MARI – Bid Structure and Linking

Table of Content

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NOTE CONCERNING WORDING USED IN THIS DOCUMENT

The force of the following words is modified by the requirement level of the document in which they are used.

- SHALL: This word, or the terms “REQUIRED” or “MUST”, means that the definition is an absolute requirement of the specification.
- SHALL NOT: This phrase, or the phrase “MUST NOT”, means that the definition is an absolute prohibition of the specification.
- SHOULD: This word, or the adjective “RECOMMENDED”, means that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications shall be understood and carefully weighed before choosing a different course.
- SHOULD NOT: This phrase, or the phrase “NOT RECOMMENDED”, means that there may exist valid reasons in particular circumstances when the particular behaviour is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behaviour described with this label.
- MAY: This word, or the adjective “OPTIONAL”, means that an item is truly optional. One IT vendor may choose to include the item because a particular marketplace requires it or because the vendor feels that it enhances the product while another vendor may omit the same item. An implementation which does not include a particular option SHALL be prepared to interoperate with another implementation which does include the option, though perhaps with reduced functionality. In the same vein an implementation which does include a particular option SHALL be prepared to interoperate with another implementation which does not include the option (except, of course, for the feature the option provides.).

Version History

Version	Date	Comments
1	12/2020	Initial version
2	05/2023	Amendments and terminology consistency

List of abbreviations

AOF – Activation Optimisation Function

BSP – Balancing Service Provider

DA – Direct Activation

IG – mFRR Implementation Guide

MARI – Manually Activated Reserves Initiative

mFRR – manually activated Frequency Restoration Reserves

MTU – Market Time Unit

QH – Quarter Hour

SA – Scheduled Activation

1. Introduction

This document describes, based on the mFRR Implementation Framework[1] dated 30th September 2022, the bidding options to be used in common mFRR platform for cross-border balancing energy exchange (MARI). The document covers bid definition, bid type, bid properties and bid availability which are used and supported within MARI. The document serves to provide insight and details internally as well as externally for BSPs.

[1] Implementation framework for the European platform for the exchange of balancing energy from frequency restoration reserves with manual activation in accordance with Article 20 of Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing, 30 September 2022.

2. Bid definition and Type of Bids

2.1. Bid definitions and terminology

This section introduces and explains the terminology related to bid type definitions used and supported within the mFRR platform and in this document. Table 1 summarizes the main types of bids and their definitions.

Table 1: Bid definitions and terminology.

Terminology	Definition in terms of common mFRR platform
Standard mFRR balancing energy bid	A standard mFRR balancing energy product bid means the balancing energy bid for a standard mFRR balancing energy product. **Standard mFRR balancing energy bid consists of one price and one volume**. Standard mFRR balancing energy bids can be grouped together in a form of complex bids.
Simple bid	Simple bids are bids, which are not and cannot be grouped together in any form (linking of bids between different MTUs is not considered as grouping). Simple bids define the smallest component in the bid structure of the mFRR platform and consist of one price and one volume. In terms of divisibility simple bids can be fully, partly, or indivisible.
Complex bid	Complex bids are special bids aiming to model technical and economical behaviours of energy assets. Complex bids consist of multiple (two or more) bids (where each bid is referred as a component), which are grouped in a defined way in the same QH.
Exclusive group	An exclusive group is a type of complex bid, consisting of a group of bids (where each bid is referred as a component) within the same MTU, where only one component can be activated from the list of components being part of the exclusive group.
Multipart group	A multipart group is a type of complex bid which consists of a group of bids (where each bid is referred as a component) within the same MTU, where the components part of the multipart group, can be activated based on the pricing rules.
Component	A component is a bid which is part of a multipart group or an exclusive group of bids.

The BSPs enter their bids via the local IT systems of the connecting TSO. Every TSO must then submit the standard mFRR balancing energy bids to the mFRR platform.

Each standard mFRR balancing energy bid is always characterized by at least those 6 characteristics: offered volume, divisibility, minimum offered volume, direction, price and activation type. Each bid is characterized by a single price.

All standard mFRR balancing energy bids have the characteristics shown in Table 2.

Table 2: Standard mFRR energy bids characteristics

	Value	Technical limit
Offered volume	Variable	[1;9999] MW 1 MW step
Divisibility	Divisible or Indivisible	
Minimum offered volume	Variable or N/A[2]	[1;9999] MW
Direction	Upward or Downward	
Price	Variable	[-99'999; 99'999] €/MWh 0.01 €/MWh step
Activation Type	Scheduled Activation (SA), Direct Activation (DA)	

- The offered volume determines the size of the standard mFRR energy bid.

A bid selected by the mFRR platform Algorithm Optimization Function (AOF) follows the rules of Table 3.

Table 3: Bid characteristics of selected bids

	Value
Minimum activated volume	1 MW
Maximum activated volume	Offered Volume
Minimal incremental activated volume	1 MW

2.2. Type of bids

In general two types of bids are allowed on the mFRR platform: simple bids and complex bids. Simple bids are those bids, which are not grouped together in any form. Simple bids define the smallest component in the bid structure of the mFRR platform and consist of one price and one volume.

A complex bid is always a combination of standard mFRR energy bids grouped together, and which can be cleared only under specific rules.

2.2.1. Simple Bids

In the mFRR platform, three types of simple bids are possible due to the choices regarding divisibility (fully divisible / divisible / indivisible) and the minimum offered volume. Table 2Different clearing rules may apply depending on the type of simple bid.

Table 4 depicts the three types of simple bids that can be modelled according to attribute "minimum offered volume" and "divisibility":

[2] Not applicable if the bid is indivisible

Table 4: Three types of simple bids

	Fully divisible bid	Divisible bid	Indivisible bid
Divisibility	Divisible	Divisible	Indivisible
Offered Volume	x MW	x MW	x MW
Minimum offered Volume	z MW, where z = 0 MW	z MW, where: 0 MW < z < x MW	N/A

Figure 1 shows a fully divisible bid, a divisible bid and an indivisible bid. A divisible bid is a bid which can be partially selected by the mFRR platform AOF. It means that the selected volume of divisible bid may be different from the offered volume. In the case of the fully divisible bid, the minimum selected volume may be as low as 1 MW while for the divisible bid, the minimum value is capped by the minimum offered volume (indivisible part of the bid, e.g. technical minimum of the unit). An indivisible bid is a bid which can only be selected in its entirety by the AOF.

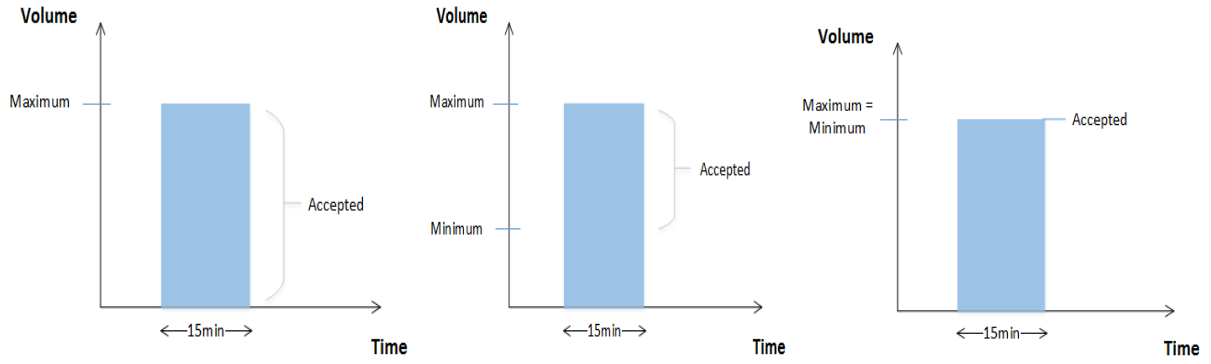


Figure 1: Representation of a fully divisible bid, divisible bid and indivisible bid

NB: the model presented here is defined in the IG, which sets the format of simple bid between the TSO and the mFRR platform. The TSO may choose to model simple bids differently to adapt to its local market. Nevertheless, the format shall follow the IG. It is therefore the responsibility of the TSO to convert the local format to the IG format.

2.2.2. Complex Bids

A complex bid is a special bid to model technical and economical behaviours of energy assets. It consists of multiple (two or more) standard mFRR balancing bids (where each standard mFRR balancing bid is referred as a component), which are grouped in a defined way in the same MTU. The complex bids may have to be limited in size (number of bids in a complex bid) as well as in number (number of submitted complex bids), as they have significant impact on the performance of the algorithm.

Multipart Group

The MARI Project agreed to reuse the multipart modelling, already existing in TERRE Project and in the ENTSO-E EDI Bid document based on a monotonous price rule[3]. Within the ENTSO-E EDI documents and within the mFRR platform the term multipart group will be used.

A multipart group consists of two or more standard mFRR balancing bids (where each standard mFRR balancing bid is referred as a component) within the same QH. Thus, each component of the multipart group follows the same characteristics as defined for a bid.

However, additional rules apply on the components of the multipart group:

- The components must have different prices but may have the same or different volumes.
- The components may be fully divisible, divisible or indivisible without any restrictions on the combinations.
- All components must be in the same direction, i.e. either in downward or upward direction.
- All components of a multipart group must have the same activation type, i.e. scheduled onlyor direct activation.
- A component of a multipart group cannot at the same time be a component of another multipart group. Likewise, a component of a multipart group cannot at the same time be part of an exclusive group.

The following clearing rules related to multipart groups apply:

- A component of an upward multipart group cannot be activated unless all other components with a lower price have been activated up to their entire offered volumes. A component of a downward multipart group cannot be activated unless all other components with a higher price have been activated up to their entire offered volumes.
- If at least one component is activated in SA, the remaining volume of the multipart group is no longer available for DA. Likewise, if at least one component is activated in an optimisation for DA, the remaining components are no longer available for any subsequent DA optimisations.

Example: Multipart group

A multipart group of total upward 80 MW, available for DA is submitted. It consists of:

- An indivisible component 1: 50 MW @ 10 € / MWh;
- A fully divisible component 2: 10 MW @ 25 € / MWh;
- A fully divisible component 3: 10 MW @ 15 € / MWh;
- A fully divisible component 4: 10 MW @ 20 € / MWh.

The AOF selects 65 MW of the multipart group. The cross-border marginal price is 20 €/MWh, i.e. component 1 and component 3 are fully activated since they are in-the-money and component 4 is partially activated with 5 MW. The remaining volume of component 4 and component 2 cannot be activated in DA and the volume is thus lost.

[3] This constraint may be lifted, if another modelling is used. However, this is not foreseen before the Go-Live.

Figure 2 depicts the activation of the multipart group and its components graphically, which are stacked in monotonously increasing price.

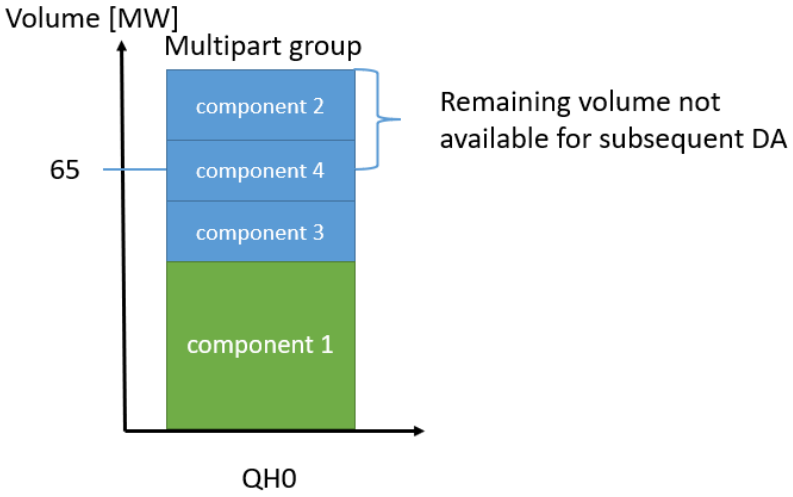


Figure 2: Example of multipart group

Exclusive Group

The exclusive group consists of a group of standard mFRR balancing bids (where each standard mFRR balancing bid is referred as a component) within the same MTU, for which at most one of the components can be activated; hence, the activation of a component belonging to an exclusive group excludes the activation of the other components belonging to the same exclusive group. The exclusive group can be used to model start-up costs with different offered volumes and prices.

An exclusive group consists of two or more components (which have the same identification attribute) within the same QH. Thus, each component of the exclusive group follows the same characteristics as defined for a standard mFRR balancing bid.

Additional rules apply on the components of the exclusive group:

- The components may have different directions, volumes and/or prices
- The components must have the same activation type.
- The components within the group may be fully divisible, divisible or indivisible without any restrictions on the combinations.
- The components must have the same availability status.

The following clearing rules related to components of exclusive group apply:

- Only one of the components within the exclusive group can be activated.
- An exclusive group can be available for both SA and DA. If none of the components in the exclusive group is activated in SA, the whole exclusive group remains available for DA.

Example: Exclusive Group

In Table 5 and Figure 3 an exclusive group is presented with four indivisible components of various volumes and prices.

Table 5: Example of an exclusive group

Component of Exclusive Group	Price [€/MWh]	Volume [MW]	Activation type	Bid ID
Indivisible component 1	20	15	DA	#ID1
Indivisible component 2	70	10	DA	#ID2
Indivisible component 3	50	20	DA	#ID3
Indivisible component 4	40	30	DA	#ID4

Only one of the components of an exclusive group can be accepted. In case a component of exclusive group is divisible/fully divisible bid, the remaining volume of the partially cleared component is not available for the next DA.

The AOF of the mFRR platform will select the optimal component to fulfil the objective function. The AOF will not always select the cheapest component of an exclusive group. In this example, the component with the volume of 30 MW @ 40 €/MWh is selected. This may be the case if the required volume was exactly 30 MW.

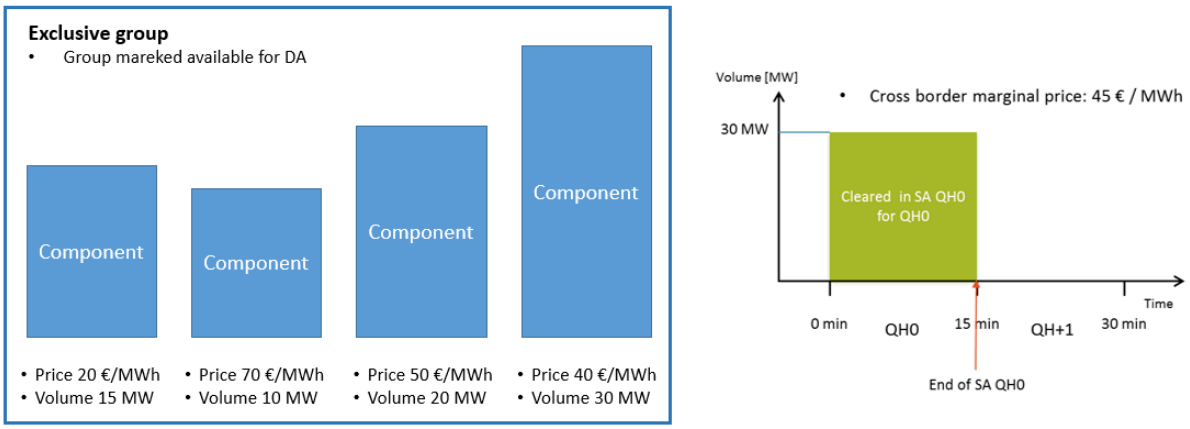


Figure 3: Exclusive group

3. Bid properties

3.1. Activation type

Every balancing energy bid submitted by the TSOs to the mFRR platform has one of the following activation types:

1. Activation type 1: scheduled activation only (SA bid);
2. Activation type 2: scheduled and direct activation (DA bid);

SA bid (1) is only available for scheduled activation while DA bid (2) can be cleared either in the scheduled or in direct activation.

The BSP must be aware that a direct activation of its bid results in a delivery extending until the end of the next quarter hour (QH). The BSP must be able to perform this delivery.

3.1.1. Guaranteed Volume

The need for Guaranteed Volume is the following: DA bids may be selected by the AOF when optimising scheduled or direct activations. Locally, TSOs would like to avoid that bids eligible for DA become exhausted during SA, leaving the connecting TSO with too low reserves for DA (which cannot be recovered because DA bids may have been consumed instead of SA bids or because of changes in cross border capacity limits). In extreme cases, this could cause frequency problems. Therefore, some TSOs want to retain a certain volume of DA bids eligible for DA also after SA, by marking some DA bids as not activatable SA optimisation TSOs wishing to use Guaranteed Volume shall introduce this in their terms and conditions or methodologies.

3.2. Linking of Bids

This section describes types of the linking of bids between QH. A BSP can link bids together with a technical link and/or with a conditional link. Technical linking and conditional linking are not mutually exclusive.

The linking of bids between QH is needed, because at the gate closure time for QH0 (current QH), the BSPs do not have the knowledge, if their bid was activated in QH-1 (previous QH) either in SA or DA or if their bid was activated in QH-2 in DA. Figure 4 depicts the information state for BSPs.

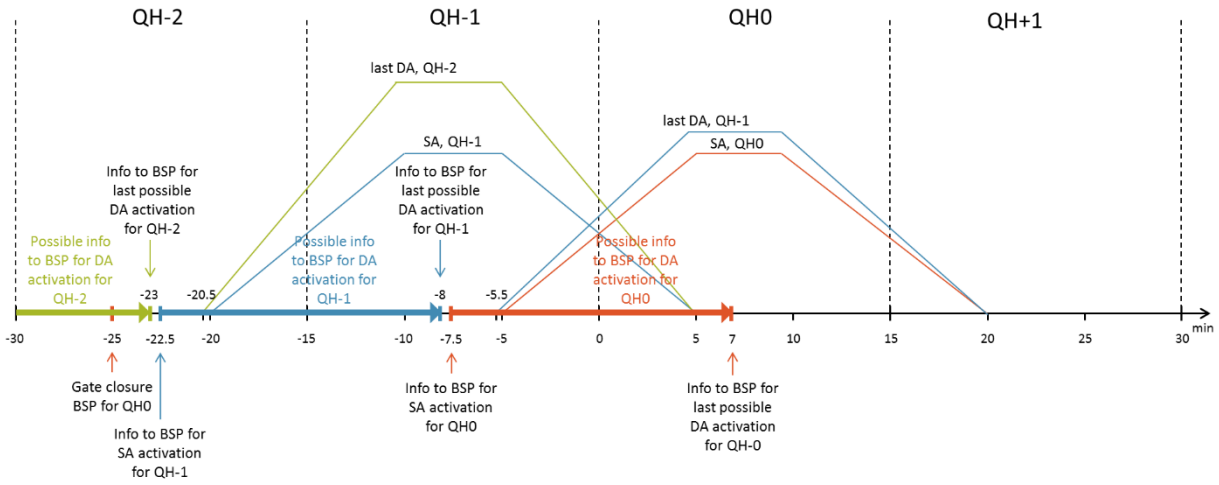


Figure 4: Information state of BSPs for QH0

Until the Gate Closure Time for BSP for QH0 at T-25, a BSP can still be notified until T-23 for the activation of a bid of QH-2 (in Direct Activation). Therefore, in some cases, BSPs are not able to update their bids for QH0 if the activation of the bids in QH-2 have an impact on the bids in QH-0. For example, ramping constraints between the DA bid of QH-2 and the SA and DA bid of QH0.

Similarly, to the previous case, BSPs are notified at T-22.5 (i.e. after the GCT for QH-1), if their bid was selected for activation in SA for QH-1. Until T-8, BSPs can be notified for an activation in DA for QH-1. Since the Gate Closure Time for BSP is passed, BSPs cannot update their bids for QH0. For example, a

bid which is activated in QH-1 in direct activation may have an impact on the bid in QH0 if both bids represent the same underlying asset.

Therefore, technical linking between QH-1 and QH0 as well as conditional linking between QH-2 and QH0 and, QH-1 and QH0 have been introduced to solve those issues. It should be noted that linking may seamlessly continue to stretch into future MTU periods therefore the outcome of the bid in QH0 may subsequently affect the availability of bids in QH1 and QH2, etc.

The principle of the linking is to switch the availability status of the bids from available to unavailable (or vice-versa) to avoid unfeasible activations. The processing of the availability of the bids, i.e. which bids will be included in the CMOL, shall be done on the MARI platform.

In principle, the BSP has the responsibility to link the bids together to avoid unfeasible activations but each TSO may facilitate the input of the bids of the BSP based on information of underlying assets, the technical and/or commercial constraints of such assets, etc. It is at the discretion of the BSP (or the TSO facilitating the input) to choose between technical and conditional linking or combination thereof to achieve the bidding objectives.

The mFRR platform does not consider the specificities and flexibilities provided by the TSOs to the BSPs. Therefore, the input of the TSOs shall in any case be compliant with the modelling outlined by this document and the precise bid formatting as prescribed by the IG.

3.2.1. Technical Linking

At gate closure for QH0, the BSP does not know the result of the clearing of SA for QH-1, as well as any clearing for DA for QH-1, as depicted in Figure 4. Therefore, if the bids submitted for QH-1 and QH0 represent the same asset or the same pool, the dependencies between those bids must be communicated to the mFRR platform to prevent overlapping or unfeasible activations.

Technical linking is the linking of two bids (simple bid or complex bid component) in two subsequent QH. Within a given QH period, there may not be more than one bid having the link to the same bid in previous QH(QH-1).

Technical linking ensures that a bid in QH0 is not available for clearing if the bid in the previous QH (QH-1) was activated in DA. This is important in order not to activate the same balancing resource twice. Technical linking rule will be respected by the platform.

Rule for CMOL function for a bid in QH0 technically linked to a bid in QH-1:

- If the bid in QH-1 is subject to DA, the technically linked bid in QH0 will be unavailable (for SA as well as DA).

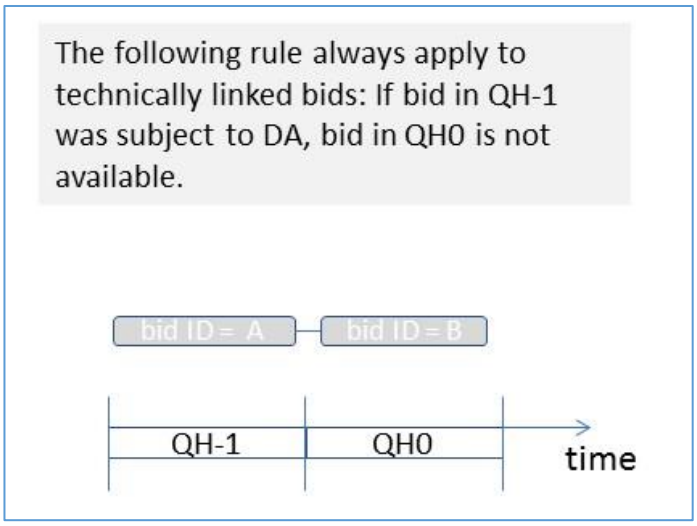


Figure 5: Technical linking

Technical Linking Requirement

- Technical linking can be used in combination with conditional linking.
- Technical linking applies to simple bids as well as complex bids (multipart groups and exclusive groups).
- For components of a complex bid in QH0, the outcome in terms of availability applies uniformly to all its components.

Technical Linking detailed modelling

Every bid will have a unique identifier within the context of data provider (i.e. TSO) and data recipient (mFRR platform). The TSO is responsible for ensuring uniqueness also across different MTU periods. The mFRR platform is responsible for ensuring uniqueness among several data providers[4].

Unless a technical link has been explicitly declared by the data provider, mFRR platform assumes that a bid is available for SA and/or DA as per its declared activation type and is entirely independent on the outcome of any other bids.

Technically linked bids shall be assigned a common "bid group identifier" by the data provider, as shown in Table 5. Not more than one bid in each MTU period may have the same bid group identifier. This identifier will be used by the mFRR platform to enforce the basic rule that the bid in QH0 becomes unavailable when the linked bid in QH-1 was subject to DA.

Table 6: Example of technical link between two bids

MTU period	**QH-1**	**QH0**
Unique bid identifier	bb	cc

[4] Theoretically two TSOs might have used the same bid identifier. The mFRR platform shall ensure uniqueness by applying a TSO-specific prefix or suffix to the bid identifier to distinguish each data provider.

Bid group identifier	xx	xx

If the bid in QH-1 is a component of multipart or exclusive group, the link shall refer to the multipart/exclusive group identifier (not to any individual component), as shown in Table 7. The example shows a multipart group in QH0 (identified by "yy"), which is technically linked to a multipart group in QH-1 (identified by "ww"). Additionally, a multipart group in QH+1 (identified by "zz") is technically linked to a multipart group in QH0 (identified by "yy"). In the example, all multipart group consist of four components. If one of the components of a multipart group or exclusive group has been at least partially activated, the entire complex bid (multipart group or exclusive group) is deemed activated.

Table 7: Example of technical link between multipart group components

MTU period	Type of identifier	QH-1	QH0	QH+1
Component 1	**Unique bid identifier**	bb	ff	jj
	Multipart group identifier	ww	yy	zz
	Bid group identifier (technical link)	xx	xx	xx
Component 2	**Unique bid identifier**	cc	gg	kk
	Multipart group identifier	ww	yy	zz
	Bid group identifier (technical link)	xx	xx	xx
Component 3	**Unique bid identifier**	dd	hh	ll
	Multipart group identifier	ww	yy	zz
	Bid group identifier (technical link)	xx	xx	xx
Component 4	**Unique bid identifier**	ee	ii	mm
	Multipart group identifier	ww	yy	zz
	Bid group identifier (technical link)	xx	xx	xx

Example: Bid is not available in QH0 due to activation in DA QH-1

A BSP technically links together bid B for QH0 with bid A in QH-1, see Figure 6: Example of technical linking. This means, if bid A is activated in DA in QH-1, it has a direct effect on the availability of bid B. Thus, bid B is not available for QH0 and will be removed from the CMOL.

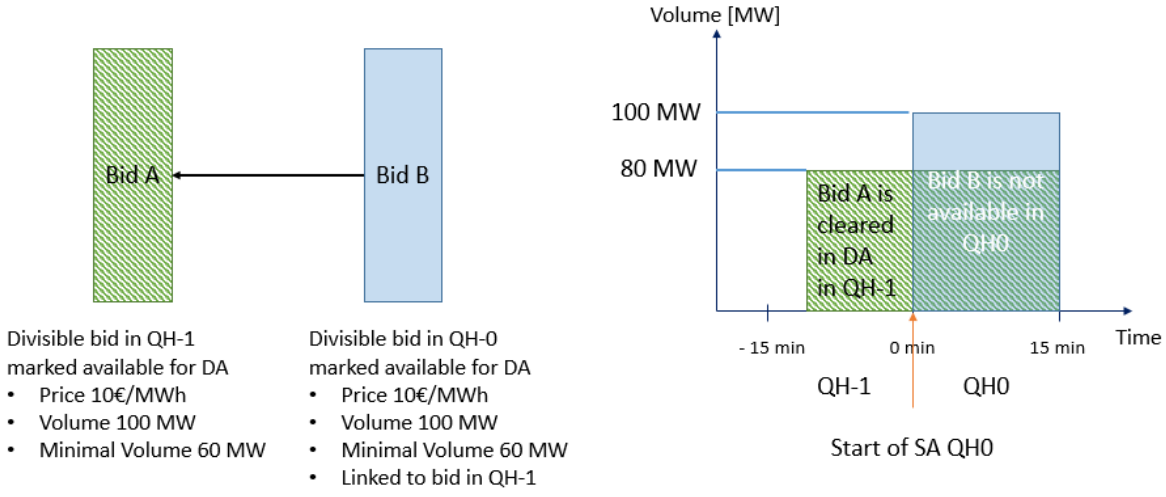


Figure 6: Example of technical linking

3.2.2. Conditional Linking

Conditional linking between MTUs is needed because the BSP do not know at gate closing QH0, if their simple bid in QH-2 was activated in DA or if their simple bid in QH-1 was activated in SA or DA. Due to constraint of the underlying assets or as a bidding strategy, a simple bid in QH0 may for example be available or not for clearing if simple bid in QH-2 was activated in DA or simple bid in QH-1 was activated in SA or DA. The conditional linking is a property similar to technical linking and aims to change the availability of a simple bid in QH0 under certain conditions.

The link may also specify that if the simple bid in QH-1 was subject to SA, the simple bid in QH0 is not available for DA (it may still be available for SA though).

All simple bids subject to conditional linking have an initial availability status: they may be either available or unavailable. The conditional linking will turn the initial availability status of simple bids to the opposite availability status when at least one of the conditions materialise.

Conditional linking is only applicable to simple bids. In a later release of the platform, it can be evaluated, if this function should also include complex bids.

Figure 7 represents conditional linking example, where bid refers to a simple bid type. A given simple bid in QH0 may have conditional links to a maximum of three simple bids in QH-1 and/or a maximum of three simple bids in QH-2. Each conditional link indicates exactly one condition that depends on the outcome of the simple bid in QH-2 or QH-1. If that condition is fulfilled, the status of the simple bid in QH0 is adjusted accordingly.

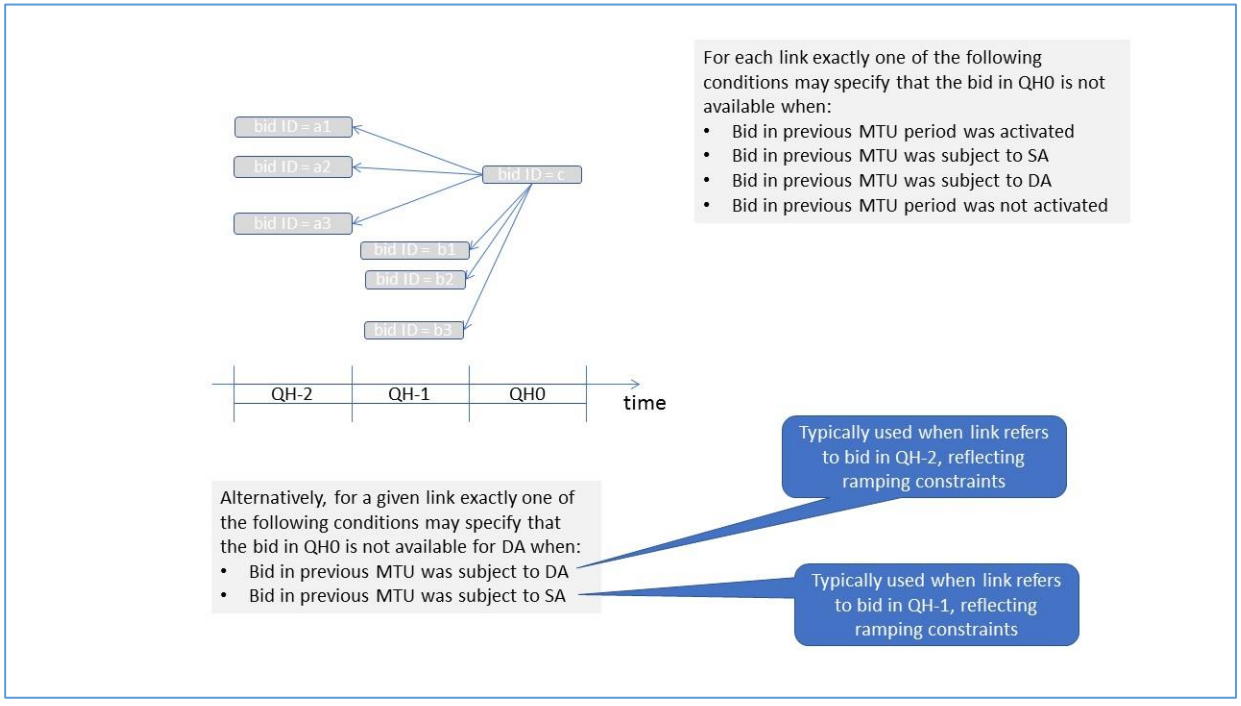


Figure 8: Conditional linking: example with an initial availability status "available"

While a given simple bid in QH0 may not have more than a total of six conditional links to simple bids in previous MTU periods, it should be noted that there is no limit on how many simple bids within QH0 a given simple bid in QH-1 or QH-2 might influence. Theoretically, an unlimited number of simple bids in QH0 may all have different dependencies on a single given simple bid in QH-1 or QH-2. Nonetheless, it remains the responsibility of the BSPs to ensure that the conditional linking rules reflect the actual technical availabilities of the underlying assets for activation.

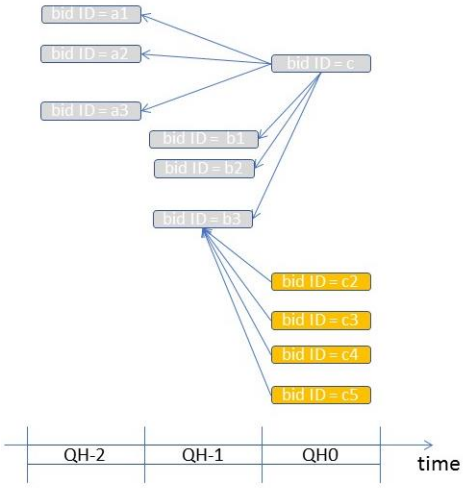


Figure 9: Conditional linking with one simple bid in QH-1 influencing several simple bids in QH0

Conditional Linking detailed modelling

Same as for technical linking, every bid will have a unique identifier.

Similar to technical linking, unless a conditional link has been explicitly declared by the data provider, mFRR platform assumes that a bid is available and is entirely independent on the outcome of any other bids.

The data provider may conditionally associate the simple bid in QH0 with between zero and three specific simple bids in QH-1. The data provider may conditionally associate the simple bid in QH0 with between zero and three specific simple bids in QH-2. For each association exactly one of the following conditionality must be specified:

- If simple bid in earlier MTU period is activated, the linked simple bid in QH0 is unavailable/available
- If simple bid in earlier MTU period is activated in SA, the linked simple bid in QH0 is unavailable/available
- If simple bid in earlier MTU period is activated in SA, the linked simple bid in QH0 is unavailable/available for DA
- If simple bid in earlier MTU period is activated in DA, the linked simple bid in QH0 is unavailable/available
- If simple bid in earlier MTU period is activated in DA, the linked simple bid in QH0 is unavailable/available for DA
- If simple bid in earlier MTU period is not activated, the linked simple bid in QH0 is unavailable/available.

As it has been stated in the previous paragraph, the final availability status of the linked simple bid becomes the opposite of the initially assigned availability status when at least one of the conditions materialise.

The simple bids in QH-1 and QH-2 must be unique, i.e. it is not permitted to link a given simple bid in QH0 more than once to a given simple bid in QH-1 or QH-2.

<table>
<tr><td>MTU period</td><td>QH-2</td><td>QH-1</td><td colspan="2">QH0</td></tr>
<tr><td rowspan="3">Unique bid identifier</td><td>a1</td><td>b1</td><td colspan="2" rowspan="3">c</td></tr>
<tr><td>a2</td><td>b2</td></tr>
<tr><td>a3</td><td>b3</td></tr>
<tr><td colspan="3" rowspan="6">Link</td><td>Associated simple bid</td><td>Dependency</td></tr>
<tr><td>a1</td><td>If a1 activated then c not available
XOR
If a1 activated in SA then c not available
XOR
If a1 activated in DA then c not available
XOR
If a1 not activated then c not available
XOR
If a1 activated in SA then c not available for DA
XOR
If a1 activated in DA then c not available for DA</td></tr>
<tr><td>a2</td><td>etc.</td></tr>
<tr><td>a3</td><td>etc.</td></tr>
<tr><td>b1</td><td>etc.</td></tr>
<tr><td>b2</td><td>etc.</td></tr>
<tr><td>b3</td><td>etc.</td></tr>
</table>

Example: Hydro Pump-Storage

The price of water for a pump-storage hydro plant will change depending on the remaining amount of water in the reservoir. A BSP will be willing to reflect this opportunity costs. The figure below shows that, depending on whether the simple bid a2 in QH-1 is activated, one of the simple bids (a3, b3 or c3) in QH0 will be available. If simple bid a2 for 10 €/MWh is activated in QH-1 then simple bid b3 for 20 €/MWh will be available in QH0. If simple bid a2 for 10 €/MWh was not activated in QH-1, then simple bid a3 for 10 €/MWh will be available in QH0. If simple bid b2 for 30 €/MWh was activated in QH-1, then simple bid c3 for 30 €/MWh will be available in QH0.

A BSP has a 100 MW on a water turbine on a pump storage unit. The pricing of the water becomes different every time water has been sold. Therefore, the BSP puts several simple bids for the same volume (100 MW) but with different prices to maximize the profit.

One hypothesis is that the BSP has only 100 MW of available capacity to sell and therefore conditional linking is necessary.

Let us suppose the BSP has a trading strategy consisting of three simple bids which are referred to the same quantity of 100MW. The BSP always offers 100 MW. However, depending on which of his simple bids has been activated in the previous MTU he wants to be remunerated at a different price.

In the following example we assume that the submitted simple bids have no technical links.

The conditional link which is shown in the example is recursive over consecutive QH. The conditions written for each QH are simply sliding.

Taking the example of QH0, each simple bid of QH0 is conditionally linked to all simple bids of QH-1 (a2, b2, c2) and QH-2 (a1, b1, c1). In this example, it is considered that no activation prior to QH-2 is impacting the simple bids of the example.

- 'Simple bid a3' is available per default and it turns to unavailable if either 'simple bid a2', or 'simple bid b2', or 'simple bid c2' has been activated in QH-1 or 'simple bid a1', or 'simple bid b1', or 'simple bid c1' has been activated in QH-2 for DA.
- 'Simple bid b3' is unavailable per default and it turns to available if 'simple bid a2' has been activated in QH-1 or 'simple bid a1' has been activated in QH-2 for DA.
- 'Simple bid c3' is unavailable per default and it turns to available only if 'simple bid b2' or ' simple bid c2' has been activated in QH-1, or 'simple bid b1', or 'simple bid c1' has been activated in QH-2 for DA.

Use Case: **Hydro power plants**

	QH-2						QH-1						QH0					
Unique bid Identifier	a1		b1		c1		a2		b2		c2		a3		b3		c3	
Volume	100		100		100		100		100		100		100		100		100	
Price	10		20		30		10		20		30		10		20		30	
Activation type	SA+DA		SA+DA		SA+DA		SA+DA		SA+DA		SA+DA		SA+DA		SA+DA		SA+DA	
Bid Direction	Upward		Upward		Upward		Upward		Upward		Upward		Upward		Upward		Upward	
Initial availability status	Available		Unavailable		Unavailable		Available		Unavailable		Unavailable		Available		Unavailable		Unavailable	
Conditional Link + Rule	link	rule	link	rule	link	rule	link	rule	link	rule	link	rule	link	rule	link	rule	link	rule
	a0	u_a	a0	a_aSA	b0	a_aSA	a1	u_a	a1	a_aSA	b1	a_aSA	a2	u_a	a2	a_aSA	b2	a_aSA
	b0	u_a			c0	a_aSA	b1	u_a	a0	a_aDA	c1	a_aSA	b2	u_a	a1	a_aDA	c2	a_aSA
	c0	u_a					c1	u_a			b0	a_aDA	c2	u_a			b1	a_aDA
							a0	u_aDA			c0	a_aDA	a1	u_aDA			c1	a_aDA
							b0	u_aDA					b1	u_aDA				
							c0	u_aDA					c1	u_aDA				

Min/max range **+100MW**
0MW

Bids a0, a1, a2, a3 ..., an are **available** per default
Bids b0, b1, b2, b3, ..., bn are **unavailable** per default
Bids c0, c1, c2, c3, ..., cn are **unavailable** per default
Note: Partial activation is considered as full activation.

Type of link
No need to specify the type of linking: neither AND- nor OR- relationship
All conditions are standalone and self-consistent

Legend for Conditional Linking

u_a	Linked bid was activated => bid unavailable in QH0
a_aSA	Linked bid was activated in SA => bid available in QH0
u_aDA	Linked bid was activated in DA => bid unavailable in QH0
a_aDA	Linked bid was activated in DA => bid available in QH0

Example: Ramping Constraints

A BSP sends two upward simple bids (one of 40 MW, the other of 10 MW) and a downward simple bid (100 MW). The activation of these three simple bids over the MTUs is conditional to the upward and downward ramp-rates of the BSP's power plant (+4 MW/min and -10MW/min). Simple bids a2 and b2 cannot be cleared in the QH-1 optimization due to slow ramp-rates.

Here conditional links are applied in order to avoid the occurrence of unfeasible and overlapped market solutions. Links shown in the example are recursive over consecutive QH.

Taking the example of QH0 from the figure below, each simple bid of QH0 is conditionally linked to a variable number of simple bids from QH-1 and QH-2. The upward simple bids are linked to the downward simple bids, because the activation of the downward simple bid is not feasible in QH-1, whatever upward simple bid is activated in QH-1. The mirror criterion is used to model the link between the downward simple bid and the upward simple bids. Also link between upward simple bids is necessary due to slow ramping up speed.

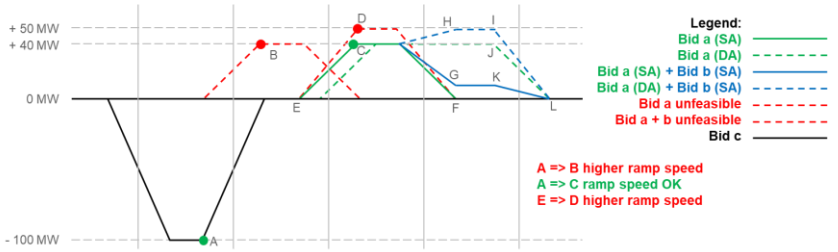
It is sufficient that a condition is met that the concerned activation is no longer possible.

10 MW upward simple bid is unavailable as initial status because upward simple bids cannot be cleared at the same time in the QH-1 optimization due to slow ramp-rates. 10 MW upward simple bid is SA only bid due to slow ramp-rates. Simple bid b2 will become available only when simple bid a1 was activated or simple bid a0 was activated in DA.

Use Case: **Ramping Constraints**

	QH-2						QH-1						QH-0					
Unique bid Identifier	a0		b0		c0		a1		b1		c1		a2		b2		c2	
Volume	40		10		100		40		10		100		40		10		100	
Price	10		20		-5		10		20		-5		10		20		-5	
Activation type	SA+DA		SA		SA+DA		SA+DA		SA		SA+DA		SA+DA		SA		SA+DA	
Bid Direction	Upward		Upward		Downward		Upward		Upward		Downward		Upward		Upward		Downward	
Initial availability status	Available		Unavailable		Available		Available		Unavailable		Available		Available		Unavailable		Available	
Conditional Link + Rule	link	rule	link	rule	link	rule	link	rule	link	rule	link	rule	link	rule	link	rule	link	rule
							c0	u_a	a0	a_a	a0	u_a	c1	u_a	a1	a_a	a1	u_a
							a0	u_aDA			c0	u_aDA	c0	u_aDA	a0	a_aDA	b1	u_a
													a1	u_aDA			a0	u_aDA
																	c1	u_aDA

Min/max range	**+50MW**
	-100MW
Ramp rate	**+4MW/min**
	-10MW/min



Bids a0, a1, a2, ..., an are **available** per default
Bids b0, b1, b2, ..., bn are **unavailable** per default
Bids c0, c1, c2, ..., cn are **available** per default
Note: Partial activation is considered as full activation.

Type of link
No need to specify the type of linking: neither AND- nor OR- relationship
All conditions are standalone and self-consistent

Legend for Conditional Linking

u_a	Linked bid was activated => bid unavailable in QH0
a_a	Linked bid was activated => bid available in QH0
u_aDA	Linked bid was activated in DA => bid unavailable in QH0
a_aDA	Linked bid was activated in DA => bid available in QH0

Conditional linking:

- Simple bid a2 is linked to simple bid c1 with a condition “u_a” as the upward simple bid a2 cannot be activated following a downward activation of simple bid c1 **in either scheduled activation or a direct activation in QH-1**.
- Simple bid a2 is linked to simple bid c0 with a condition “u_aDA” as the upward simple bid a2 cannot be activated following a downward activation of simple bid c0 **in a direct activation in QH-2**.
- Simple bid a2 is linked to simple bid a1 with a condition “u_aDA” as the activation of simple bid a1 in DA of QH-1 does not allow additional activation in QH0.

- Simple bid b2 (initially set as unavailable) is linked to simple bid a1 with a condition “a_a” as the activation of simple bid a1 **in either scheduled activation or a direct activation** in QH-1 allow additional activation in QH0.
- Simple bid b2 (initially set as unavailable) is linked to simple bid a0 with a condition “a_aDA” as the activation of simple bid a0 in DA of QH-2 allow additional activation in QH0.
- Simple bid c2 is individually linked to simple bid a1 and simple bid b1 with a condition “u_a”. It is sufficient that one of the conditions is fulfilled. So that, the downward simple bid c2 cannot be activated following an upward activation **in either scheduled activation or a direct activation in QH-1**.
- Simple bid c2 is linked to simple bid a0 with a condition “u_aDA” as the downward simple bid c2 cannot be activated following an upward activation **in a direct activation in QH-2**.
- Simple bid c2 is linked to simple bid c1 with a condition “u_aDA” as the activation of simple bid c1 in DA of QH-1 does not allow additional activation in QH0.
- The mentioned conditions are recursive over QHs.

Example: Start-up Costs

A BSP sends two upward simple bids (both of 10MW). The activation of these simple bids over the MTUs is conditional to the activation of the preceding QH. In fact, the two simple bids are distinguished by different prices. The simple bid a, as represented by the figure below, contains both variable and start-up costs. Instead the simple bid b is priced at the variable cost only and it is classified as activatable in SA only. Such activation type is due to simple bid b pricing. In fact, simple bid b can be activated just as a continuation of an energy delivery which has begun in the previous QH/s, without performing any ramp.

Here conditional links are applied in order to avoid the occurrence of overlapped market solutions and preventing consecutive activations from being priced at the start-up costs, respectively. Both links shown in the example are recursive over consecutive QH.

Use Case: **Start-up and Variable Costs**

	QH-2				QH-1				QH-0			
Unique bid Identifier	a0		b0		a1		b1		a2		b2	
Volume	10		10		10		10		10		10	
Price	10		1		10		1		10		1	
Activation type	SA+DA		SA		SA+DA		SA		SA+DA		SA	
Bid Direction	Upward		Upward		Upward		Upward		Upward		Upward	
Initial availability status	Available		Unavailable		Available		Unavailable		Available		Unavailable	
Conditional Link + Rule	link	rule	link	rule	link	rule	link	rule	link	rule	link	rule
					a0	u_a	a0	a_aSA	a1	u_a	a1	a_aSA
					b0	u_a	b0	a_aSA	b1	u_a	b1	a_aSA
									a0	u_aDA	a0	a_aDA

Start-up cost	**9 €/MWh**
Variable cost	**1 €/MWh**

Bids a0, a1, a2, ..., an are **available** per default
Bids b0, b1, b2, ..., bn are **unavailable** per default
Note: Partial activation is considered as full activation.

Type of link
No need to specify the type of linking: neither AND- nor OR- relationship
All conditions are standalone and self-consistent

Legend for Conditional Linking

u_a	Linked bid was activated => bid unavailable in QH0
a_aSA	Linked bid was activated in SA => bid available in QH0
u_aDA	Linked bid was activated in DA => bid unavailable in QH0
a_aDA	Linked bid was activated in DA => bid available in QH0

Conditional Linking:

- Simple bid a2 (initially set as available) is individually linked to simple bids a1 and b1 as the activation of one simple bid (either a1 or b1) in QH-1 does not allow activation of simple bid a2 in QH0.
- Simple bid a2 (initially set as available) is linked to simple bid a0 as the direct activation of a0 in QH-2 does not allow activation of simple bid a2 in QH0. Explanation: When a direct activation in QH-2 spans over QH-1, the compensation of star-up costs is not due anymore. Therefore, simple bid a2 is unavailable for SA in QH0. Moreover, since two consecutive DAs are not allowed by the current modelling of conditional linking, a direct activation of simple bid a2 is not allowed in QH0 either.
- Simple bid b2 (initially set as unavailable) is individually linked to simple bids a1 and simple b1. If simple bid a1 or simple bid b1 is activated simple bid b2 becomes available in QH0.
- Simple bid b2 (initially set as unavailable) is linked to simple bid b0 (in QH-2), meaning that if simple bid b0 is activated in DA of QH-2, simple bid b2 becomes available in QH0.
- The mentioned conditions are recursive over subsequent QH.

3.3. Availability of bids – combinations of different rules

The final availability of a bid for SA and/or DA may potentially be influenced by up to three different mechanisms, which will apply in the following descending order of precedence:

1. Unavailability as foreseen by EB GL art. 29(14)
2. Activation type or use of the principles of Guaranteed volume

3. Dependencies on associated bids in previous MTU periods due to conditional and/or technical linking

If a bid is subject to both conditional and technical linking and those links would yield a different outcome, the most restrictive result shall apply.

Please note, that TSOs shall according to Article 9 mFRR IF[5] and Article 29 EBGL[6] report the changes to the availability status of the balancing energy bids to the ENTSO-E Transparency Platform.

[5] Implementation framework for the European platform for the exchange of balancing energy from frequency restoration reserves with manual activation in accordance with Article 20 of Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing, 30 September 2022.

[6] Commission Regulation (EU) 2017/2195 of 23 November 2017 Establishing a Guideline on Electricity Balancing.

Literature

ENTSO-E. (30 September 2022). *All TSOs' proposal for the implementation framework for a European platform for the exchange of balancing energy from frequency restoration reserves with manual activation in accordance with Article 20 of Commission Regulation (EU) 2017/2195 establishing.*

ENTSO-E. (October 2022). *Common Platform for Replacement Reserves - Implementation Guide.*

ENTSO-E. (October 2022). *Reserve Bid Documentation UML Model and Schema.*