted balancing energy bids can be predicted for the next day. The study's main conclusions were:

- **aFFR**: no substantial volumes of aFRR non-contracted balancing energy bids can be predicted, due to low liquidity and the limited time series available at the time of the study.
- **Downward mFRR**: confirmation of Elia's current approach not to procure downward mFRR balancing capacity as observed non-contracted balancing means almost cover the full downward mFRR capacity needs.
- **Upward mFRR**: available date has shown that a potential volume of 500 MW (including reserve sharing) can be predicted with a reliability of 99.0%, on average, while a volume of 1000 MW can be ensured for 14% of the time. **It is confirmed that there is a potential value for this prediction tool** but many uncertainties are present following upcoming system evolutions (evolution to explicit bidding, reduction of the full activation time and implementation of the EU balancing energy platforms).

Link here.

One of the main conditions to harness predictions of upward mFRR non-contracted capacity is whether appropriate procurement mechanisms can be found to deduct this capacity from the balancing capacity to be procured. The following presentation explores different mechanisms to do so.

Presentation of the methodological approach



Identification of 3 main options

0 Status quo

1 No procurement based on post-market re-scheduling

No procurement in day-ahead based on re-scheduling in day-ahead market stage to reschedule / start up plants to free up sufficient balancing capacity

2 Intermittent procurement

Avoid procuring balancing means (after sharing) only when expected available non-contracted balancing energy bids are sufficient

3 Partial procurement

Procure lower volume of balancing capacity by taking into account expected available non-contracted balancing energy bids (and sharing).

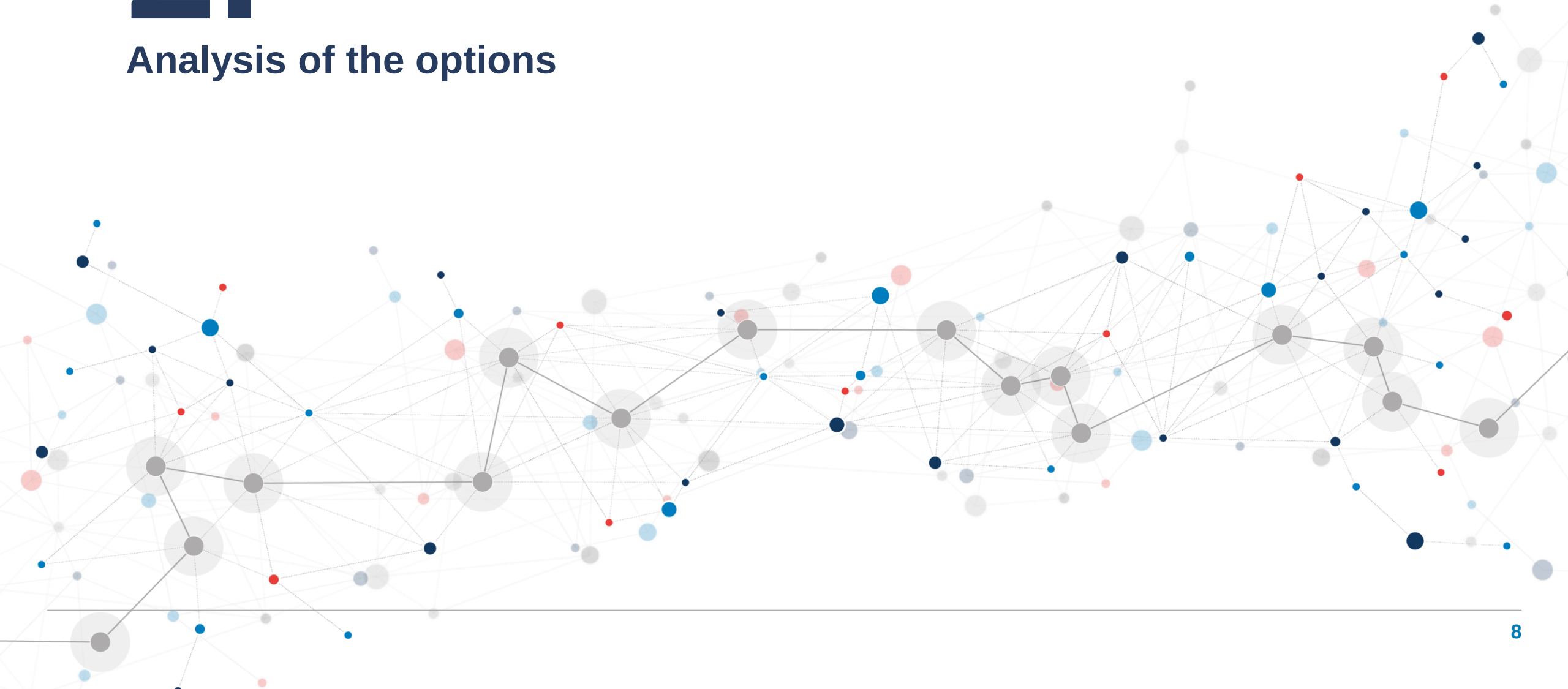
Identification of a set of criteria to evaluate market design options

1	**Operational security**	*Decisive criterion* • Does it guarantee a sufficient amount of reserves and an adequate level of operational security?
2	**Economic efficiency**	• Does it provide efficient dispatch incentives? • Does it provide efficient long-term incentives to provide flexibility?
3	**Cost for TSO / grid users**	• Is it likely to reduce costs for grid users?
4	**Market impact**	• Does it negatively impact the efficient functioning of market mechanisms for balancing and price formation and wholesale market? • Does it provide a clear and stable framework for market participants?
5	**EU / Belgium compatibility**	*Decisive criterion* • Is it compatible with EU / Belgian legislation?

Questions/Reactions from the floor?

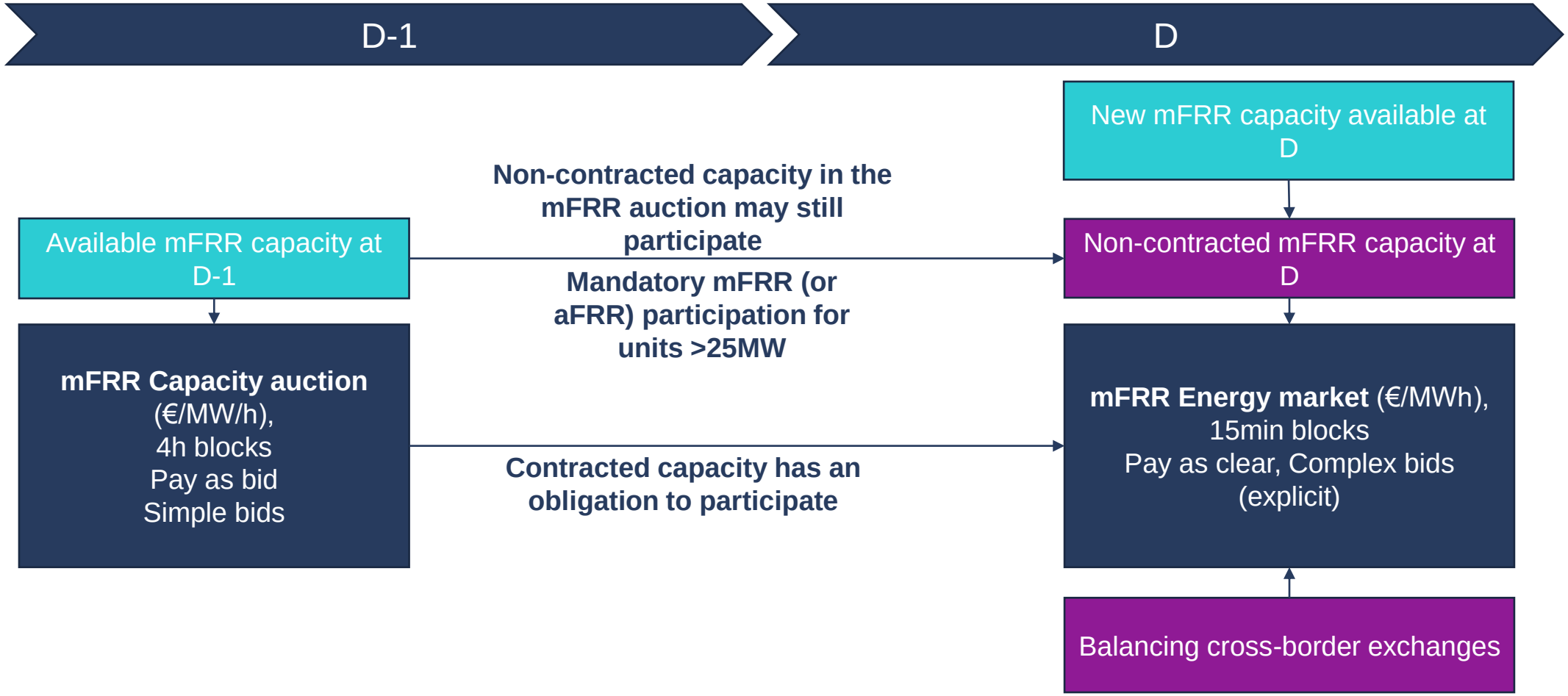
2.

Analysis of the options



The mFRR market design features capacity and energy auctions

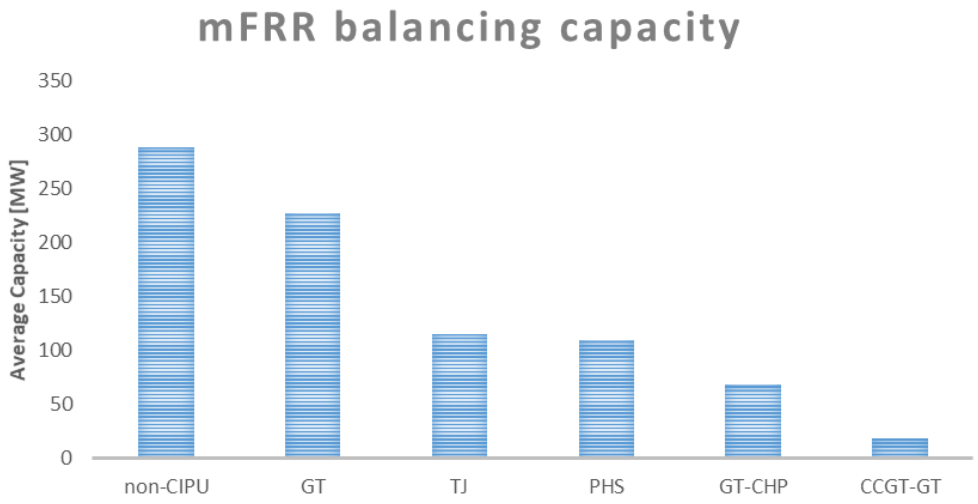
Overview of the mFRR process (post-MARI)



Contracted and non-contracted mFRR capacities are currently provided by different technologies

D-1

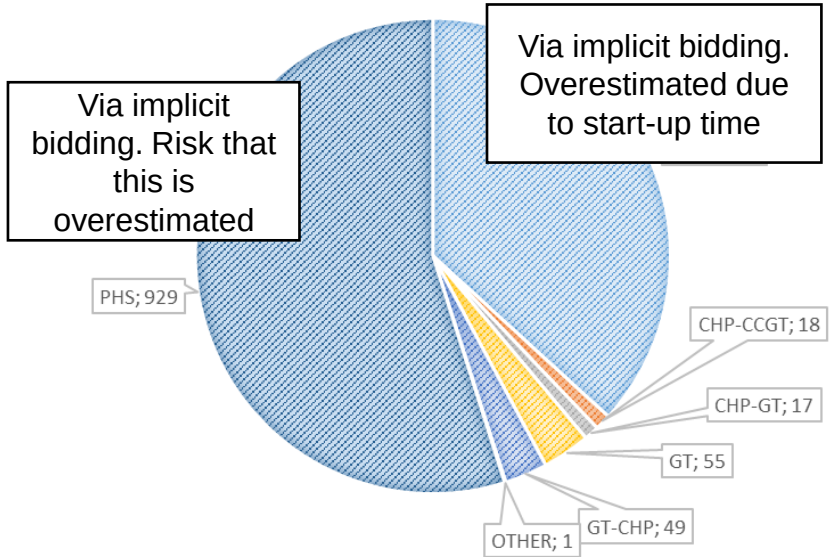
Balancing energy bids provided through contracted mFRR balancing capacity



Volumes following mFRR balancing capacity at D-1 is mainly composed of OCGTs, Turbo Jets, and DSR.

D

Balancing energy bids provided through non-contracted flexibility [MW] (2020)

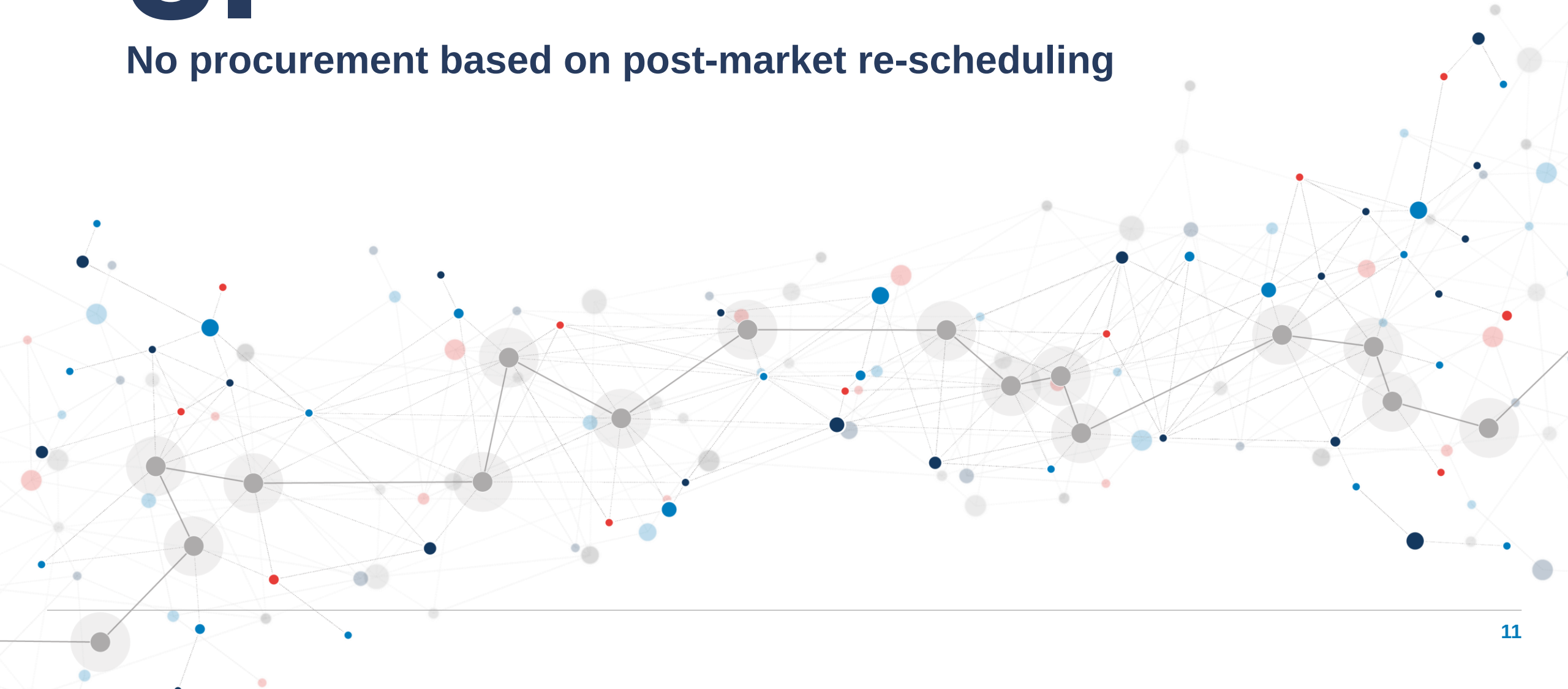


Non-contracted mFRR capacity is mainly provided by CCGTs and pumped-hydro storage, although these units are subject to uncertainty.

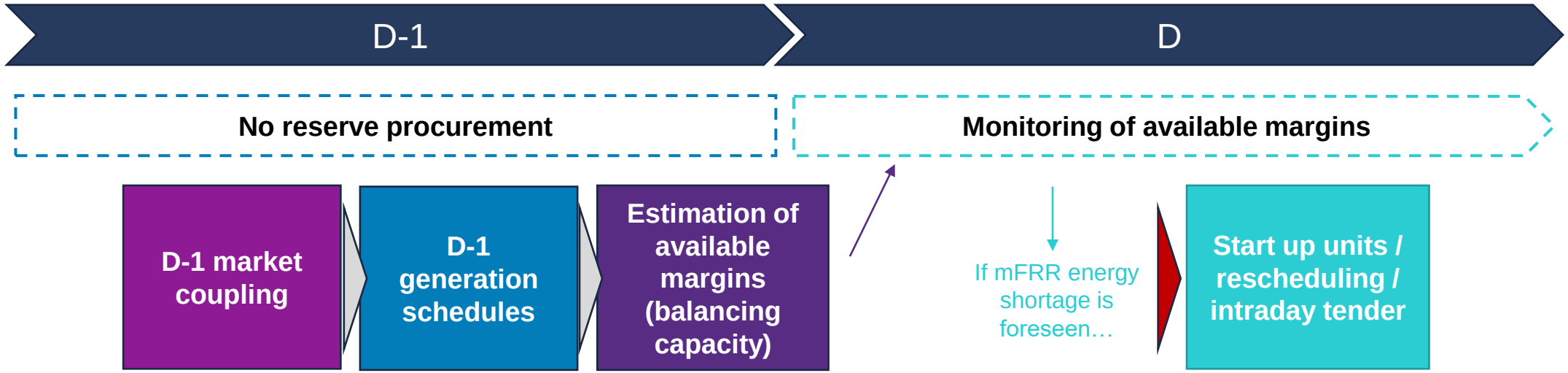
Source : ELIA

3.

No procurement based on post-market re-scheduling



No procurement complemented with post-market rescheduling



- In this option, Elia would not procure mFRR capacity in D-1: it would rely on non-contracted, especially thanks to mandatory participation. Indeed, in accordance with article 226(1) of the Federal Grid Code, technical facilities with installed capacity of 25MW or more (and storage capacity) have to provide to Elia their available capacity.
- Elia would have to **monitor its available balancing capacity** after the D-1 market schedule is drawn. Based on these schedules, should there be risks that mFRR capacity be below requirements, Elia would **proceed to rescheduling actions.** Post-market rescheduling would allow Elia to **redispatch generation or start up new plants to provide additional mFRR capacity.**
- This solution has similarities with the mechanism foreseen in the LFC operational block agreement, through which additional CCGTs can be started to provide additional flexibility if required. However, this mechanism should only be used for exceptional events.

Not procuring mFRR should be discarded as long as reserve capacity is not (almost) always fully covered by non-contracted resources

No procurement of mFRR capacity

1. **Operational security**

This solution requires Elia to have a clear view on available resources and be able to start up plants when more flexible capacity is needed. **Elia may not have access to adequate resources, hence higher operational security risks, in particular in case of need close to real time and as non-contracted decentralised flexibility may no longer be available/ visible.**

2. **Economic efficiency**

No procurement minimises impacts on the day-ahead market, which **may improve dispatch efficiency**. However, re-scheduling actions may not be fully efficient, as a TSO may not have visibility on decentralised flexibility for example, so they would need to be triggered only in exceptional circumstances.

3. **Cost for TSO / grid users**

Costs are only incurred for additionally needed capacity, and as such there is no remuneration of free bids: this solution could lower procurement costs. However, **re-scheduling/start-up costs could be high** and **costs could increase if decentralised flexibility develops** (may not be accessible to Elia for such a purpose) and/or re-scheduling is **too frequent**.

4. **Market impact**

It may become harder for market participants to forecast revenues on wholesale energy markets if the TSO regularly implements corrective rescheduling actions to free up mFRR capacity. As a result, this **might bring more instability and complexify the market environment for generators**. Could be seen as **discriminatory for decentralised resources**.

5. **EU / Belgium compatibility**

Implementing this option is a significant departure from current arrangements as well as the EU target model if post-market rescheduling is frequent. **Implementation might require substantial regulatory and operational changes**. There is also a risk that this solution is **not technology neutral**, and would favour large-scale generation flexibility as opposed to decentralised flexibility outside of the generation schedule.

If reserve capacity is not consistently fully covered by non-contracted resources, there would be **frequent post-market interventions** by ELIA and **operational risks** due to frequent lack of mFRR

No procurement based on post-market rescheduling departs significantly from current market philosophy and result in operational risks

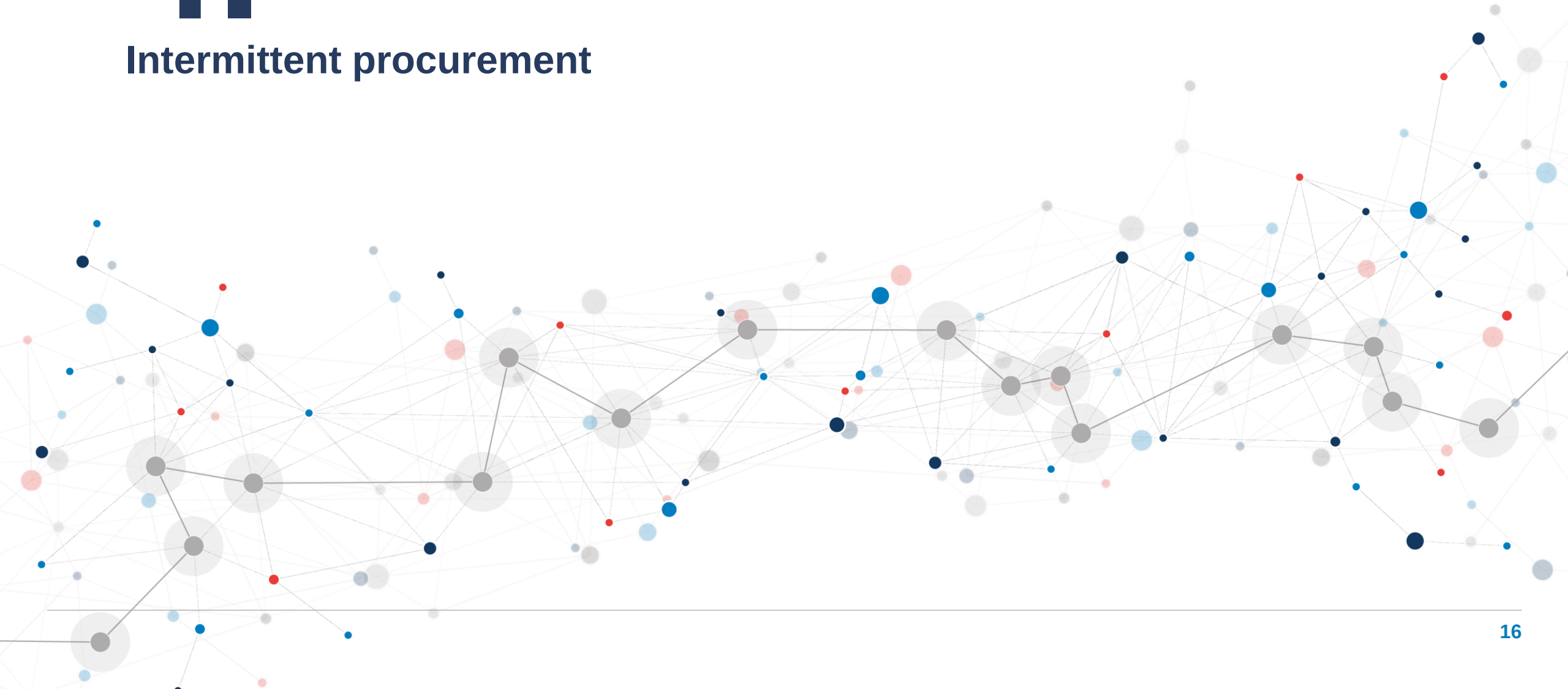
1. **No procurement based on post-market rescheduling raises operational security risks** as Elia may no longer have access to all necessary resources to perform it.
   - **Current generation mix does not guarantee that Elia will have access to adequate resources to re-schedule plants** when needed (slow start-up times of conventional thermal units, e.g. CCGT).
   - **Tight system conditions (peak demand) does not guarantee the availability of upward flexibility when needed in real time.**
2. Post-market rescheduling could be used as **back-up in other approaches to reduce operational risks**, as it is foreseen today (cf. exceptional balancing measures). But Elia should only have to resort to it **under exceptional circumstances**.
3. Insofar as decentralised flexibility develops but does not have obligation to participate and provide its available flexibility, this could raise **concerns in terms of visibility on these resources by ELIA, and therefore in terms of operational security, efficiency and discriminatory treatment between large-scale generation resources and decentralised flexibility**.

In the current system, this model option is considered infeasible. Low mFRR liquidity would imply frequent re-scheduling actions and induce operational security risks. In the long run, if decentralised flexibility develops strongly and is able to cover (almost) systematically full reserve needs without contracting, this model could be investigated again.

Questions/Reactions from the floor?

4.

Intermittent procurement

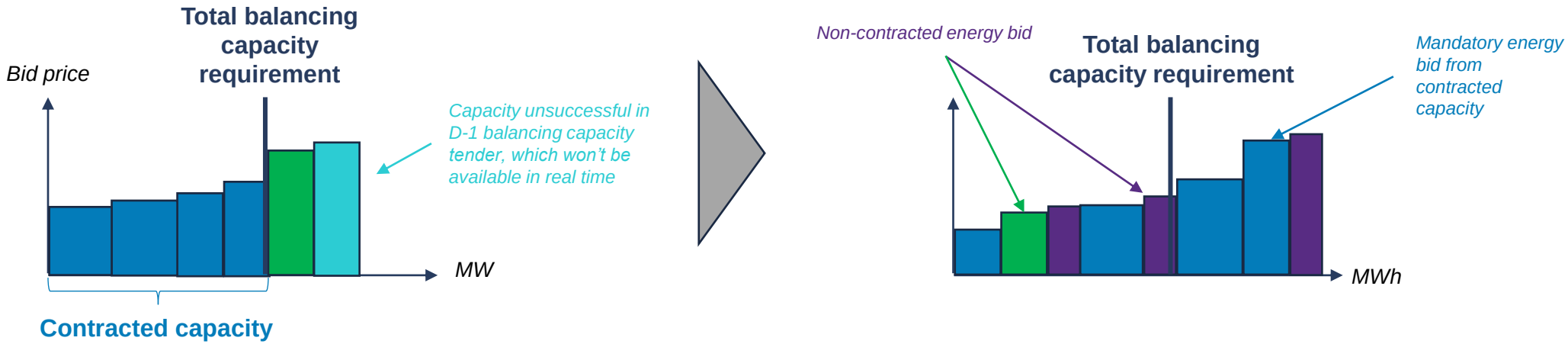


Currently, Elia procures upward mFRR capacity to cover the entire upward mFRR capacity requirement

D-1 mFRR capacity auction

D mFRR energy market

Status Quo



In real time, available balancing capacity may come from:

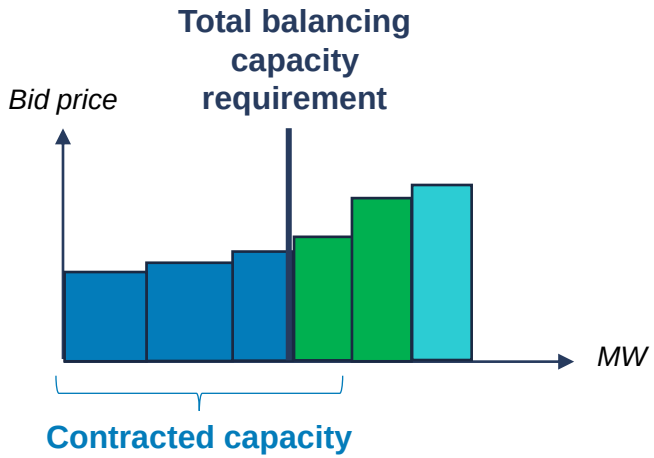
- **Contracted capacity**: being contracted in the D-1 tender obliges balancing capacity providers to bid in the balancing market
- **Non-contracted capacity, which bid unsuccessfully in the D-1 tender**: either (i) may have **overestimated opportunity costs** of not participating in the day-ahead / intraday markets, (ii) **may have overestimated the marginal price** (pay-as-bid context), (iii) may be **due to the differences in market time unit** (4h for the mFRR capacity auction vs. 1h for the day-ahead energy market) or (iv) had a **higher opportunity cost**.
- **Non-contracted capacity, which did not bid in the D-1 tender**: Available bids in real time, for instance capacity which was expected to be dispatched, but was not in the end, or capacity kept for intraday but not used

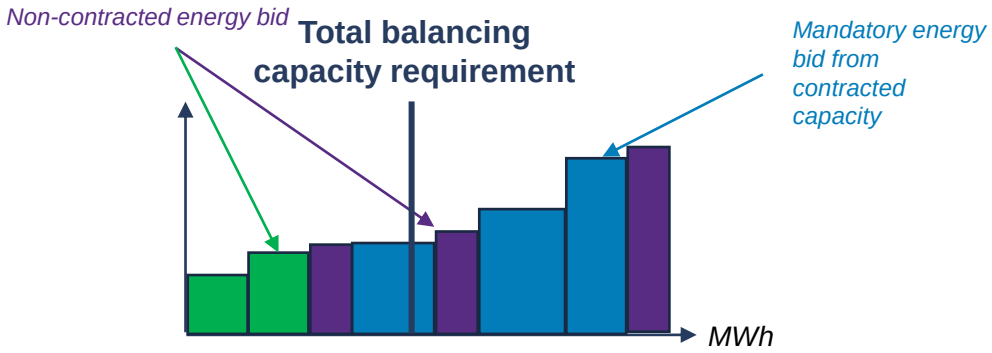
However, **non-contracted capacity bidding unsuccessfully in the D-1 tender** may not offer energy for mFRR activation in real time. This could be due to the fact that capacity payments were necessary to guarantee the start-up of production units for instance but they were too expensive.

The possibility of intermittent procurement depends on to what extent non-contracted bids in the status quo would still be available in that case

D-1 mFRR capacity auction → D mFRR energy market

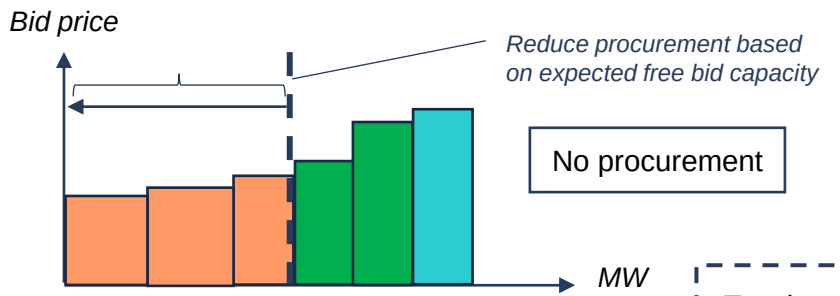
Status Quo



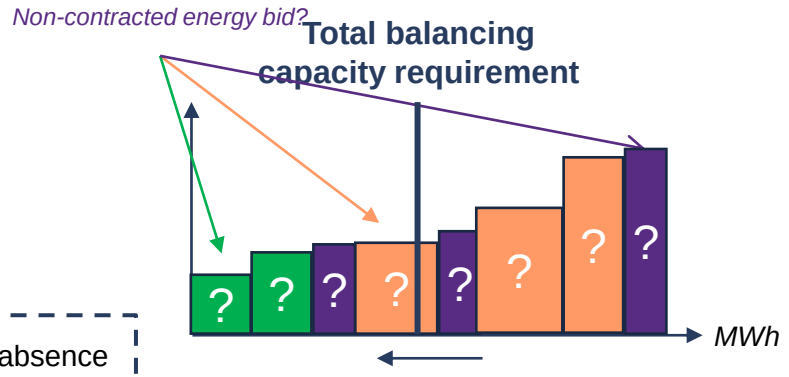


Best-case scenario: free bids are not affected

Intermittent



?

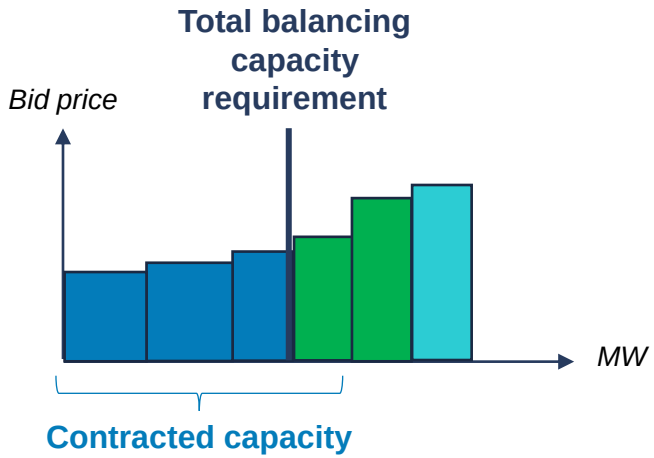


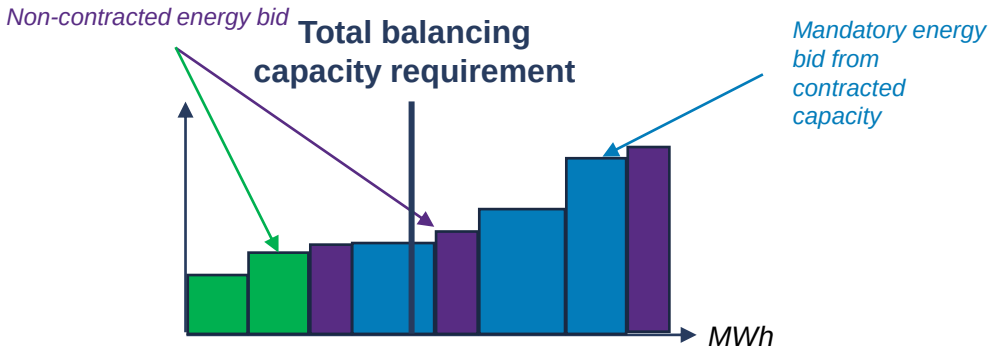
To what extent would the absence of mFRR procurement change bidding behaviours of "previously" non-contracted bids?

In theory, in case of intermittent procurement, free bids may still be present, as they were available without being contracted in any case

D-1 mFRR capacity auction → D mFRR energy market

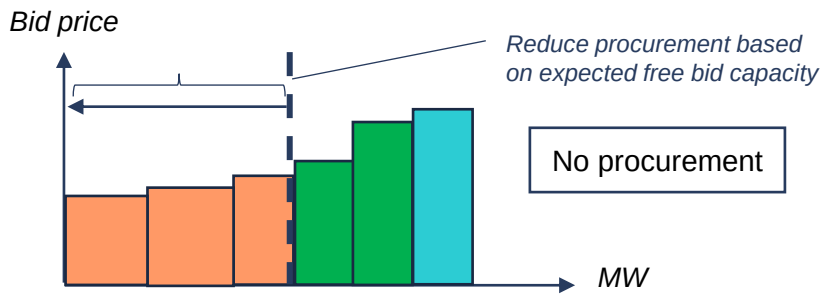
Status Quo

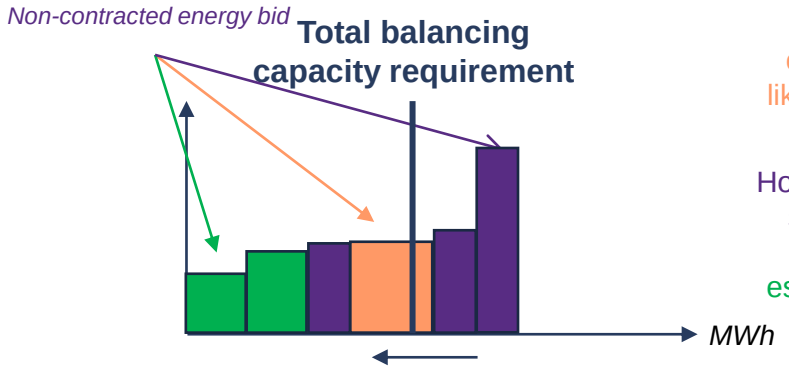




Best-case scenario: free bids are not affected

Intermittent





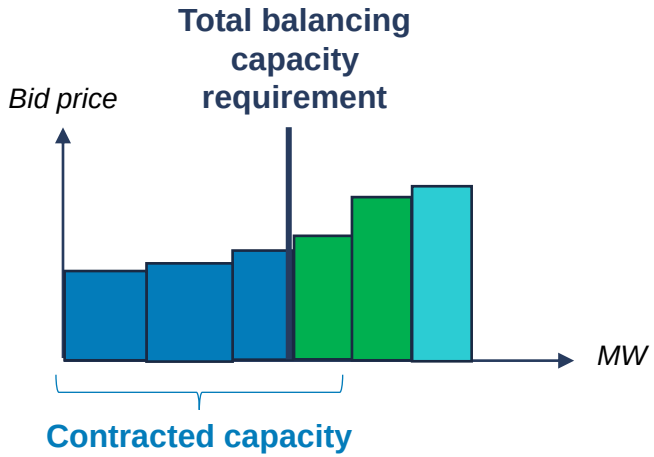
Part of the no-longer-contracted capacity will likely not participate in the balancing market

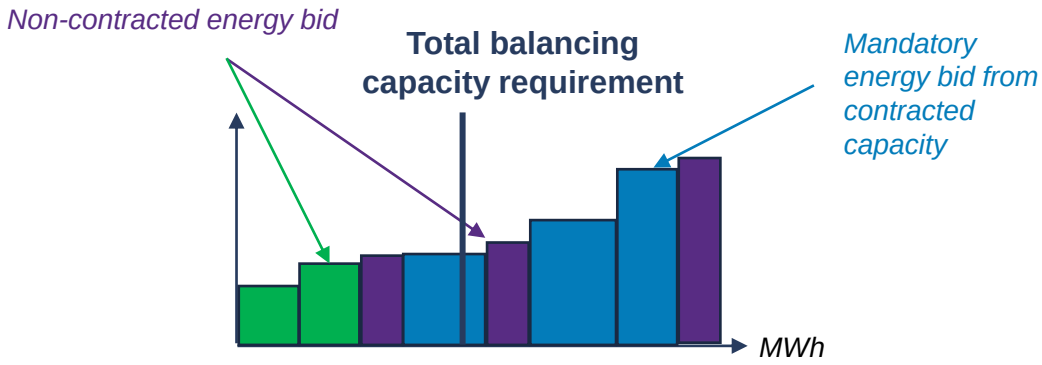
However, free bids from the status quo may remain (same opportunity cost estimation, same dispatch expectations).

However, in case of intermittent procurement, free bids may no longer be available as well, raising operational risks

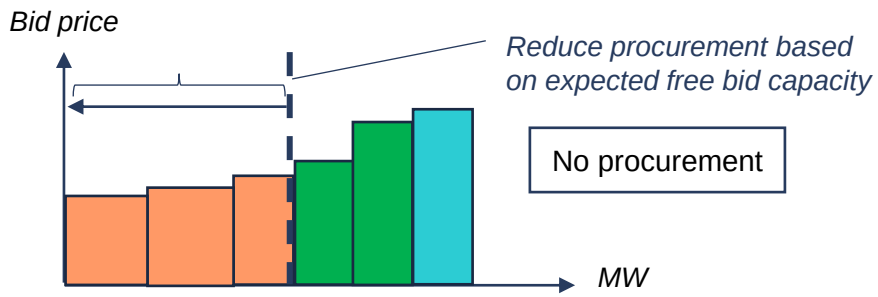
D-1 mFRR capacity auction → D mFRR energy market

Status Quo

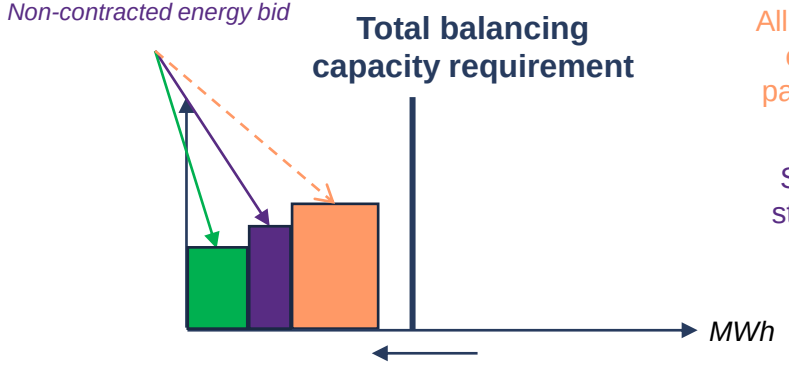




Intermittent



Worst-case scenario: free bids are affected and capacity requirement is longer met



All the no-longer-contracted capacity may no longer participate in the balancing market

Some free bids from the status quo may no longer be available.

Illustrative example – intermittent procurement could reduce capacity available to provide mFRR in real time, by influencing dispatch decisions

Power system

Demand of **400MW**

Balancing capacity requirement of **200MW**

Generator 1

Plant of **500MW** (Pmin is **200MW**)

Marginal cost of **€40/MWh**

Generator 2

Plant of **500MW** (Pmin is **100MW**)

Marginal cost of **€50/MWh**

Scenario 1 – mFRR 'full' capacity auction

- To meet the demand and balancing capacity requirement, both plants need to be dispatched to provide 400MW of energy (300MW for Generator 1 and 100MW for Generator 2) and 200MW of reserve.
- In the mFRR tender *(ex. if equilibrium price at €48/MWh)*:
  - Generator 1 will *provide 175MW of reserve at €8/MW, its opportunity cost*
  - Generator 2 will bid in the balancing capacity auction in order to cover the cost of producing 100MW and sell it below its marginal cost *=> it will provide 25MW of reserve at €8/MW*

Available non-contracted bids in the balancing market would amount to 400MW.

Scenario 2 – no mFRR capacity auction

- Taking into account free bids, in an intermittent procurement case, the TSO could decide not to procure any mFRR capacity in this situation, as the expected 400MW of free bids far exceeds its 200MW requirement.
- In such a case,
  - Generator 1 produces 400MW and provide 100MW of reserve in the mFRR Energy market
  - Generator 2 would therefore neither produce nor provide balancing capacity.

In such a case, available balancing capacity would only be 100MW and would not meet the balancing capacity requirement.

This dummy exercise shows that intermittent procurement could also impact generation schedules, and reduce the reserve available in real time.

Non-contracted upward mFRR capacity is predictable for the next day, but may still present a risk of error above required reliability levels

The adequacy of partial upward mFRR capacity procurement relies on the ability to forecast non-contracted capacity for the next day. In our examples from the previous slides, we assumed that non-contracted capacity in the status quo could be predicted accurately at D-1.

In its 2021 study, Elia tested whether non-contracted balancing energy bids can indeed be predicted for the next day.

- **Method**: a machine-learning approach is used in which algorithms are trained, based on historic observations, to predict the available non-contracted balancing means for each period of the next day
- **Results**: non-contracted upward mFRR balancing means can be predicted to an acceptable extent, demonstrating a potential volume of 500 MW (including reserve sharing), on average, while a volume of 1000 MW can be ensured for 14% of the time.
- **Accuracy**: The algorithms tested are shown to have a reliability ranging between 98.9-99.0%

Link here.

It is worth noting that **the prediction reliability of forecasting algorithm does not guarantee the availability of the required capacity, adding up to the maximum risk accepted in the reserve dimensioning.**

Performance of different forecasting algorithms on non-contracted mFRR means compared to a static approach

		Static	Linear regression	Random Forests	Neural Networks
UPWARD	Volume [MW]	319	388	500	463
	Reliability	99.0%	99.0%	98.9%	99.0%
	MAE	5.4	4.53	3.24	3.95

Source: Elia

Moving to intermittent procurement induces a greater operational risk caused by two effects

1 Operational risk from forecast error

Accuracy of predictions of non-contracted bids for the next day comprise a risk of error

- Elia's study on the daily prediction of non-contracted mFRR energy bids is based on assumptions regarding availability of pumped hydro storage plants to provide mFRR. As these capacities have technical constraints which are not fully taken into account in the study, this presents an additional risk of inadequate mFRR contracting for the next day
- Elia's study shows that the forecasted non-contracted bids have a lower reliability than the required network reliability level.
- Forecast error on the quantity of free bids for the next day **may lead Elia inaccurately assessing that no procurement is needed on a particular day.** In turns, this could lead to mFRR shortages in real time. This increases the operational risk for Elia's network.
- Non-contracted capacity prediction is conducted using machine learning based on historic data. Sudden market evolutions will result in accuracy issues, which could lead to situations where reserve capacity needs are not fully covered. In particular, it does not take into account the consequences of the modification of the full activation time requirement.

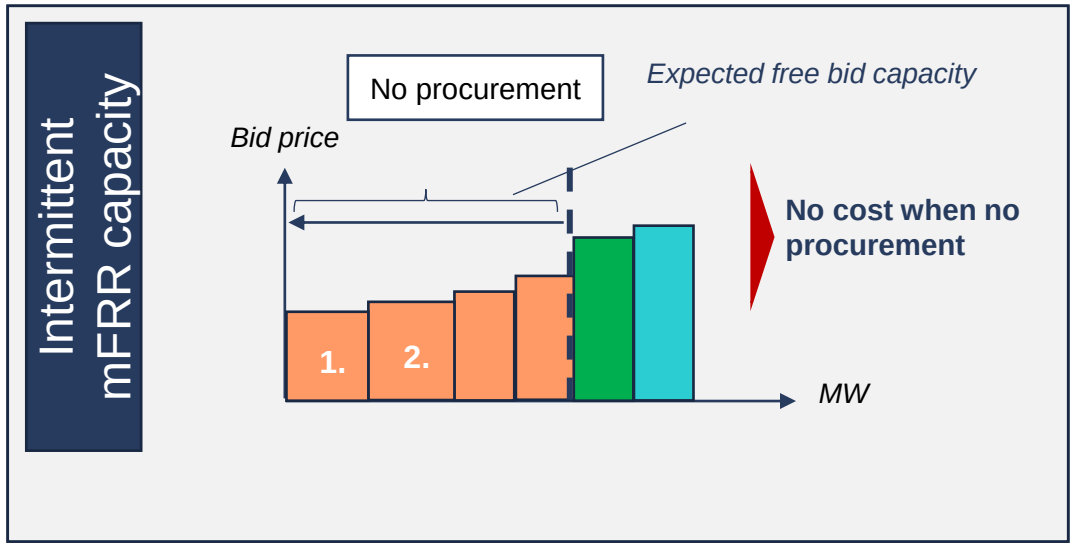
2 Operational risk from impacts on dispatching

Assuming fully accurate predictions, intermittent procurement could still reduce non-contracted bids available for the next day

- As shown previously, intermittent procurement could affect dispatching decisions of generators. This is because generators' strategies might decide not to run at all following the cancellation of a mFRR capacity auction on a given day.
- As a result, intermittent procurement could cause a reduction in non-contracted bids available in the next day, impacting available reserve. This presents an operational risk in case this reserve is needed by Elia on the day.

Intermittent procurement will likely increase operational security risks as availability of sufficient balancing capacity in real time is no longer guaranteed.

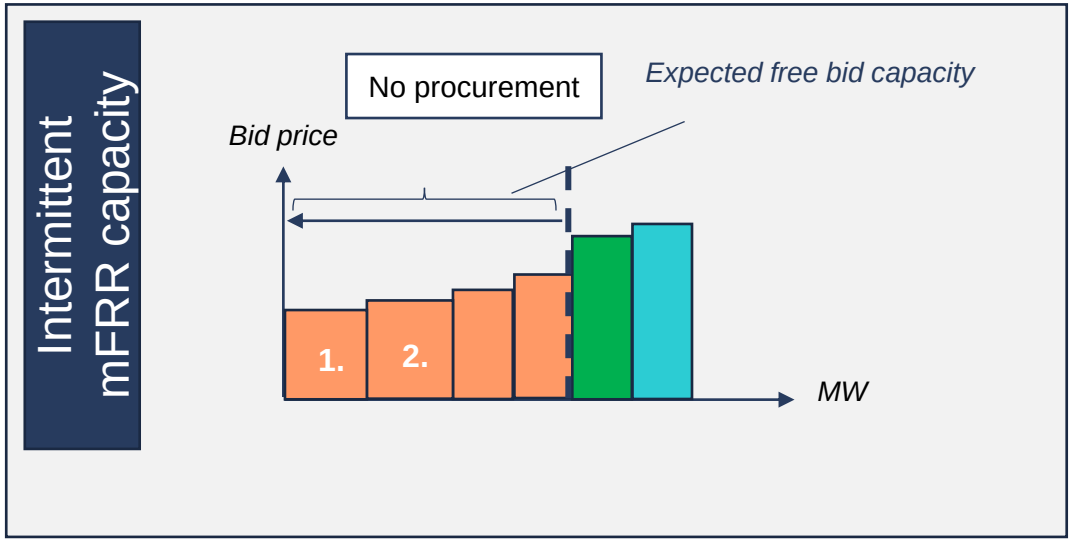
Intermittent procurement may reduce costs & improve dispatch efficiency to a limited extent, and only if Elia does not have to intervene due to a lack of reserve

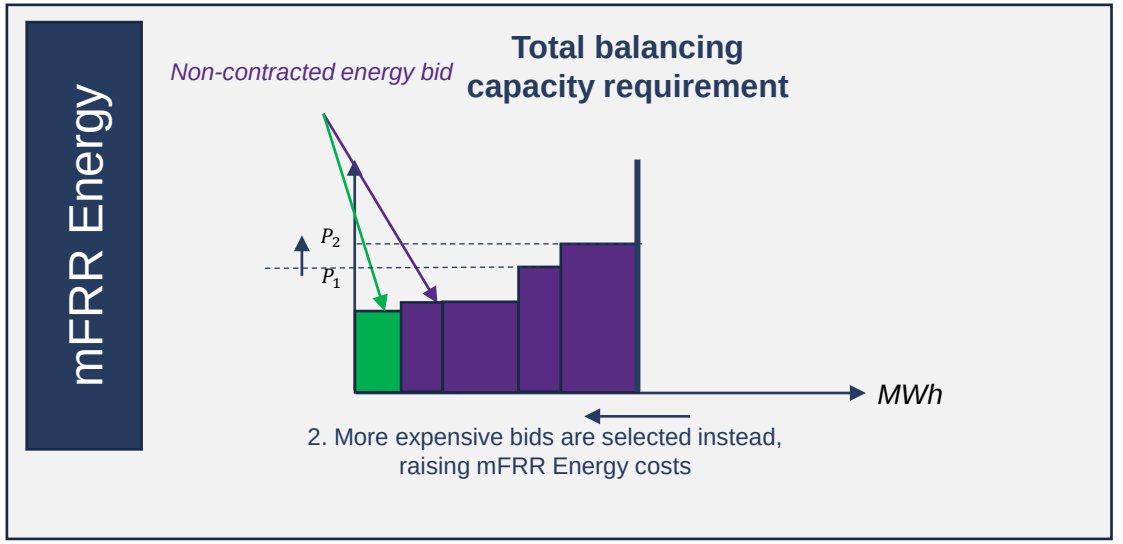


- With intermittent procurement, **previously contracted capacity** is no longer paid capacity payments. As a result, procurement costs are reduced to zero in such circumstances.
- However, the more free bids are available in real time, the lower the mFRR capacity price in day-ahead is. Therefore, **the gains obtained in occurrences when intermittent procurement is possible may be limited by the lower prices** in those cases.
- Intermittent procurement may dampen longer-term incentives but it should be limited as it happens when mFRR capacity prices are lower, so with a rather limited impact on prospective revenues, unless there is frequently no tenders. However, the fact that mFRR capacity auctions are not systematically organised may result in **a less stable market functioning, reducing long-term visibility for market participants and increasing risks of operational errors on the market side** (e.g. unvoluntary no participation).
- **No longer contracted capacity will be able to participate in the wholesale market at its actual marginal costs and thus improve the efficiency of the dispatch**. However, the gains would also be limited as the opportunity costs are smaller in those cases (as indicated by lower capacity prices).
- Moreover, if Elia has to intervene due to the lack of available mFRR capacity in the balancing market, it would have an impact on balancing costs and dispatch efficiency.

- **Intermittent procurement will likely reduce procurement costs, but to a limited extent as mFRR capacity prices tend to be lower when free bids' availability is high.**
- **Gains in terms of dispatch efficiency are also likely but will be more limited.**
- **Intermittent procurement could reduce market functioning stability and increase risks of operational errors, and may dampen, to a certain extent, long-term incentives.**

Partial procurement of mFRR capacity may impact competition and market power in mFRR energy and capacity markets





- Lower availability in the mFRR energy market will likely **increase risks of market power**, as available mFRR capacity in real time would often be close to total balancing capacity requirement, making bids likely to be activated pivotal. **The use of market power may result in even higher prices**
- This could though **attract new flexibility including through reactive balancing**, thus mitigating market power. However, such situations might be rare and too uncertain to actually drive additional flexibility development.
- The **participation in EU balancing platforms (MARI) will also contribute to mitigating market power concerns**.

- **Intermittent procurement could increase market power in the balancing timeframe.**

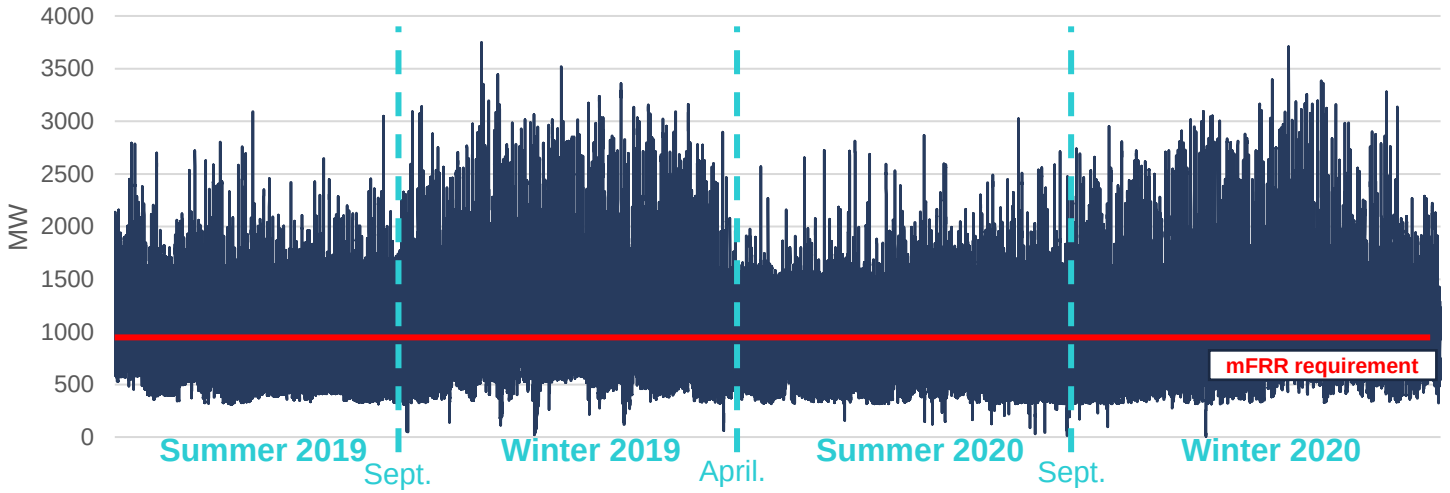
If implemented today, intermittent procurement would create significant uncertainty in mFRR capacity auctions for market participants

Intermittent procurement could provide a stable framework only if non-contracted capacity follows predictable patterns (e.g. seasonal?)

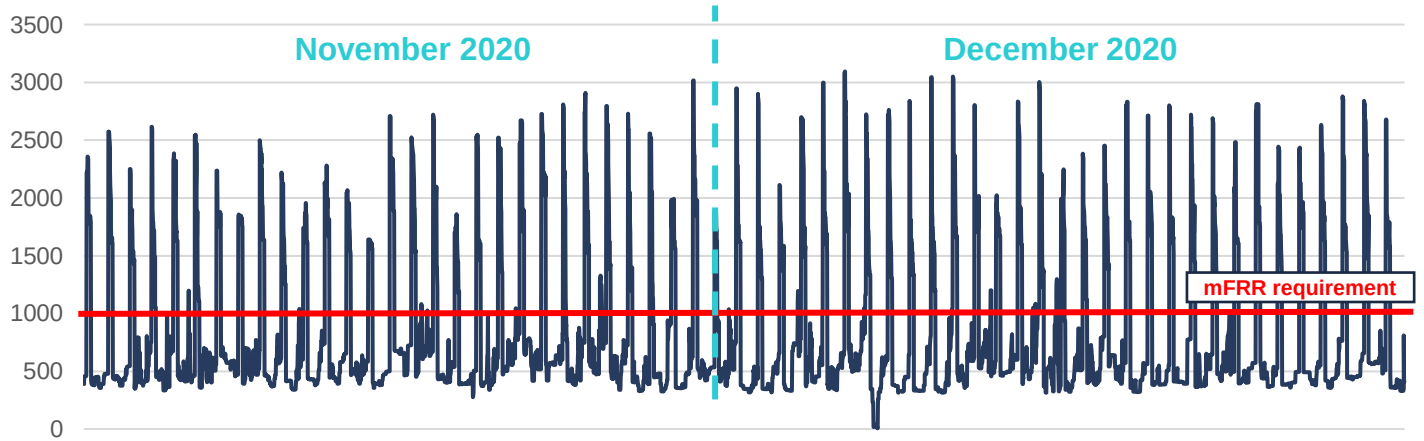
This is not the case on a seasonal/weekly basis, and so intermittent procurement could induce significant uncertainty for market participants

If implemented, would this model be sufficiently rewarding for market players to participate in mFRR capacity auctions altogether?

Observed non-contracted mFRR balancing means Summer 2019 to Winter 2020 (15min MTU)



Observed non-contracted mFRR balancing means November to December 2020 (15min MTU)



Source: CL analysis of Elia data

Intermittent procurement would induce additional operational security risks. Consumers may benefit from low cost savings, but only if these risks are limited.

Intermittent procurement of mFRR capacity

1. **Operational security**

When mFRR capacity auction takes place, the full procurement of mFRR capacity secures operational needs. **Issues may arise in cases where no procurement is carried out**, and that unforeseen mFRR scarcity arises. Difficulties to forecast free bids' availability exist and would **likely lead to a lower (and inacceptable?) average level of operational security**.

2. **Economic efficiency**

Intermittent procurement may improve dispatch efficiency in the wholesale market by freeing up some previously-contracted mFRR capacity, but to a more limited extent. However, should there be not sufficient mFRR capacity in real time, the TSO may have to resort to costly and less efficient measures to guarantee operational security.

3. **Cost for TSO / grid users**

Intermittent procurement may grants less cost-reduction benefits than partial procurement, as full mFRR capacity would still be procured in times where free bids would not cover the entire mFRR energy requirement and intermittent procurement may occur predominantly when mFRR capacity prices are low.

4. **Market impact**

This framework does not guarantee regular auctions which could be less predictable to market parties and could result in operational errors, and could have an impact on long-term incentives. Reducing contracted capacity could reduce mFRR bids available in real time (limited to occurrences of no procurement), and therefore have an upward effect on mFRR energy prices, increasing incentive to balance the system.

5. **EU / Belgium compatibility**

Similarly to partial procurement, intermittent procurement of mFRR capacity is compatible with the Belgium and EU legal and regulatory framework. In particular, partial procurement is in line with Article 32 Commission Regulation (EU) 2017/2195 of 23 November 2017 (EBGL), specifying that non-contracted energy bids should be accounted for in determining the optimal provision of reserve capacity.

Compared to the status quo, intermittent procurement leads to higher operational risks and market instability, with limited cost savings

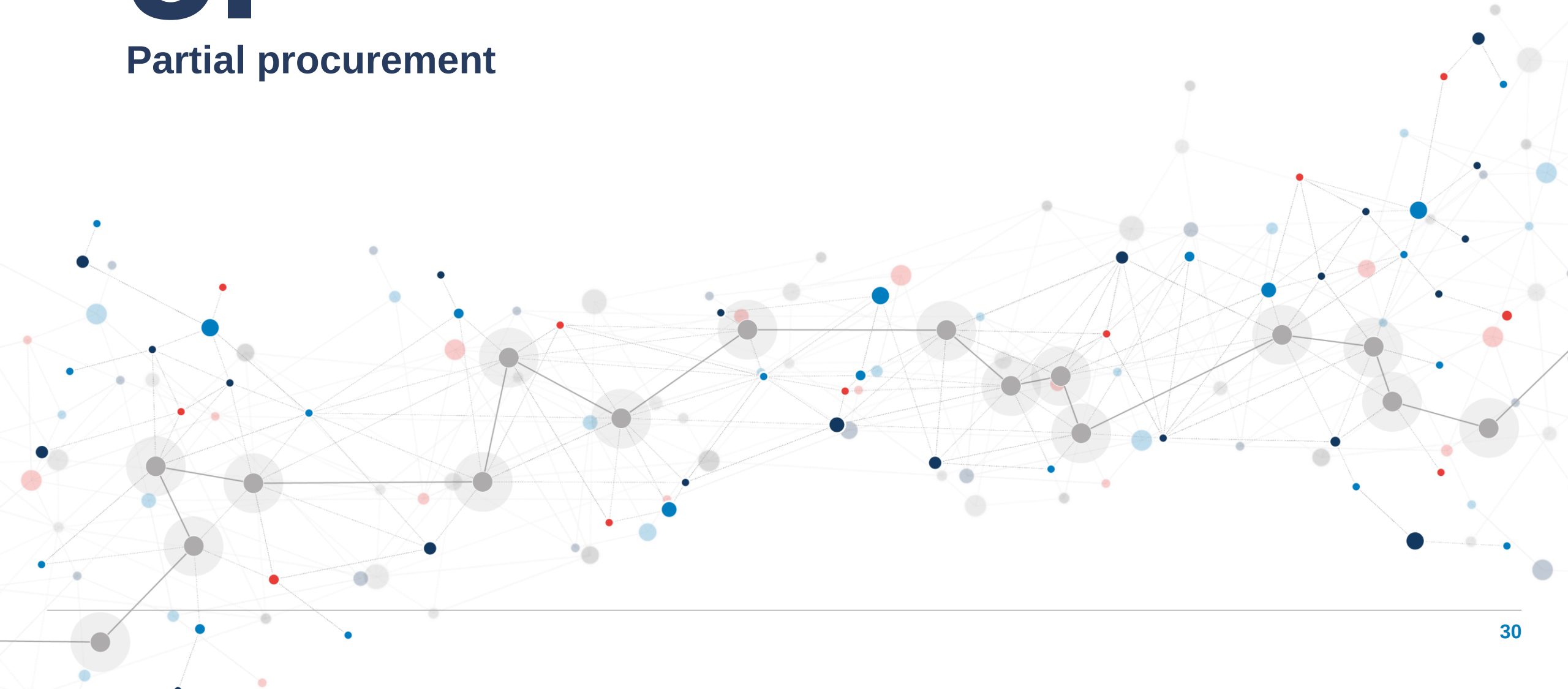
1. Intermittent procurement **raises concerns if the expected available free bids are no longer there** in practice which is possible as:
   - **Forecasting** the availability of free bids **is not an easy task** and it is difficult to reach adequate volumes available at 'firm' availability level (cf. current forecast analyses at 99.0 instead of 99,9% or higher)
   - **Intermittent procurement could have an impact on dispatch behaviour** and corresponding free bids' availability, leading to operational security risks (due to capacity not started up in the absence of balancing capacity contract).
2. **Intermittent procurement would lead to a less predictable and stable market environment**, which could discourage market participation and result in operational errors at market side. It could be detrimental to its functioning in the short and long run and increase market power in the balancing energy market.
3. **Gains associated to intermittent procurement are expected to be limited** as mFRR capacity prices tend to be low when free bids' availability is sufficiently high to cover full reserve capacity needs. The costs **induced by lower operational security and reduced market stability could therefore outweigh the gains**.

This model option currently presents drawbacks, as it would enable limited cost savings but could induce significant operational risks and uncertainty for market participants. This option could only be considered if periods of full-coverage would follow predictable patterns, but this is not demonstrated in the analyses.

Questions/Reactions from the floor?

5.

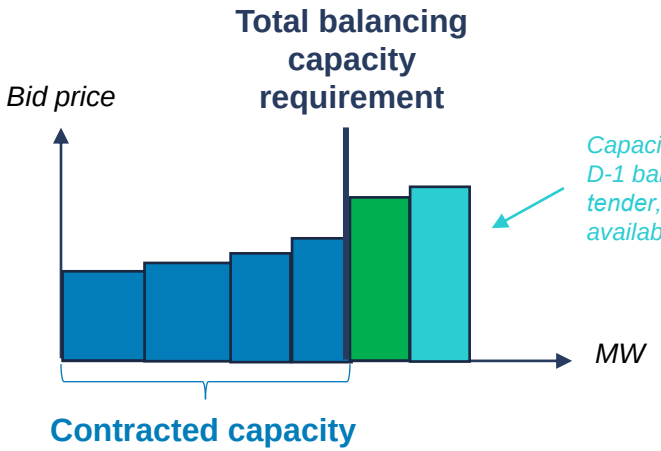
Partial procurement

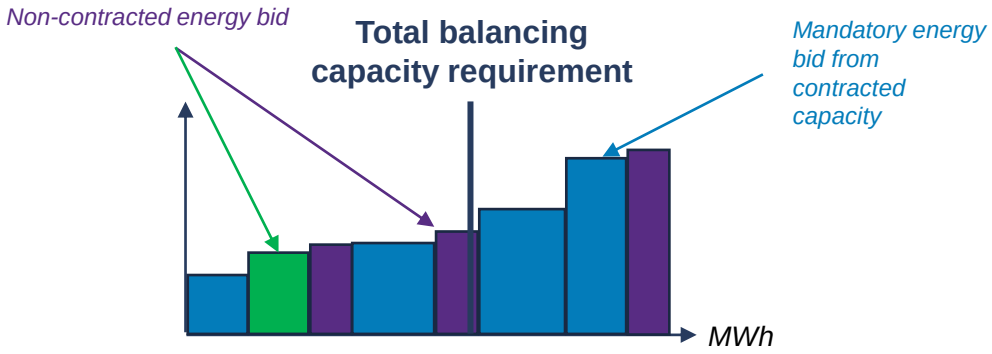


The possibility of partial procurement depends on to what extent non-contracted bids in the status quo would still be available in that case

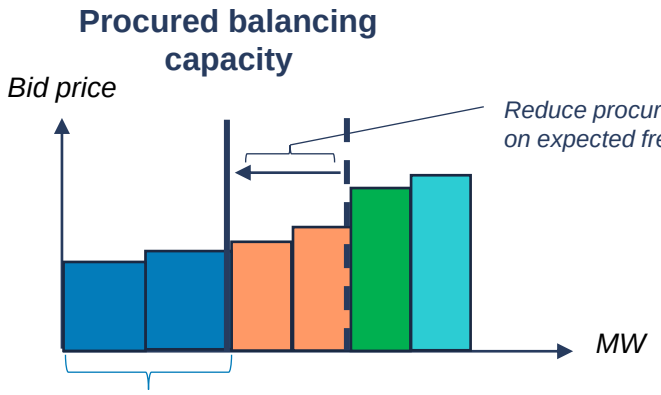
D-1 mFRR capacity auction → D mFRR energy market

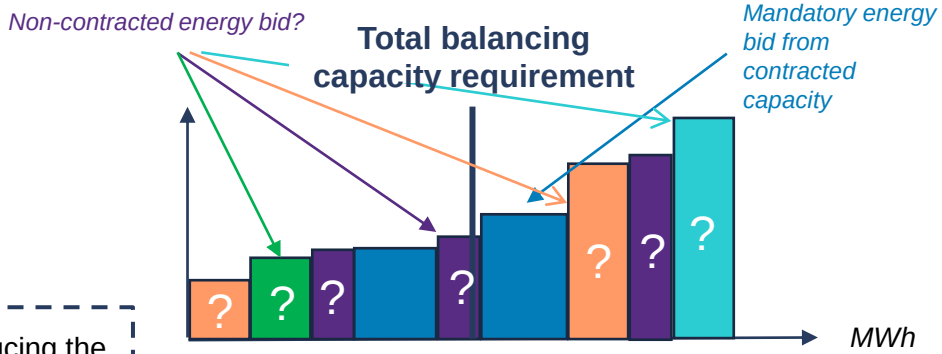
Status Quo





Partial



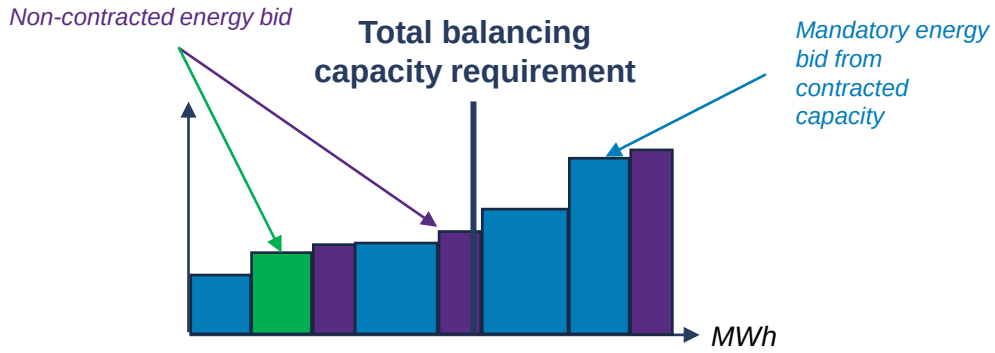


To what extent would reducing the balancing capacity to be procured change bidding behaviours of "previously" non-contracted bids?

In theory, in case of partial procurement, free bids may still be present, as they were available without being contracted in any case

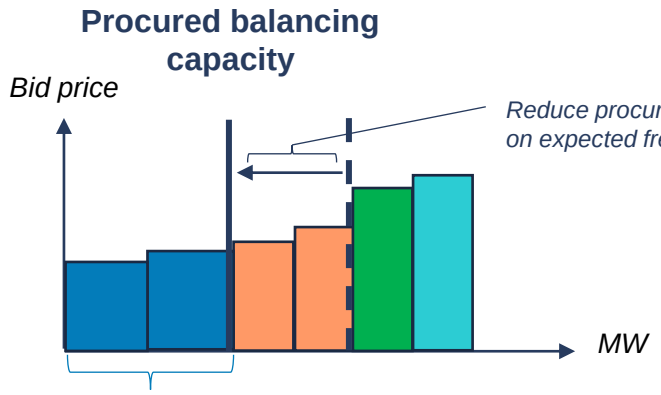
D-1 mFRR capacity auction → D mFRR energy market

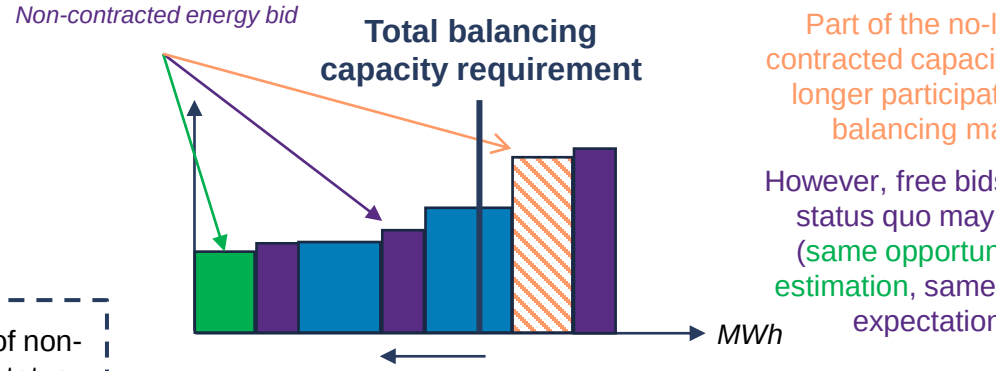
Status Quo



Best-case scenario: free bids are not affected

Partial





The bidding behaviour of non-contracted bids in the status quo is unlikely to change

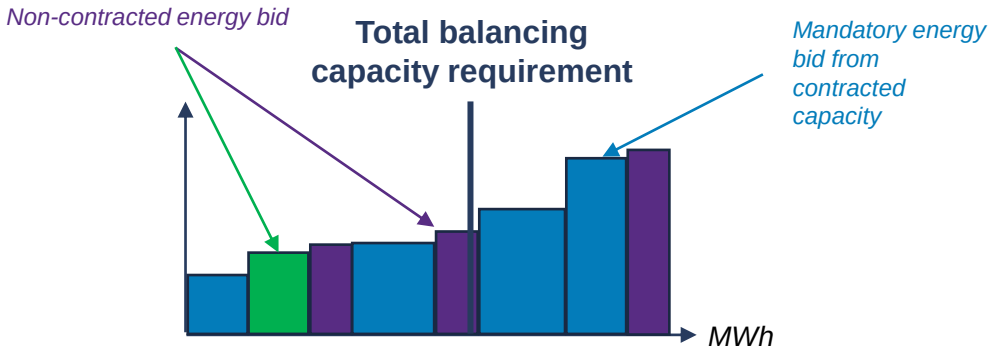
Part of the no-longer-contracted capacity may no longer participate in the balancing market

However, free bids from the status quo may remain (same opportunity cost estimation, same dispatch expectations).

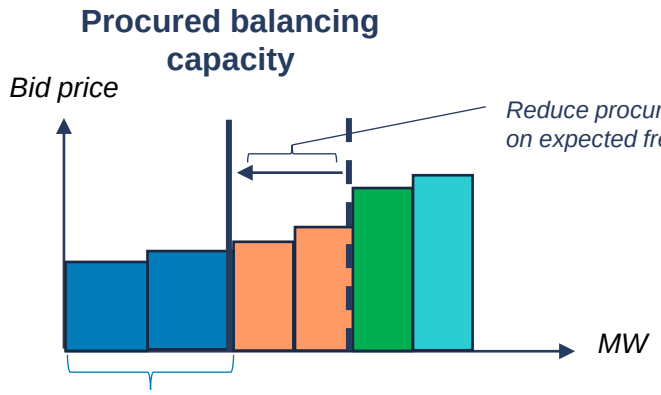
However, in case of partial procurement, free bids may no longer be available as well, raising operational risks

D-1 mFRR capacity auction → D mFRR energy market

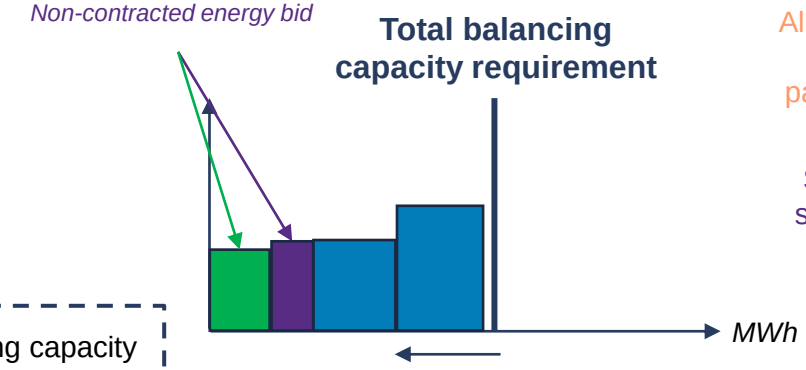
Status Quo



Partial



Worst-case scenario: free bids are affected and capacity requirement is longer met



All the no-longer-contracted capacity may no longer participate in the balancing market

Some free bids from the status quo may no longer be available.

Impact of lower balancing capacity on overall dispatch may affect non-contracted bids' availability

Illustrative example – partial procurement could reduce capacity available to provide mFRR in real time, by influencing dispatch decisions

Power system

Demand of **400MW**

Balancing capacity requirement of **200MW**

Generator 1

Plant of **500MW** (Pmin is **200MW**)

Marginal cost of **€40/MWh**

Generator 2

Plant of **200MW** (Pmin is **100MW**)

Marginal cost of **€50/MWh**

Scenario 1 – mFRR 'full' capacity auction

- To meet the demand and balancing capacity requirement, both plants need to be dispatched to provide 400MW of energy (300MW for Generator 1 and 100MW for Generator 2) and 200MW of reserve.
- In the mFRR tender *(ex. if equilibrium price at €48/MWh)*:
  - Generator 1 will bid its opportunity cost equal to the market price – its marginal costs => *it will provide 175MW of reserve at €8/MW*
  - Generator 2 will bid in the balancing capacity auction in order to cover the cost of producing 100MW and sell it below its marginal cost => *it will provide 25MW of reserve at €8/MW*

Available non-contracted bids in the balancing market would amount to 400MW.

Scenario 2 – mFRR partial capacity auction

- Taking into account free bids, in a partial procurement case, mFRR capacity to be auctioned would be 100MW, as the TSO would expect the other 100MW to be procured through non-contracted capacity.
- In such a case,
  - Generator 1 produces 400MW and would bid 100MW at 0 opportunity cost.
  - Generator 2 would therefore neither produce nor provide balancing capacity.

In such a case, available balancing capacity would only be 100MW and would not meet the balancing capacity requirement.

This dummy exercise shows that partial procurement could impact generation schedules, and reduce balancing capacity available in real time.

Moving to partial procurement induces a greater operational risk, caused by two effects

1 **Operational risk from forecast error**

Accuracy of predictions of non-contracted bids for the next day comprises a risk of error

- Elia's study on the daily prediction of non-contracted mFRR energy bids is based on assumptions regarding availability of pumped hydro storage plants to provide mFRR. As these capacities have technical constraints which are not fully taken into account in the study, this presents an additional risk of inadequate mFRR contracting for the next day.
- Elia's study shows that the forecasted non-contracted bids have a lower reliability than the required network reliability level.
- Forecast error on the quantity of free bids for the next day may lead to under-procurement of mFRR capacity, which in turns could lead to mFRR shortages in real time. This increases the operational risk for Elia's network.

Non-contracted capacity prediction is conducted using machine learning based on historic data. Sudden market evolutions will result in accuracy issues, which could lead to situations where reserve capacity needs are not fully covered. In particular, it does not take into account the consequences of the modification of the full activation time requirement.

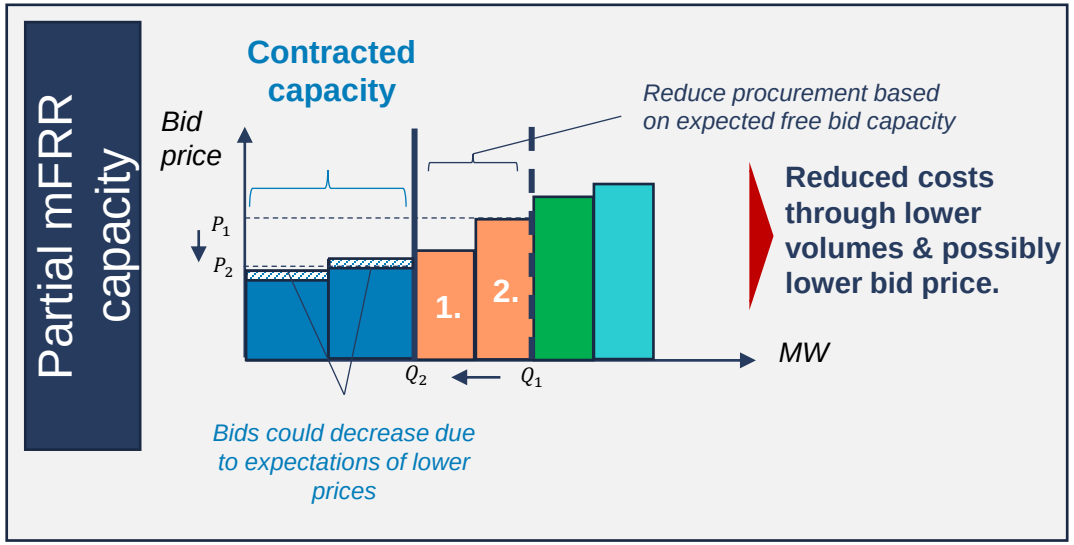
2 **Operational risk from impacts on dispatching**

Assuming fully accurate predictions in the status quo, partial procurement could still reduce non-contracted bids available for the next day

- As shown previously, partial procurement could affect dispatching decisions of generators. This is because generators' strategies can differ depending on the volumes of procured capacity, and could decide to turn off.
- As a result, partial procurement could cause a reduction in non-contracted bids available in the next day, impacting available reserve. This presents an additional operational risk in case this reserve is needed by Elia on the day.

Partial procurement will likely increase operational security risks as availability of sufficient balancing capacity in real time is no longer guaranteed.

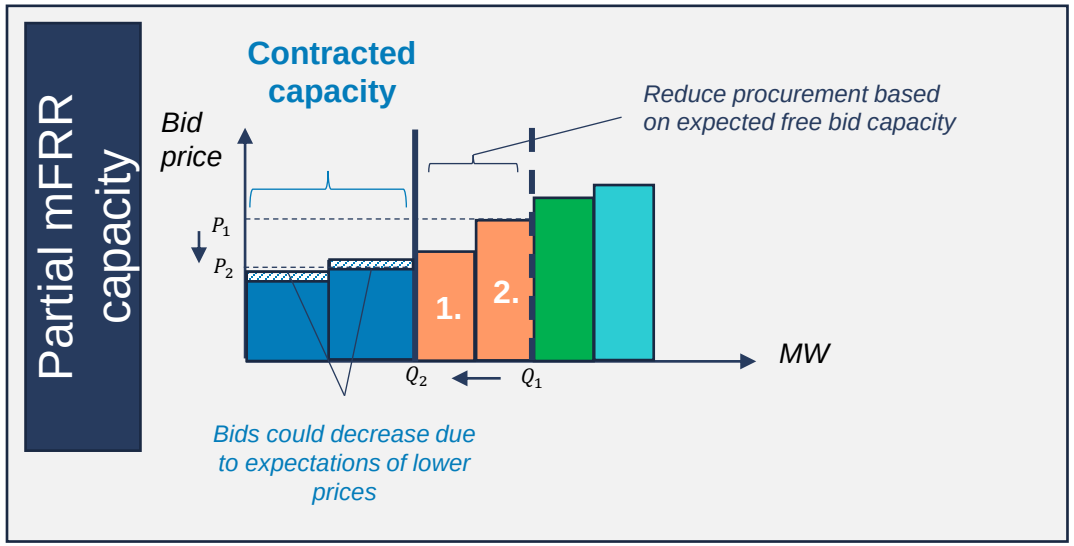
In theory, partial procurement may reduce costs, but could have long-term adverse effects

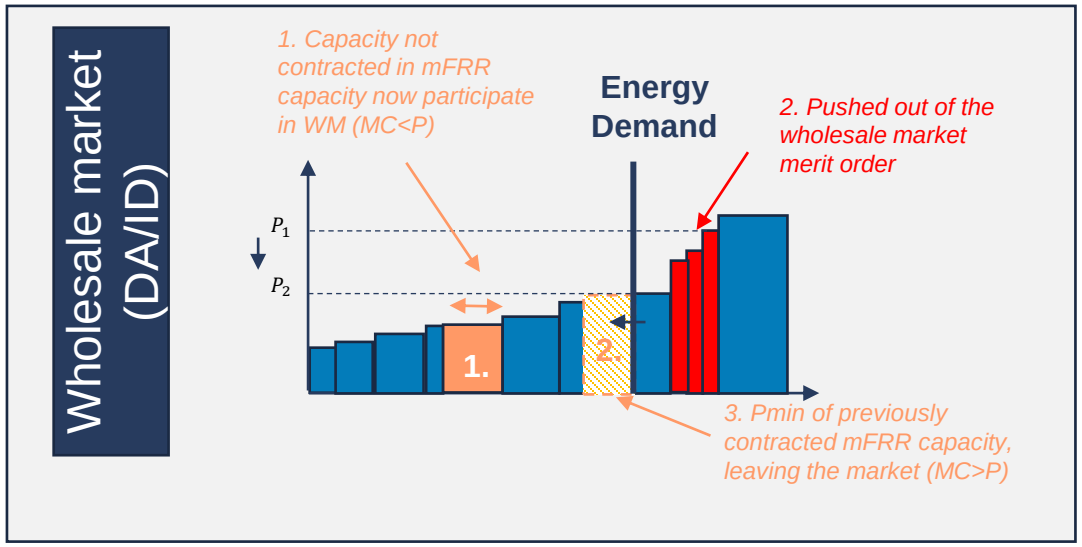


- With a lower capacity to be procured, the **most expensive bids** – previously selected with a higher balancing capacity demand – are no longer selected.
- In a pay-as-bid auction, **market participants – with low marginal cost or opportunity cost** – may try to bid at a price as close to the marginal price as possible to maximise their revenue. Given the marginal price is expected to decrease, they are also likely to reduce their bid prices (potentially only to a very limited extent).
- To conclude, **partial procurement would lead to a reduction of procurement costs** – mainly linked to the volume effect – equal to the sum of:
  - The volume no longer contracted multiplied by the most expensive bid prices (**orange blocks**); and
  - The (probably limited) impact on bid prices for the still contracted balancing capacity (**dashed blue blocks**).
- The fact that mFRR capacity auctions are not systematically organised or that volumes vary significantly over time may result in **a less stable market functioning, reducing long-term visibility for market participants and increasing risks of operational errors on the market side** (e.g. unvoluntary no participation).

- **Partial procurement will likely reduce procurement costs, mostly thanks to a volume effect.**
- **However, in the long run, lower prices may lead lower incentives to provide mFRR capacity, either reducing flexibility development incentives or reducing incentives for existing mFRR capacity to be maintained.**
- **Partial procurement could reduce market functioning stability and increase risks of operational errors, also contributing to lower long-term incentives.**

In theory, partial procurement may improve dispatch efficiency, except if Elia has to intervene due to a lack of mFRR capacity available





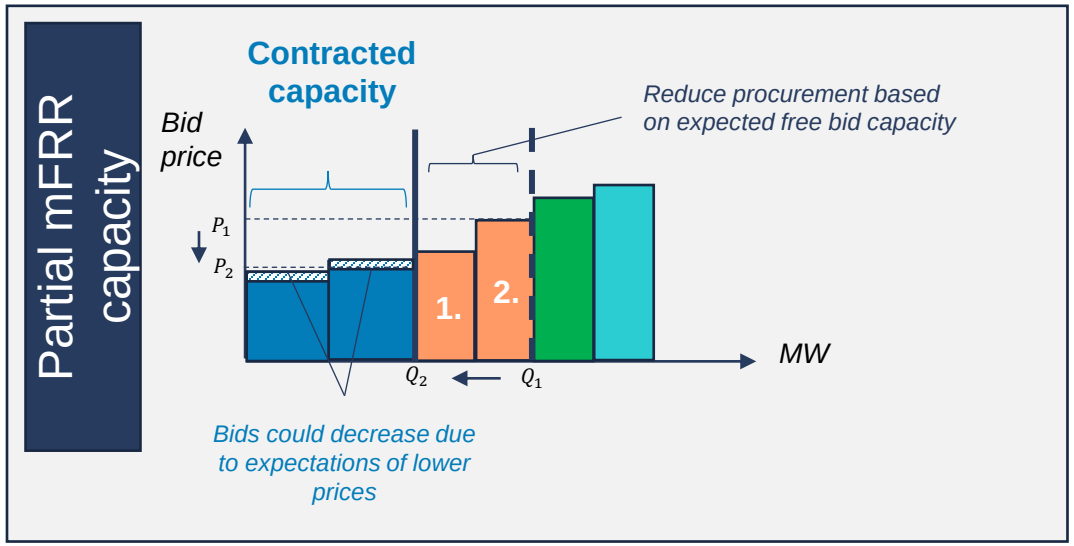
- **No longer contracted capacities** have relatively high capacity bids because:

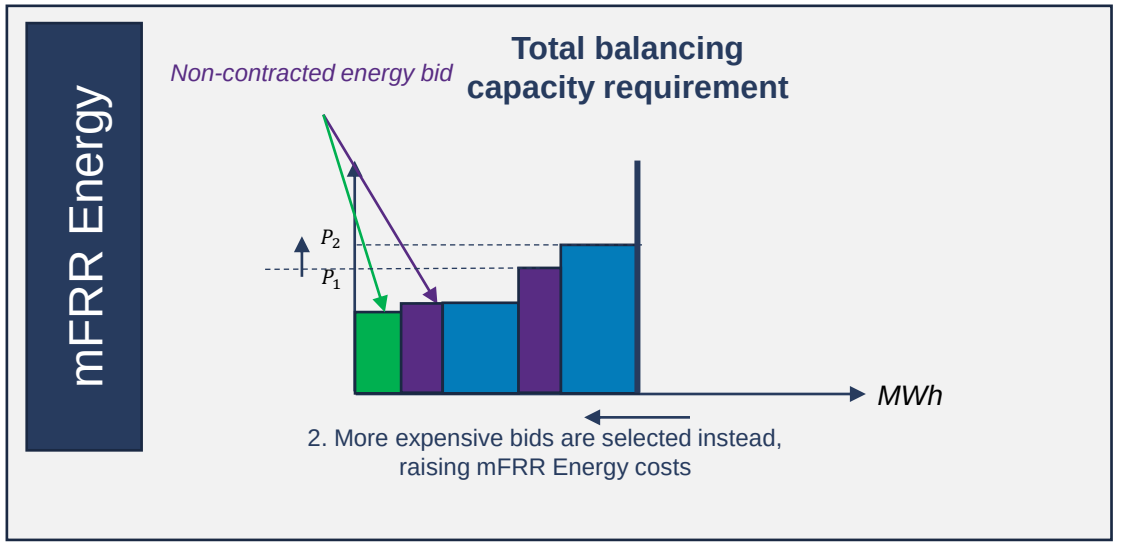
  (1.) they have opportunity costs as their marginal cost is below the market price => they can now be dispatched in the wholesale market instead of more expensive bids

  (2.) they have to produce at minimum power despite their marginal cost being higher than the market price, resulting in loss of revenue => they can now not be dispatched in the wholesale market and be replaced by capacity with lower marginal cost

- **Partial procurement will likely result in a more efficient dispatch, reducing generation costs.**
- **However, if there is a risk of not having sufficient mFRR capacity in real time, Elia may need to start up a plant, resulting in a similar or less efficient dispatch as in the status quo.**

Partial procurement of mFRR capacity may impact competition and market power in mFRR energy and capacity markets





- Lower demand in the mFRR capacity auction will likely **reduce risks of market power exercise in the short term**.
- However, **in the long run**, lower prices may not attract as much capacity (or existing capacity may decide to shut down), resulting in **adverse effects on competition and prices**.

- Lower availability in the mFRR energy market will likely **increase risks of market power,** especially in a "full" partial procurement, as available mFRR capacity in real time would equal total balancing capacity requirement, making bids likely to be activated pivotal. **The use of market power may result in even higher prices**
- This could though **attract new flexibility including through reactive balancing**, thus mitigating market power. However, such situations might be rare and too uncertain to actually drive flexibility development.
- The **participation in EU balancing platforms (MARI) will also contribute to mitigating market power concerns**.

- **Partial procurement could increase market power in the balancing timeframe.**

Partial procurement may increase operational risks, but cost savings and efficiency gains could materialise if operational security can be safeguarded

1. **Operational security**
2. **Economic efficiency**
3. **Cost for TSO / grid users**
4. **Market impact**
5. **EU / Belgium compatibility**

Partial procurement of mFRR capacity

The deduction of expected available (in Belgium) non-contracted balancing energy bids to the balancing capacity to be procured **may raise concerns on the actual availability of mFRR balancing capacity in real time and therefore on operational security. The limited ability to predict free bids' availability likely leads to a lower (and inacceptable?) average level of operational security.**

Partial procurement may improve dispatch efficiency in the wholesale market by freeing up capacity previously participating in the mFRR energy market. However, should there be not sufficient mFRR capacity in real time, the TSO may have to resort to costly and less efficient measures to guarantee operational security. The **long-term incentive for flexibility may also be reduced**, leading to less efficient evolution of the mix.

Partial procurement would reduce procurement costs *in fine* paid by energy consumers (mostly volume effect, potential price effect). However, should there be not sufficient mFRR capacity in real time, the TSO may have to resort to costly and less efficient measures to guarantee operational security. The long-term incentive for flexibility may also be reduced, leading to higher costs in the long run.

Capacity to be contracted could vary significantly and be less predictable to market parties. Reducing contracted capacity could reduce mFRR capacity available in real time, and therefore have an upward effect on mFRR energy prices, **increasing market power in the balancing market, but also increasing incentive to balance the system**.

Partial procurement of mFRR capacity is compatible with the Belgium and EU legal and regulatory framework. In particular, partial procurement is in line with Article 32 Commission Regulation (EU) 2017/2195 of 23 November 2017 (EBGL), specifying that non-contracted energy bids should be accounted for in determining the optimal provision of reserve capacity.

Partial procurement would enable larger procurement cost savings than intermittent procurement but still entails operational risks

1. **For the same reasons as intermittent procurement, partial procurement may raise operational risk concerns if the expected available free bids are no longer there** in practice.

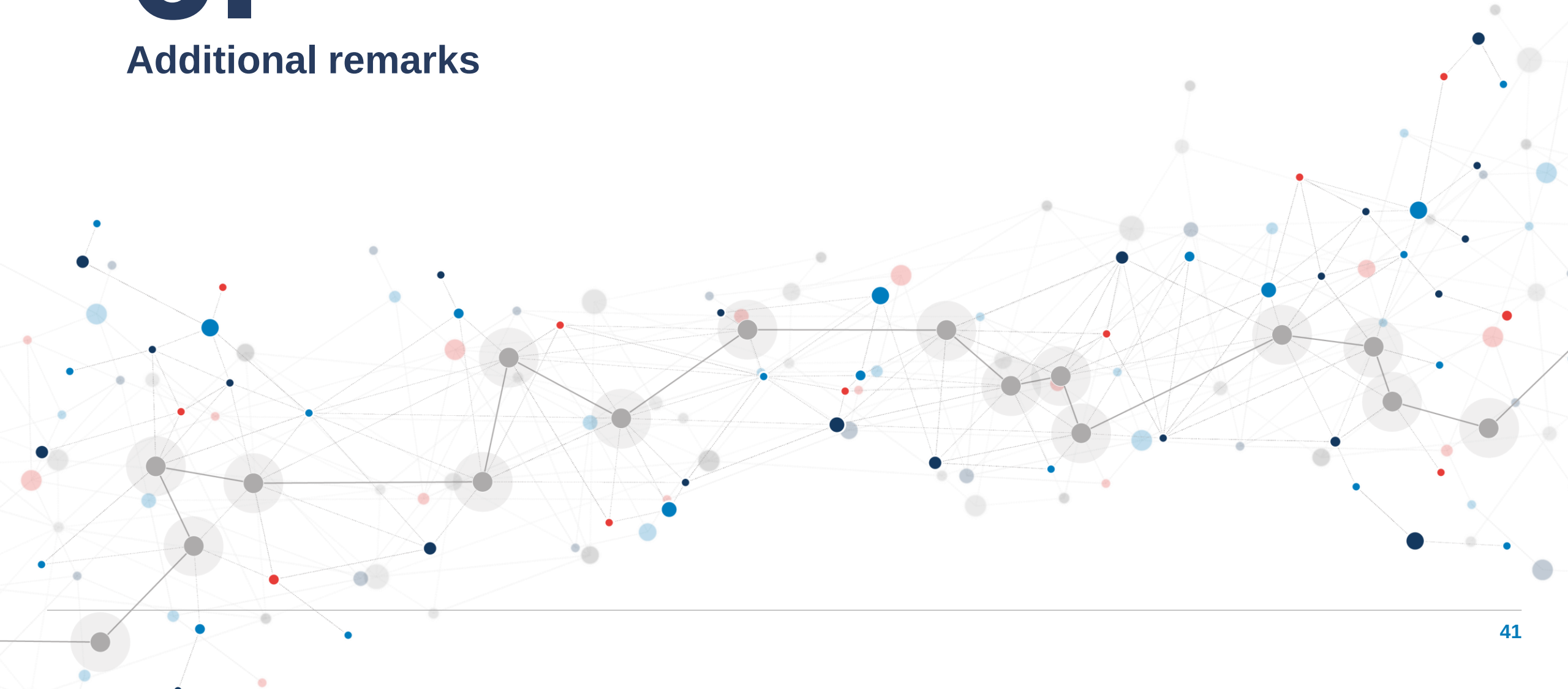
2. **Gain associated to partial procurement could be higher than intermittent procurement** due to reduced volume effect (at relatively high prices). However, **the costs induced by lower operational security and reduced market stability could outweigh the gains**. Impact on mFRR capacity prices **could also reduce long-term incentives for flexibility development.**

3. **Partial procurement would lead to a less predictable and stable market environment**. In addition, lower mFRR availability in real time **could increase market power** in the balancing market.

While this model can result in procurement cost savings, it presents drawbacks as it could induce operational risks and additional uncertainty for market players. Managing these risks would limit cost savings (by means of reducing volumes which can be taken into account or expensive measures to manage the operational risks).

6.

Additional remarks



Expected mFRR supply in neighbouring systems could be used to reduce mFRR capacity contracted in Belgium through reserve sharing or energy balancing exchanges

- In accordance with the European Guideline on Electricity Balancing (EBGL – art. 32) and the System Operation Guidelines (SOGL – art. 157), TSOs **can reduce balancing capacity requirements by accounting sharing**.

⇒ **Elia is currently accounting a sharing contribution with four neighbouring countries in its dimensioning.**

- In addition, all TSOs are developing a **European platform** for **mFRR energy** exchanges (project "MARI"). Through the MARI platform, **Elia will be able to access mFRR bids submitted in other systems**.

⇒ The expected additional mFRR accessible through MARI, taking into account cross-border capacity, could be used to reduce contracted mFRR capacity in Belgium. It raises however similar issues as domestic free bids (predictability…) and it is important to avoid double counting the energy bids through sharing and balancing energy exchange.

- As specified by the MARI implementation framework (Art. 3.10), '***each participating TSO may request the activation of a higher volume of standard mFRR balancing*** *energy product bids from the common merit order lists,* ***than the total volume of balancing energy submitted*** *by this TSO to the mFRR-Platform*.' '*In that case the mFRR-Platform will inform all participating TSOs, without undue delay, sending to them the information regarding the additional volume requested.'*

⇒ A TSO could activate more mFRR than submitted in the MARI, but if it is too recurrent, it would likely trigger reactions and suspicions of freeriding.

However, it is worth noting that reserve sizing will very likely be coordinated by Regional Coordination Centres (see ENTSOE's proposed methodology consulted on in December 2021).

- **The sharing of reserve – coupled with available cross-border capacities – should be considered in reserves' dimensioning (which is done).**
- **mFRR bids available on the MARI platform – coupled with available cross-border capacities – could thus be taken into account through partial procurement.**
- **This could though be only to a limited extent as, if Elia requests volumes higher than submitted too frequently, this may trigger reactions and suspicions of freeriding.**

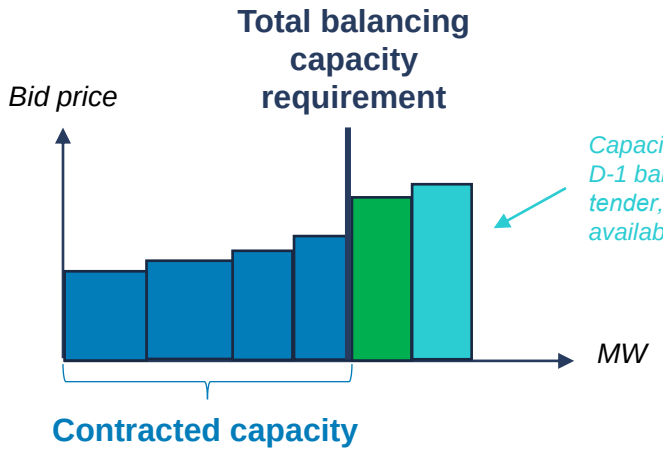
Source: Elia mFRR design note 2022, ENTSO-E, MARI Implementation Framework

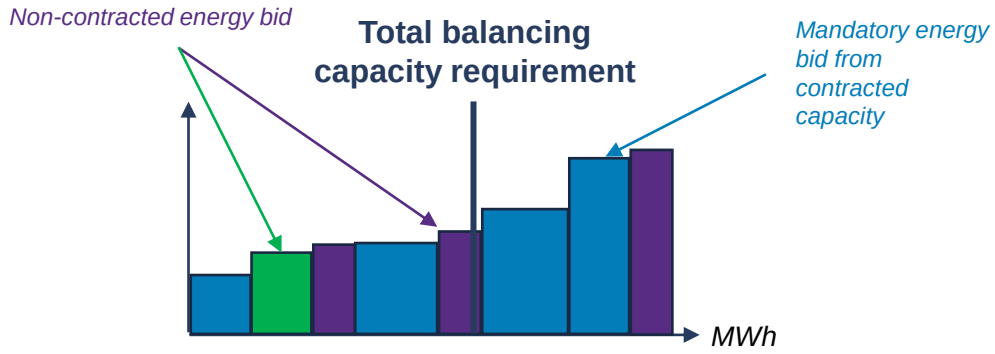
Expected mFRR supply in neighbouring systems could be used to reduce mFRR capacity contracted in Belgium through energy balancing exchanges

D-1 mFRR capacity auction

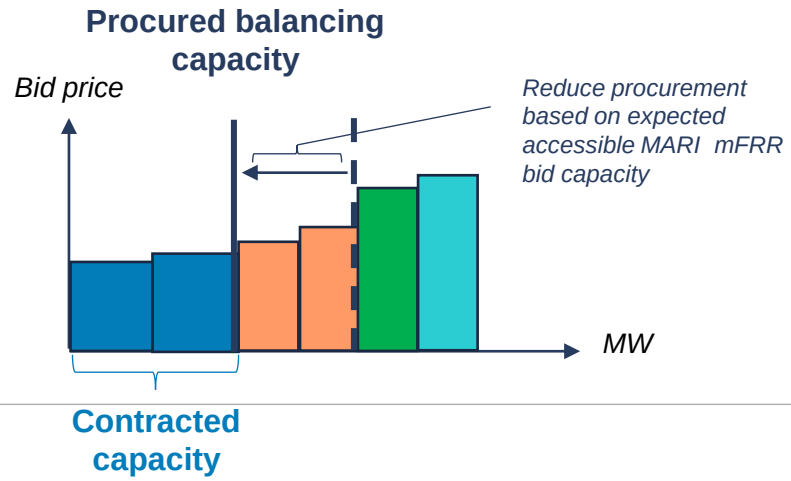
D mFRR energy market

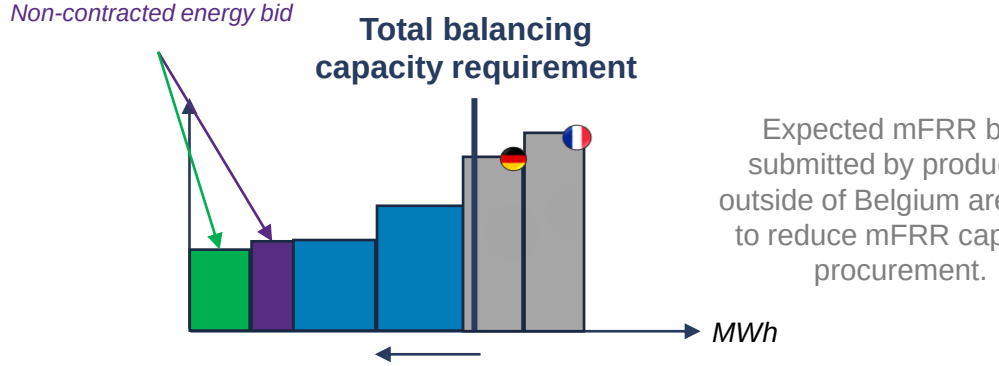
Status Quo





Partial



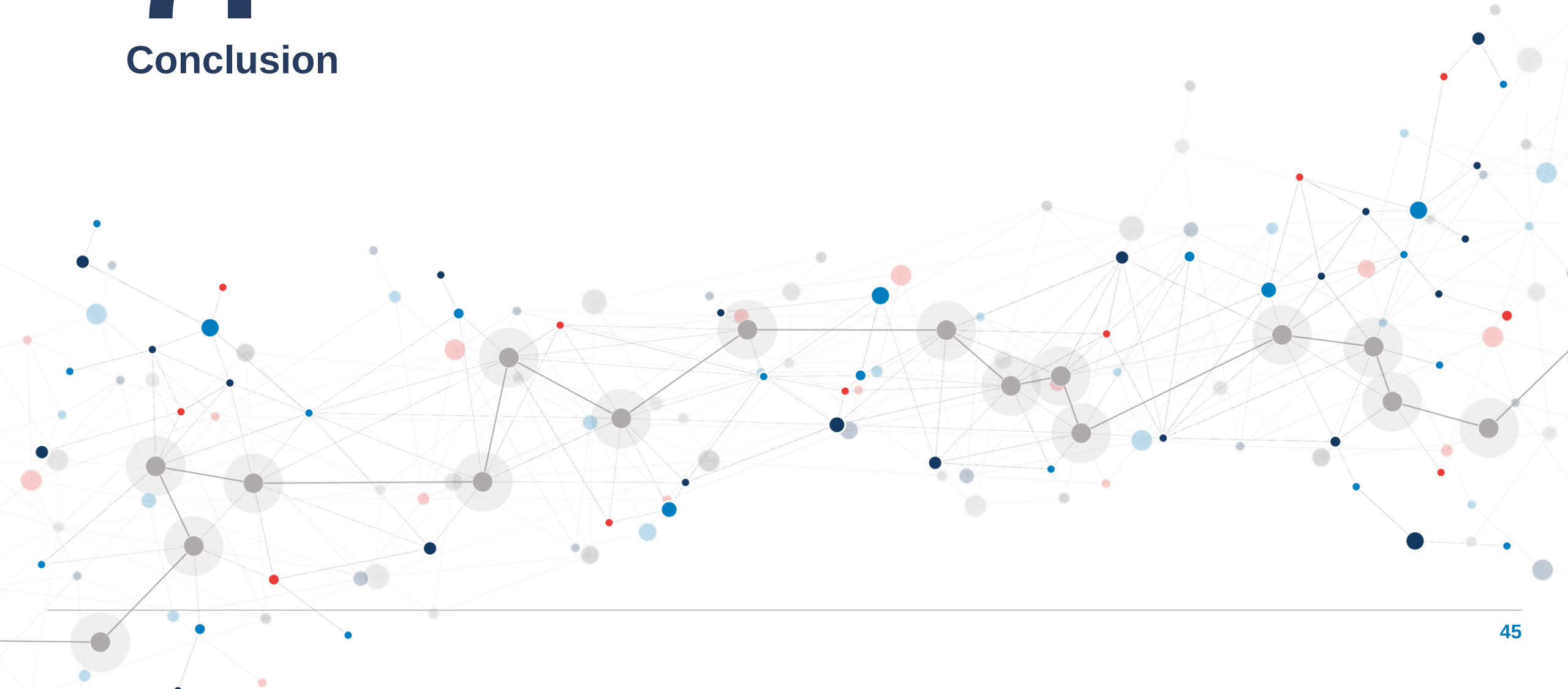


Expected mFRR bids submitted by producers outside of Belgium are used to reduce mFRR capacity procurement.

Questions/Reactions from the floor?

7.

Conclusion



Summary of initial assessment of upward mFRR procurement options

	No procurement based on post-market rescheduling	Intermittent procurement	Partial procurement
1 Operational security	Risk of inadequate mFRR resources without clear visibility on available generation	Risk of unplanned mFRR shortages, and added risk of free bid forecast error.	Increased risk of mFRR shortage occurrence, and added risk of forecast error.
2 Economic efficiency	Dispatch efficiency could improve, but rescheduling could be inefficient.	Could increase liquidity in the wholesale market. Remedial actions could be costly in case of reserve shortage.	Could increase liquidity in the wholesale market. Remedial actions could be costly in case of reserve shortage, and long term flexibility incentives could be reduced.
3 Cost for TSO / grid users	Lower procurement cost but costly redispatching/ start up, which could increase further.	Some mFRR capacity procurement reduction, but at times of lower mFRR prices.	Partial procurement would reduce direct procurement costs, but could be overrun by higher remedial costs.
4 Market impact	More instability and complexity in the wholesale market. Potentially discriminant to decentralised generation.	No regular auctions guaranteed, creating uncertainty and resulting in operational errors.	Procurement volumes less predictable. Market power and mFRR energy prices could increase.
5 EU / Belgium compatibility	Significant departure from current arrangements and EU target model. Requires substantial regulatory/ operational changes.	No identified incompatibility with EBGL/ Belgium legal and regulatory framework.	No identified incompatibility with EBGL/ Belgium legal and regulatory framework.

Conclusions - Partial (or intermittent to a lesser extent) procurement could unlock cost savings to grid users (at least in the short term), but could lead to deteriorated and potentially unacceptable level of operational security

1. **No procurement based on post-market scheduling in the current market context where upward mFRR capacity needs are frequently not covered by the available non-contracted balancing means would be a significant reform with uncertain benefits and high operational risks**

2. **Partial and intermittent procurement could in theory provide cost savings to grid users, but entail higher operational risks** due to the difficulty / impossibility to guarantee the free bids' availability, and leads to a lower level of operational security. In addition, they raise concerns regarding market stability (particularly in case of intermittent procurement), which could in turn have impacts in the longer run.

3. When considering partial procurement (and intermittent to a lesser extent), **long-run impact on investment in or maintaining flexible capacity, impact on market power** need to be duly taken into account.

LOCATIONS

Berlin
Kurfürstendamm 217
Berlin, 10719

Brussels
23 Square de Meeûs
Brussels, 1000

Copenhagen
Bredgade 6
Copenhagen, 1260

Düsseldorf
Kö-Bogen
Königsallee 2B
Düsseldorf, 40212

Helsinki
Unioninkatu 30
Helsinki, 00100

London
5 Aldermanbury Square
London, EC2V 7HR

Madrid
Paseo de la Castellana 7
Madrid, 28046

Milan
Via San Raffaele 1
Milan, 20121

Paris
22 Place de la Madeleine
Paris, 75008

Singapore
8 Marina View
Asia Square Tower 1
Singapore, 018960

Tel Aviv
Yigal Alon Street 114
Toha Building
Tel Aviv, 6744320