Design Note

Smart testing: Availability testing in the market and modifications to the T&C mFRR

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1. Introduction

One of the main tasks of Elia as transmission system operator is to keep the balance between production of electricity and the consumption thereof. In To maintain this balance, Elia uses several balancing services. These balancing services are procured via the market. In this document, the focus will be on the **mFRR balancing service**.

In order for Elia to have confidence in the availability and quality of the delivery of the balancing services, several controls are in place. These include prequalification testing, activation control and availability testing.
Prequalification testing assures Elia that the BSP can, at least once, deliver the respective balancing service as required. Activation control checks ex-post if the service that Elia requested was actually delivered in line with the requirements detailed in the applicable T&C. Finally, via the availability control bids that were submitted in application of the capacity auction can be activated as well, in order to assure Elia that they are indeed capable of delivering the balancing capacity service that the BSP is being remunerated for. As such, availability testing is an essential part of the controls that Elia has put into place to keep the system in balance at all times.

To further improve on availability testing, an algorithm was developed during an incentive study in 2020. The goal of this algorithm was to select the to-be-tested bids in a data driven way. The implementation of this algorithm is currently ongoing and will be finalized before the end of 2024. In the context of this implementation, the question was asked if there could be improvements to the execution of these availability tests, specifically mentioning availability testing in the market.

In that context, Elia is currently investigating several alternatives to the current implementation for the execution of availability tests. A description of these alternatives can be found in this document. Elia would like to ask for feedback on these alternatives in order to be able to make a final proposition by the end of 2024. The first Section of this document describes the process for an activation via the MARI platform. This is followed by a description of the current design for availability testing. Alternative ways to perform availability testing follow in Section 4. In Section 5 a comparison is made between the different options for availability testing with their respective advantages and disadvantages. Finally in Section 6 we conclude and give an overview of the next steps for implementation.

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Next to the alternatives to the current implementation for the execution of availability testing, Elia has also added the articles that are required to be introduced in the T&C mFRR for the implementation of smart testing in Section 7. Elia also requests feedback on these articles.

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2. The process for an activation via the MARI platform

As mentioned before, the current document is focused on the mFRR balancing service. As such, to better understand the alternatives to the current availability testing process described below, this section provides a short and very high-level overview of the processes with relation to the MARI platform that are relevant for the understanding of this document. In Figure 1 a visual representation of these high-level steps is given. This Figure shows how to go from sending a bid to being activated. The description below is highly simplified to maintain the focus on the goal of this document and thus not give an exhaustive description of the functioning of the MARI platform.

Elia receives the bids from the BSPs (step 1) and sends them (anonymized) to the MARI platform together with the "TSO demand" (the demand that Elia has for its LFC area) (step 2 & 3). The MARI platform receives all bids from all connected countries and their respective demand. Based on this information, the platform creates, using an algorithm (step 4), the MARI merit order list. In this list, the bids that need to be activated are selected. The TSOs then receives the selected bids (step 5) that shall be activated. The TSO requests the activation of the selected bids from the respective BSP.

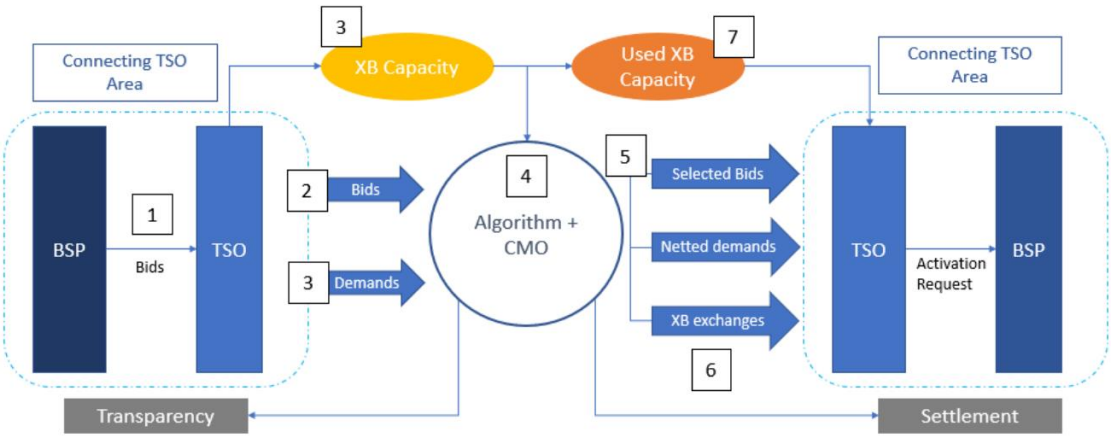

Figure 1: High-level steps in the MARI process

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3. Current design for availability testing

Description

In the current design, availability testing is done out of the market. This means that availability test is considered to be an external factor with regards to the imbalance; it can improve the system imbalance, but it can also aggravate it. Therefore, also no remuneration is foreseen for an availability test. In addition, the absence of remuneration at bid price removes the potential for gaming as well. Otherwise, a BSP could introduce a high price and expect to be remunerated at this price for an availability test. A visual representation of this process can be found in Figure 2.

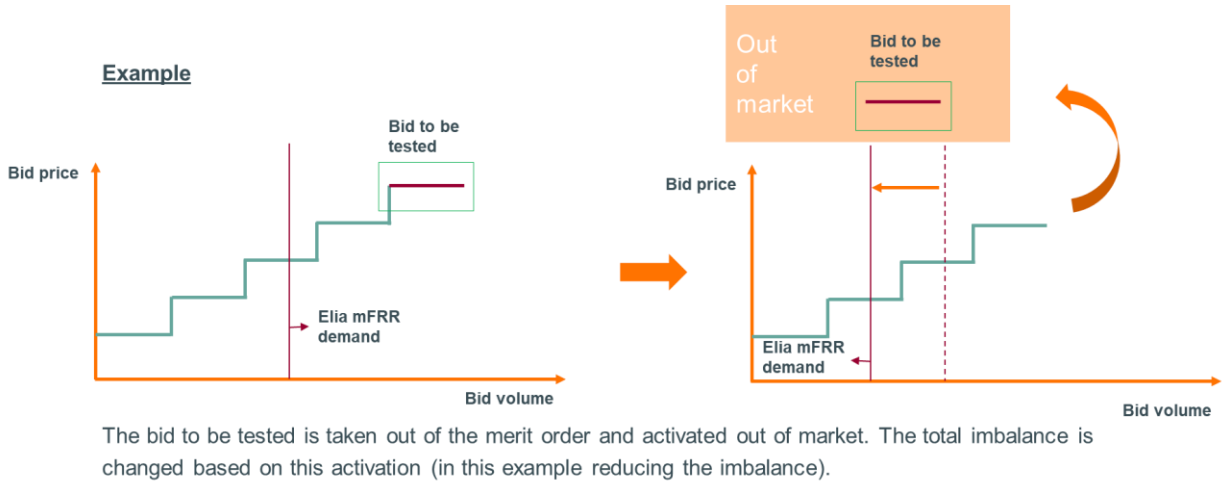

Figure 2: Availability testing out of the market

From an operational point of view, this means the following: in case the market conditions allow for it, a system engineer will launch the request to activate a certain bid according to the modalities of an availability test, without taking the specific system imbalance into account. The system imbalance resulting from the test (which can be positive or negative) will be covered by compensating the volume with an aFRR/mFRR activation (if needed) in accordance with the processes in place.

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Advantages and disadvantages

The advantages of organizing the availability test in such a way are multiple. First of all, an availability test can (as long as the market conditions allow for it) be organized at all times. In addition, gaming via availability testing is also not a possibility.

However, there are also some downsides to availability testing outside of the market. It is possible that additional imbalance is created by the execution of an availability test. The costs associated with this additional system imbalance will be indirectly covered in the imbalance costs. There is also no remuneration foreseen for the BSP. Finally, potential netting opportunities are also lost since an availability test is not used to balance the system.

Potential for improvement

As shown by the disadvantages, there is still some potential for improvements. There are 2 aspects that Elia would like to address specifically:

1. Introducing a remuneration for the BSP (without creating gaming potential)
2. Avoiding an increase of the system imbalance via the execution of an availability test

In the next Section, three options to do availability testing in the market will be discussed. A fourth option (option 0) is also shortly presented. In that option, no change is done in comparison to the current design.

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4. Options for availability testing

1. Option 0: Keep the current design

Option 0 is to maintain the current design. This means that the advantages and disadvantages described in the chapter above remain in place. The complementary advantage is the absence of implementations, changes to the legal framework, changes to the T&C,....

2. Option 1: Activate the bid via MARI platform

2.1 Description

The first option is to activate the bid via the MARI platform. This addresses the two improvements that Elia wanted to achieve, a remuneration for the BSP (without gaming potential) is possible and an availability test will not aggravate the system imbalance.

Practically speaking, this means that we need to **move the position of the to be tested bid towards the beginning of the merit order** (and thus modifying the price of the bid). This way the bid remains in the merit order list, but at a different price. In addition, the bid would be made indivisible in order to be able to test the full volume of the bid.

In case the market conditions to activate the bid would be satisfied (netted system imbalance of the uncongested area is in the correct direction to test the bid and at least the bid volume is requested), the bid is automatically activated according to the requirements of the bid. For remuneration purposes, the bid can be considered as a part of the merit order and as such as a “normal activation”. The BSP is **remunerated for the activation at the cross-border marginal price**.

When looking at the process flow in Figure 3, it would mean that Elia takes an action prior to step 2.

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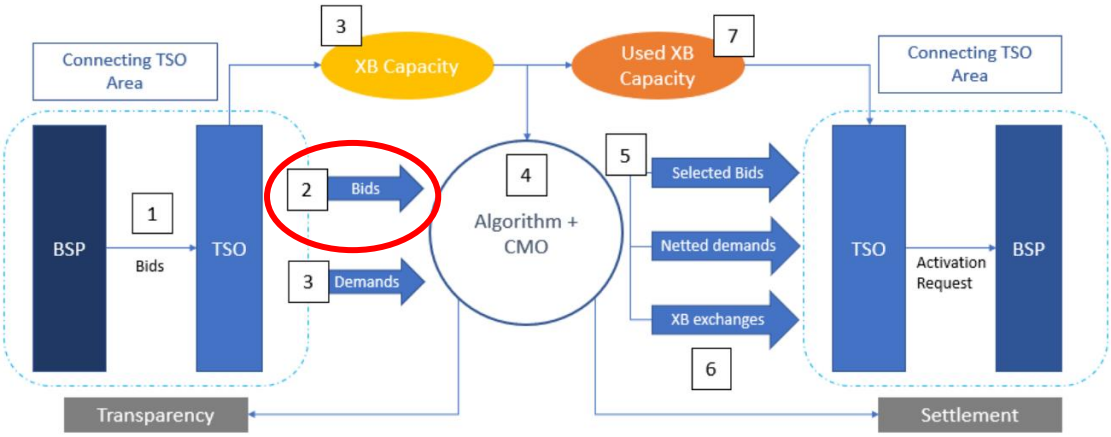

Figure 3: Area of modification to the MARI process in option 1

Market distortion

Changing the position/price of the bid can have an **impact on the cross-border marginal price**. However, this **impact would have been there as well implicitly** if the exact same activation was done outside of the market. The same goes for a BSP that would no longer be selected. On top of that, with the out-of-the -market availability tests, the cross-border marginal price could also be impacted if the activation for **the availability test increased the system imbalance.** This is no longer the case when doing the availability test in the market.

As such the **level of market impact Elia has via the availability testing reduces** in comparison with doing availability testing out of the market. The impact on the other hand would be **more transparent than before**.

2.2 Price setting of the bid

As mentioned above, the goal of the methodology would be to integrate the bid in the MARI merit order and to do the activation via the platform. To be able to do this, the price of the bid would need to be changed. The general idea is shown in Figure 4. This Figure shows a bid to be tested at the end of the merit order. Given the position of the bid, without any changes to its price, it would not be activated. However, by changing its price, the bid can be moved to the front of the merit order and as such will be activated in the market.

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Figure 4: Availability testing in the market

The question remains at which price the bid should be set. From the example above, it would seem that putting a bid at the start would be the easiest. However, as shown in Figure 5, this can lead to situations where the BSP would need to pay Elia to perform an availability test. This is the case when the cross-border marginal price would be below zero[1].

Figure 5: Price setting for availability testing in the market – price below zero

One could propose to put the minimum bid price at 0€/MWh in order to avoid this situation. However, this could then create the situation where a bid that normally would have been accepted (at a negative price) is put out of the market by Elia by increasing its price to 0€/MWh. Therefore, Elia proposes the following formula to determine the price:

$$Price(bid) = Min(Max(0, P_{First\ bid\ MOL}), P_{Bid\ to\ be\ tested})$$

[1] This situation is rather theoretical as long as availability tests are performed on upward mFRR, but the goal is to propose a design that would be applicable also in other cases.

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This allows for a bid to have a fairly high chance to be activated in the market, without creating the risk that a BSP needs to pay Elia for the execution of the test or that the bid would be put out of the market because of the intervention of Elia. An example of this is shown in Figure 6.

Figure 6: Availability testing in the market - price setting

2.3 Bid remuneration

The remuneration of the bid is relatively simple. The bid is activated via the MARI platform and will thus receive the cross-border marginal price. This remuneration can be lower than the original bid price of the bid, given that the bid price sent to the MARI platform was made equal to the bid price of the first bid in the local merit order.

2.4 Legal framework

In order to be able to change the position of a bid in the merit order, the bid needs to be in the merit order and its price needs to be modified. However, the currently applicable regulations and decisions from ACER, do not allow for this at the moment.

In decision no 16/2020 ACER writes that bids related to availability testing cannot be considered to be balancing energy bids. However, to be included in the common merit order, bids need to be balancing energy bids (EBGL 29(4)). The current framework as such does not allow those bids that are undergoing an availability test to be included. In addition, the current regulations do not allow for a TSO to modify the price of a bid. A modification to the MARI implementation framework is required to allow this.

Therefore, to implement the solution described above, these regulations would need to be amended to create a framework that allows for availability testing in the market via the MARI platform.

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2.5 Operational implementation

The operational implementation of this option would be at the first sight relatively simple. The position of the bid would need to be changed before sending it towards the MARI platform. The algorithm then activates the bid in case the market situation presents itself. Afterwards, this bid would need to be flagged as a bid on which an availability test was executed.

2.6 Advantages and disadvantages

As already highlighted before, performing the availability tests via the MARI platform creates several advantages. First of all, an availability test will always have a positive impact on the system. In addition, the BSP will receive a remuneration for the execution of the availability test. This remuneration can be lower than its original bid price but is an improvement on the current framework without introducing a potential gaming risk.

The disadvantages of this design in comparison with the current situation are twofold. First, Elia will be dependent on the actual system imbalance of the uncongested area. So, in case the system imbalance is in the opposite direction, or is too small, Elia will not be able to perform the availability test. In addition, the current European legal framework would need to be amended to allow a TSO to change the price of a bid sent to MARI.

2.7 Improvements

The improvements that this design brings in comparison with the current execution of availability tests is clear. BSPs can be (at least partly) remunerated for the availability test and the availability tests will also have a positive impact on the system imbalance.

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3. Option 2: Deviate from the selected bids from the MARI platform

3.1 Description

Just like the first proposal, the second proposal also brings the 2 improvements Elia wanted to introduce with the new design. It allows for a remuneration of the BSP and has a positive impact on the system. The way to achieve it slightly differs in comparison with the first option. Instead of changing the position of the bid before sending the information towards the MARI platform, Elia would deviate from the selection by the MARI platform and introduce the to-be-tested bid into the “selected bids”. This also means that (a part of) some bid(s) will no longer be selected (and are thus not activated nor remunerated). This circumvents the issue with the current legal framework to allow for Elia to modify the price of a bid. However, this creates a different issue with the legal framework since a TSO is required to activate the bids that are received from the MARI platform. Changes to the legal framework are expected to be required here as well. In addition, this introduces additional operational actions in a very short timeframe and can create paradoxically accepted/rejected bids.

The remuneration, as with the previous option, will be at cross-border marginal price.

When looking at the process flow in Figure 7, the action is taken after receiving the bids from the MARI platform, but before sending the activation requests to the BSP.

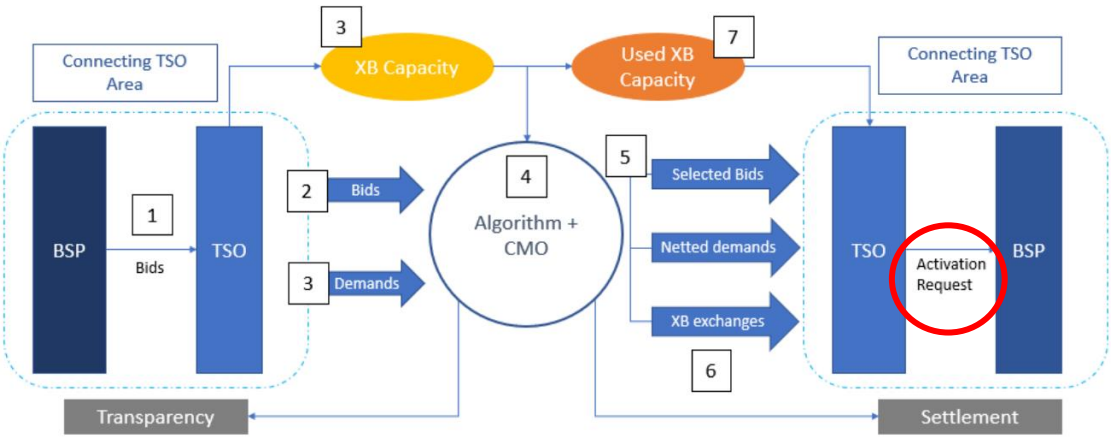

Figure 7: Area of modification to the MARI process in option 2

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3.2 Price setting of the bid

The price setting of the bid is similar to the price setting in option 1. In this case, the cross-border marginal price (CBMP) at the time the bid is introduced needs to be considered (and before introducing the bid). The CBMP should not be lower than zero unless this is greater than the bid price. In that case, the cross-border marginal price should not be lower than the bid price. If either of these options is the case, the to-be-tested bid will be activated.

3.3 Bid remuneration

As is the case for all other bids, the to-be-tested bid will also be remunerated at cross-border marginal price. However, the introduction of the to-be-tested bid into the activated bids, will cause some volume (part of a bid or complete other bid(s)) to not be activated. Given that these bids are not activated by Elia, no remuneration is foreseen. These bids are selected by creating a "local merit order", where all technical and conditional links are considered in addition to the technical requirements of the bids themselves. The to-be-tested bid is integrated in the beginning of this "local merit order" and a new selection is done with a local algorithm.

The introduction of the to-be-tested bid can also create additional complexities. For example, in case the marginal bid selected by the MARI algorithm is indivisible or exclusive with the to-be-tested bid, the marginal bid cannot be activated anymore. In this case a different bid, with a higher price needs to be activated. However, to correctly remunerate the new bid, either a pay-as-bid remuneration needs to be introduced or a new local marginal price needs to be set.

Additional rules will need to be introduced into the T&C to cover these possibilities. These will have an impact as well on the complexity of this document.

3.4 Legal framework

The issue in the legal framework from the first option is avoided in option 2. However, there is a new issue that is created. In the implementation framework for mFRR states the following:

> *"The outputs of the AOF shall be:*
> *(b) the selected standard mFRR balancing energy product bids that* ***shall be activated by the participating TSO****;"*

This means that in the current description of the mFRR implementation framework a deviation from the bids activated by the MARI platform is not allowed. So, a modification is required to deviate from the selected bids of MARI,.

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In addition, there will also be an inconsistency between the publication done on the transparency platform (directly via MARI) and the Elia website (executed activations). This discrepancy will also need to be clarified.

3.5 Operational implementation

Next to the changes to the legal framework, the operational implementation also requires specific attention and may be quite complex.

As shown in Figure 8, Elia receives the selected bids from the MARI platform at the earliest on t-9. The information needs to be provided to the BSPs by t-7,5. This means that Elia has maximum 1,5 minutes to do the required checks and controls before it needs to provide the information to the BSPs. In addition to the standard process, Elia would also need to do a recalculation of the local merit order line to correctly integrate the to-be-tested bid. However, this recalculation is not a simple optimization given the presence of complex bids with both technical and conditional linking. This puts important question marks on the feasibility of this process without doing further investments in calculation capacity and extensive development. However, these needs can only be investigated after the go-live of both MARI and PICASSO. This adds an additional step also requires additional tools that need to be maintained and include an inherent risk of failure.

Additionally, it is important the publications done by all impacted entities also correctly take into account the activation of the to-be-tested bid and subsequently the non-activation of the not-activated bids.

Finally, the MARI platform “remembers” which bids were activated in the previous QHs to correctly take into account the conditional and technical linking of the bids in the optimization algorithm. A feedback loop towards to platform needs to be in place as well to inform the platform of the deviation. Further investigations are required to analyse how the information provided in this feedback loop is taken into account in the MARI algorithm. In any case, this needs to be discussed an agreed upon by all the TSOs in the MARI project.

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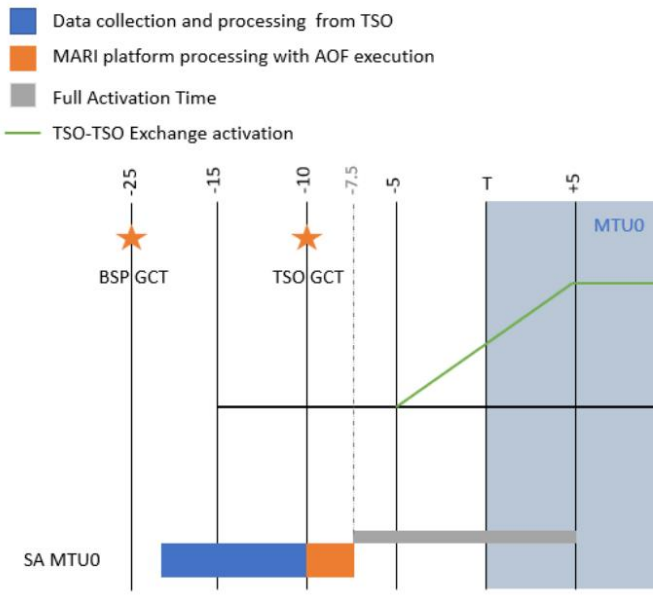

Figure 8: Timings for the exchange of information in the MARI process

3.6 Advantages and disadvantages

The main advantage compared to option 1 is the fact that there is no impact on the price formation on the MARI platform, given that the action is taken after the creation of the cross-border marginal price. However, local price changes can still occur, and these additional complexities will need to be managed in the T&C. In addition, these will also require additional publications given the paradoxically rejected and accepted bids.

One downside of this approach is the required operational implementation. The small timeframe in which the local merit order needs to be reconstructed makes this very complex. Furthermore, a feedback loop to the MARI algorithm needs to be available to communicate the activation of the to-be-tested bid and the non-activation of some selected bids. All these additional implementations also require continuous maintenance and carry inherent risks on failure. Finally, even though this implementation avoids the need to introduce the possibility to change the bid price by the TSO, a change in the MARI implementation framework is needed to allow the TSO to deviate from the selected bids by the MARI platform.

3.7 Improvements

Just like the previous option, the improvements that this design brings in comparison with the current execution of availability tests is clear. BSPs can be (at least partly) remunerated for the availability test and the availability tests will also have a positive impact on the system imbalance.

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4. Option 3: Modify TSO demand

4.1 Description

The third proposal can, to a certain extent, also bring the improvements that Elia wants to introduce. In this option Elia would perform a netting between the TSO demand and the bid on which Elia would like to perform an availability test. If this netting is not possible, the test will be cancelled. When looking at the process flow in Figure 9, this would mean that Elia would have an impact on step 2 and step 3. The to-be-tested bid would thus not be sent to the MARI platform and Elia would reduce its TSO demand with the volume of the to-be-tested bid.

However, given the European context, this removes to a certain extent the possibility to net the TSO demand between different TSOs and as such can still lead to a less efficient activation from a European perspective.

The remuneration of the to-be-tested bid is also not as clear. The bid can aggravate the imbalance when the net demand of all TSOs of the uncongested area is in the other direction. Given that the cross-border marginal price is based on bids in the other direction, using this as the remuneration price would not make sense.

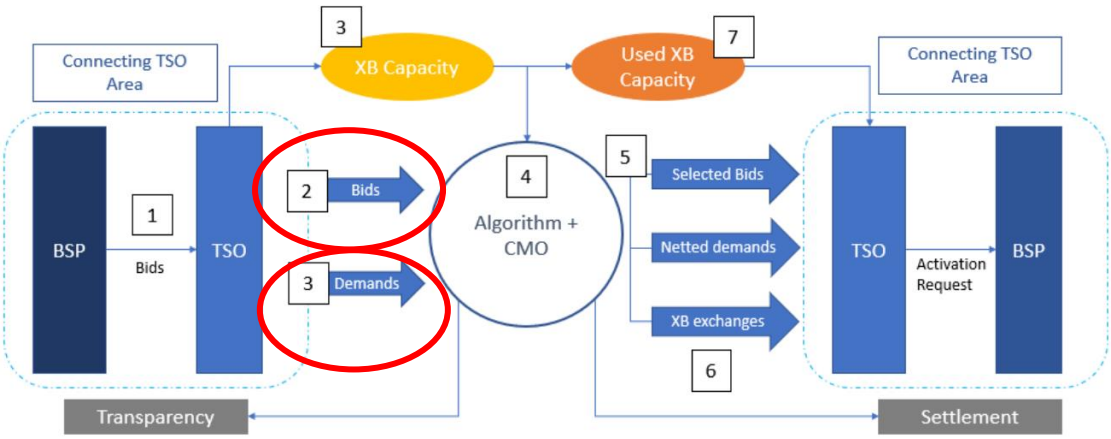

Figure 9:Area of modification to the MARI process in option 3

4.2 Price setting of the bid

Given that this approach focusses on taking a bid out of the merit order, there is no price setting of the bid.

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4.3 Bid remuneration

In general, the cross-border marginal price would also be used in this option for the remuneration of the to-be-tested bid. However, this cannot be applied in all circumstances. In case the TSO demand from Elia is in the upwards direction and can be covered by the to-be-tested bid, Elia will subtract this bid from its TSO demand. However, if then the net TSO demand in the uncongested area is in the opposite direction, the MARI platform will activate bids in the downwards direction. In this case there is no correlation between the cross-border marginal price and the activated bid and as such the bid should not be remunerated at this price.

4.4 Legal framework

The current legal framework allows for this implementation.

4.5 Operational implementation

From an operational perspective, there are no blocking points for the implementation that are currently identified. Elia would need, after the gate closure time and before sending the information to the MARI platform, to identify the to-be-tested bid and determine if it is possible to perform the availability test by comparing it to Elia's TSO demand. In case the TSO demand is larger than the bid size and in the correct direction Elia would need to subtract the bid size from its TSO demand and remove the to-be-tested bid from the bids sent to the MARI merit order.

4.6 Advantages and disadvantages

The main advantage of this approach is the relatively simple implementation. However, it also comes with a couple of downsides. First of all, netting with other TSOs' demand would no longer be possible for the concerned volume. From a European perspective, this leads to a suboptimal dispatch of balancing energy. In addition, given that the net TSO demand in the uncongested area can also be in the opposite direction, a correlation does not necessarily exist between the activation of the bid and the cross-border marginal price.

4.7 Improvements

This design brings improvements in comparison with the current execution of availability tests. BSPs can be (at least partly) remunerated for the availability test and the availability tests will also have a positive impact on the local system imbalance. However, the impact on the European dispatch can still be negative and the correlation between the execution of the availability test and the cross-border marginal price is not clear.

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5. Comparison between the different options

When comparing the different options, they all have their merits. A comparison on all the different points c an be found in Table 1.

	Ease of implementation	Current legal framework	Brings desired improvements	Price setting of the bid	Bid remuneration
Option 0	++	++	--	/	/
Option 1	+	--	++	+	+
Option 2	--	--	++	+	--
Option 3	++	++	-	/	--

Table 1: Comparison between the different options

Option 0 (doing nothing) is already implemented and is also possible in the current legal framework. However, it does not bring the desired improvements.

Option 1 (introduction into MARI) would require implementation but is achievable without increasing complexity and brings the desired improvements. There are some intricacies with the price setting of the bid, but this is manageable. The major downside is that the current legal framework does not allow for its implementation. This means that the MARI implementation framework would need to be modified.

Option 2 brings the desired improvements and would have no impact on the price formation at the MARI platform. The price setting of the bid would also be relatively simple. However, the management of paradoxically accepted/rejected bids will will need to be managed in the T&C, increasing their complexity. A feedback loop needs to be set up as well, potentially complexifying the MARI algorithm as well. The further difficulty of this proposal comes from the operational implementation. It will be very challenging to reconstruct the local merit order within the small timeframe and to manage the impacts of complex bids with the feedback loop to MARI platform and the additional tools will require continuous maintenance and carry an inherent risk. Finally, a change to the MARI implementation framework would be required as well, since currently it is not allowed for a TSO to deviate from the selected bids from the MARI platform.

Option 3 (netting) has no blockers for implementation and is allowed in the current legal framework. However, it does not fully bring the desired improvements and the correlation between the activation of the bid and the cross-border marginal price is not assured.

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The most important part of this evolution is to implement a solution that brings the improvements identified above. In that sense, option 0 and option 3 are less desirable.

When comparing the other two options (option 1 and option 2), both achieve the desired improvements, but have some downsides. For option 1, the current legal framework does not allow for this implementation and as such a modification must be made before this can be implemented. On the other hand, the operational implementation of option 2 poses a large technical challenge in a short timeframe where already many actions need to be taken on top of the required changes to the legal framework.

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6. Conclusion and next steps

The comparison in the previous section shows that either introducing the bid in the MARI merit order or deviating from the selected bids from the MARI platform bring the desired improvements. These two options are thus the possibilities that Elia would like in particular to receive the feedback from the market parties on. Any feedback on the other options is welcomed as well.

From an implementation perspective, Elia holds a large preference for the introduction of the bid in the MARI merit order. Elia was unable to do a complete feasibility analysis, however it is clear that this option creates less challenges with the operational implementation in comparison to deviating from the selected bids from the MARI platform. Also, the added complexity of the IT systems will result in higher risk of failure and maintenance costs. In addition, the paradoxically accepted/rejected bids to be addressed in the T&C, making these more complex.

The next steps for the implementation of both options can be found here below:

Introduction in the MARI merit order

1. Positive feedback from the external stakeholders
2. Discussion with EU TSOs/ACER to request the modification to the MARI implementation framework
3. Introduction of the modification in the MARI implementation framework
4. Modification of the T&C mFRR
5. Operational implementation on Elia side

Deviating from the selected bids from the MARI platform

1. Positive feedback from external stakeholders
2. Discussion with EU TSOs/ACER to request the modification to the MARI implementation framework
3. Modification of the T&C mFRR
4. Implementation of the new tool to integrate to-be-tested bid into the local merit order
5. Parallel run to verify operational timings
6. Implementation of additional legally required reporting towards the CREG

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It is not yet clear at this stage which solution would be quicker to implement. The overall implementation is dependent on the currently ongoing Go-live of both MARI and Picasso, the timings for the modifications of the legal framework and also the complexity of the operational implementation.

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7. Articles to be added to the T&C mFRR

In addition to the feedback on the proposals for availability testing in the market, Elia would also like to request feedback on the articles that need to be added to the T&C mFRR for the full implementation of smart testing. These articles where presented as well in the WG ES of the 30th of September.
The concerned articles are:

ANNEX 11.C

- ELIA triggers availability tests while respecting a limitation on the value of availability tests, which applies on a rolling window of 12 months, always starting at Month M (current Month). The value of an availability test is determined by the test regime a BSP finds itself in.
- There are 2 different test regimes:
  - Test regime 1: The valid activated volume of the BSP is below the Testing Threshold
  - Test regime 2: The valid activated volume of the BSP is equal to or above the Testing Threshold
- In test regime 1, the value of a performed availability test is 1.
- In test regime 2, the value of a performed availability test is 3.
- Over a rolling 12 months, the sum of the values of the performed availability tests may never exceed 12.
- The valid activated volume of a DP is equal to the maximum volume that has been tested via an availability test or activation control in the last 12 months, unless the last failed availability test (in accordance with Art. 13.9.) or failed activation control (in accordance with Art. 14.2) of the DP is more recent than 12 months. In this case, the valid activated volume is equal to the maximum volume that has been tested via an availability test or activation control since the last failure.
- The valid activated volume of a BSP is equal to the sum of the valid activated volume of all the DPs of the BSP.
- The Testing Threshold for a BSP is defined as follows:

$$Testing\ Threshold = \sum_{M} F_{freshness}(M) * average_{M}\left[\max_{D} Obligation(CCTU, D)\right]$$

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With:

$$F_{freshness}(M) = \begin{cases} \frac{4}{30}, \ if\ X = 2,\ 3 \text{ or } 4 \\ \frac{3}{30}, \ if\ X = 5,\ 6 \text{ or } 7 \\ \frac{2}{30}, if\ X = 8,\ 9 \text{ or } 10 \\ \frac{1}{30}, \ if\ X = 11,\ 12 \text{ or } 13 \\ else, 0 \end{cases} , where\ X\ is\ the\ \#\ of\ past\ months\ compared\ to\ month\ M$$

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