

ELEXION

P407 'PROJECT MARI'

DRAFT Solution Summary.

Public

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Background

P407 seeks to align the BSC with the European Balancing Project MARI (Manually Activated Reserves Initiative) requirements. Project MARI is an implementation project that forms part of the implementation of the European Electricity Balancing Guideline (EB GL). Project MARI aims to harmonise the Transmission System Operator (TSO) despatch of use frequency restoration reserves with manual activation (mFRR) across several TSO areas. It will do this by introducing a common mFRR product, which will be similar to current GB products such as [tbc]. This Modification will allow the implementation of the project at GB national level and ensure GB compliance with the European Electricity Balancing Guideline (EB GL).

National Grid, as the GB TSO, raised Modification P407 on 4 May 2020, with a view that the Modification should be implemented at the time the central MARI platform commences the exchange of balancing energy from manually activated frequency restoration reserves (mFRR) which is currently scheduled to be completed in July 2022.

However it is not clear what the full arrangements for the platform test phase may be, whether these timescales will be met by the central MARI project. Should there be any material technical amendments or alterations to delivery timescales from a central MARI project perspective, there will likely be impacts upon implementation timescales for P407.

Prior to P407, P344 'Project TERRE' aligned the BSC with another European Balancing Product known as Replacement Reserve (RR). There are a number of similarities between Project MARI and Project TERRE (the implementation project for RR) which the proposed P407 solution will seek to utilise. However it must be noted that mFRR is a balancing product in its own right and should not be considered as being 'the same as RR'.

What is Project MARI?

Project MARI is a balancing product implementation project, developed by European Transmission System Operators (TSOs), including National Grid. It will fulfil the legal requirements on TSOs mandated in the European Electricity Balancing Guideline (EB GL). The EB GL requires those TSOs that use frequency restoration reserves with manual activation (mFRR) to implement and make operational a new European platform for the exchange of energy.

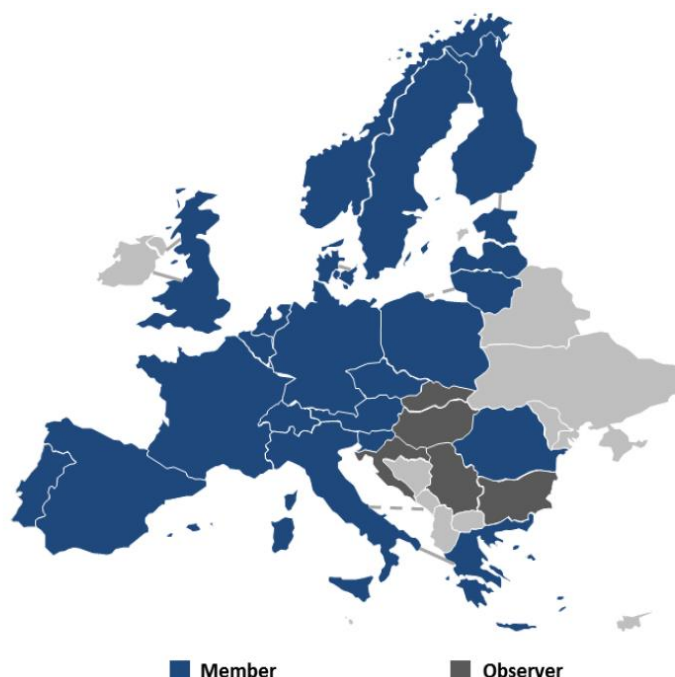


Figure 2: Overview of members and observers as of 29.03.2018

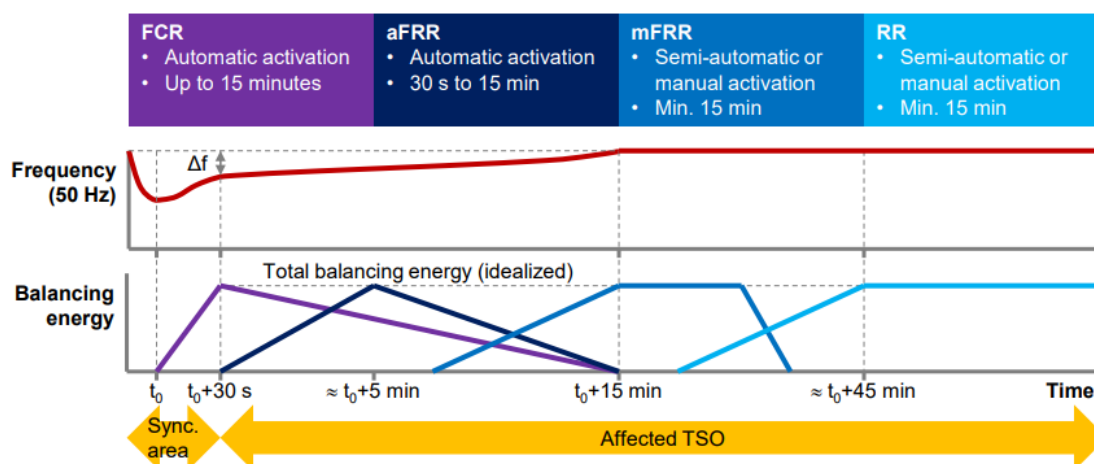
What is mFRR?

Definition of frequency restoration reserves or 'FRR' means the active power reserves available to restore system frequency to the nominal frequency.

mFRR therefore means Frequency Restoration Reserves with Manual Activation

It is designed work with in parallel with the other EU Standard Balancing Products

- Frequency Containment Reserves (FCR)
- Automatic FRR (aFRR)*
- Manual FRR (mFRR)
- Replacement Reserves (RR)



* aFRR will not be utilised by NGESO

mFRR product definition / parameters

The standard mFRR balancing energy product has been defined by the central project as follows:

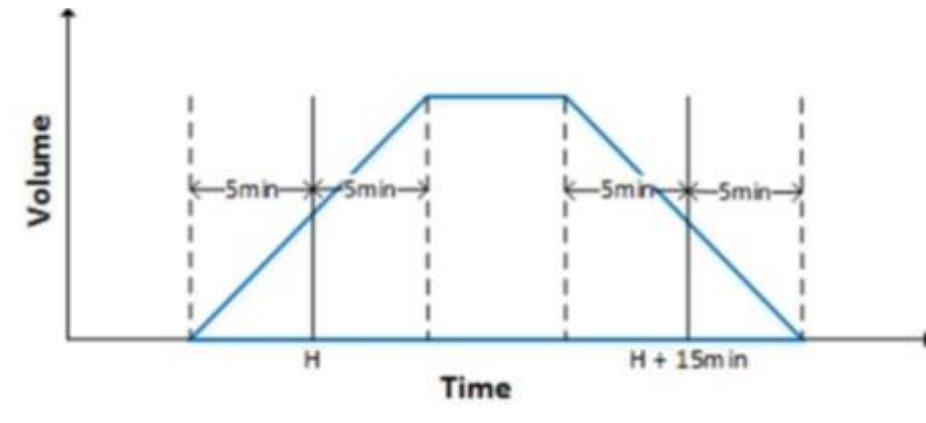
Mode of Activation	Manual
Activation Type	Direct (DA) or Scheduled (SA)
Full Activation Time (FAT)	12.5 minutes
Minimum Quantity	1 MW
Bid Granularity	1 MW
Maximum Quantity	9,999 MW
Minimum Duration of Delivery Period	5 minutes
Price Resolution	0.01 EUR/MWh
Validity Period	<p>Scheduled activation can take place at the point of scheduled activation only.</p> <p>Direct activation can take place at any time during the 15 minutes after the point of scheduled activation.</p>

Note that many characteristics have purposefully not been defined by the project (such as Ramping Time and Maximum Duration of Delivery) and are to be defined locally (i.e. by the TSO) and subject to EBGL Article 18 'Terms and Conditions relating to balancing'.

TSO-TSO Exchanged Shape / BSP-TSO Delivered Shape / Deemed Standard Product Shape

The TSO-TSO exchanged shape refers to how the changes in physical flows resulting from activations of the platform are realized. The TSO-TSO exchanged shape is defined according to the standard product characteristics.

Currently, the TSOs foresee using a linear ramp of 10 minutes for the cross-border exchange. A 10-minute ramp equals the ramp which is already in use for scheduled programs of exchange across Continental Europe.



The 'BSP-TSO delivered shape' refers to the actual delivery/withdrawal of certain units.

Deviations between the TSO-TSO exchanged shape and BSP-TSO delivered shape will lead to imbalances in the connecting TSOs imbalance area.

Each TSO has the opportunity to define certain product characteristics nationally (e.g. the preparation period, the ramping period, deactivation period, maximum duration of delivery period) in order to incentivize BSPs to follow the TSO-TSO exchanged shape or to incentivize BSPs to react faster.

How is EU mFRR activated?

mFRR (MARI) has two types of activation

Scheduled Activation (SA)

- Auction every 15 minutes paid at the clearing price

Continuous Direct Activations (DA)

- Effectively an auction is held every minute from $H-7.5$ to $H+7.5$ using bid data for the period H to $H+15$
- Paid using a conditional price based upon £ DA and £ SA of bid and delivery period.

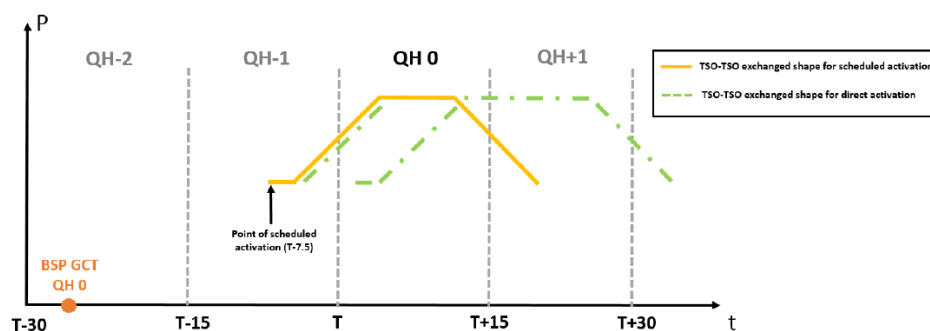


Figure 5: Illustration of the shape of the cross border exchange for a schedule activation and various direct activations

1.5. General mFRR Process

Figure 4 below explains the general process as foreseen for the mFRR-Platform:

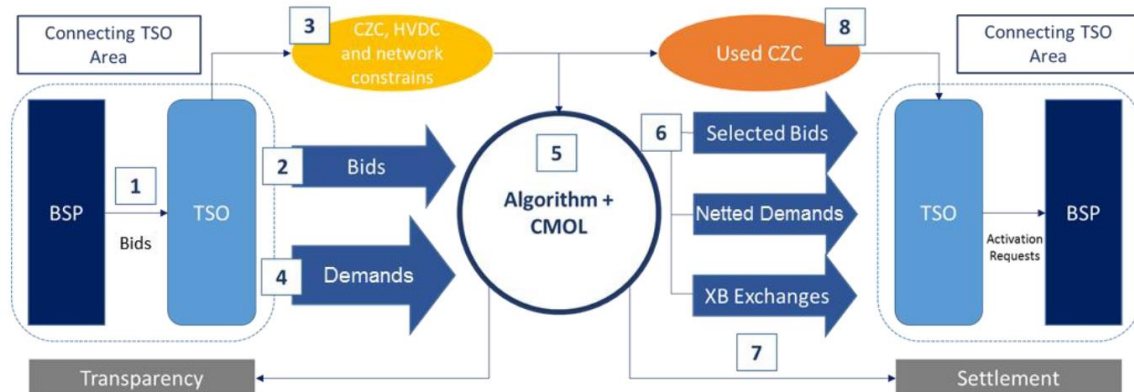


Figure 4: General Process of mFRR Activation

The MARI processes can be summarised as follows:

1. NGESO will collect mFRR bids from Balance Service Providers (BSPs);
2. NGESO will send the collated bids to the mFRR platform;
3. NGESO will also send their need / demand and to the mFRR platform;
4. NGESO will also send the cross border capacity of the relevant interconnectors to the mFRR platform;
5. Platform will run an algorithm to choose which bids are activated;
6. Platform will send activated bids, Clearing Price, Need / Demand Met and cross border schedules to NGESO;
7. Platform sends the relevant information sent to TSO-TSO settlement function
8. Platform sends the used cross border capacity to NGESO

Legal Deadline

The EB GL entered into Force on 18 December 2017, and the legal deadline for National Grid to utilise the MARI platform for GB balancing of mFRR products was December 2021. But because the final implementation framework could not be agreed it was referred to ACER who issued a final implementation framework with a new legal deadline of June 2022.

Solution Requirements

This document contains ELEXON's proposed solution for Balancing and Settlement Code (BSC) Modification P407 'Project MARI'.

The purpose of this document is to formally catalogue the Solution Requirements that ELEXON has drafted pursuant to the P407 Workgroup's discussions as of its [tbc] meeting on [tbc]. This solution was devised over a period of [tbc] meetings between [tbc].

TSO Interface

Project MARI will require various new data to be exchanged between Balancing Service Providers (BSPs), National Grid, the central MARI system and the Balancing Mechanism Reporting Agent (BMRA) / Settlement Administration Agent (SAA). BSC Settlement will need to be able to receive the following new data from National Grid (originated, amended and forwarded from the central MARI system):

- **mFRR bid data** (volume/price/physical and dynamic data) will be received from NGESO in a single XML file called Bid Document file in the format defined and provided by ENTSO-E.;
- **mFRR GB clearing price** (£/MWh) will be received from NGESO in a single XML file called Balancing Document file in the format defined and provided by ENTSO-E.
- **mFRR Activation data** and **mFRR Volume of GB need met** (MWh) is received from NGESO in a single XML file called MOL Document file in the format defined and provided by ENTSO-E.
- **mFRR Interconnector Schedule Data** will be received from NGESO for each Interconnector in a separate XML file called Schedule Document file in the format defined and provided by ENTSO-E; and

Note settlement is expecting to receive the above files per mFRR Auction. As Scheduled and Direct mFRR Auctions as they are held independently this will be result in separate files for each type of activation.

BR1

Settlement systems shall receive, validate and process new MARI-specific data from National Grid.

1.1	<p>Once per mFRR Auction Period (approximately [tbc] minutes before the Auction Period) National Grid shall send to BMRA and SAA details of all mFRR Bids submitted by GB parties for that mFRR Auction Period.</p> <p>To do so NGESO shall amend and send the MARI platform specific file (mFRR Bid Document) in the following way:</p> <ul style="list-style-type: none"> • Euro currency converted to GBP • Include NGESO BM Unit Id <p>BSP mFRR Bid submission requirements (including data items and formats) are to be detailed in a Grid Code governed document called 'MARI Validation and Consistency Rules'. The P407 solution will place obligations for BSPs to be compliance with this document.</p> <p>Mapped to BSC Section Q4.4</p>
1.2	<p>Once per mFRR Auction Period (approximately [tbc] minutes before the Auction Period) National Grid shall send to BMRA and SAA the mFRR Auction Result Data which shall compromise at least the following data sets:</p> <p>The mFRR Auction Result Data shall compromise at least of the following data sets:</p>

	<p>a) mFRR Activation Data</p> <ul style="list-style-type: none"> • mFRR Auction Period (start/end date and time) • Activation Type • Flow Direction • Resolution Type • For each Position associated to the mFRR Auction Period <ul style="list-style-type: none"> ○ an Activation Price (£/MWh) ○ an Activated Quantity (MW) <p>1.</p> <p>b) mFRR GB Need Met Data</p> <ul style="list-style-type: none"> • mFRR Auction Period (start/end date and time) • Activation Type • Flow Direction • Resolution Type • For each Position associated to the mFRR Auction Period <ul style="list-style-type: none"> ○ an Activation Price (£/MWh) ○ an Activated Quantity (MW) <p>2.</p> <p>c) mFRR Interconnector Schedule Data</p> <ul style="list-style-type: none"> • mFRR Auction Period (start/end date and time) • Activation Type • Flow Direction • Resolution Type • For each Position associated to the mFRR Auction Period <ul style="list-style-type: none"> ○ an Activated Quantity (MW) <p>Note mFRR Interconnector Schedule Data will be received for each Interconnector used for mFRR cross border flows.</p> <p>Mapped to BSC Section Q5.7</p>
1.3	<p>The BOA interface will be amended so that it can be used to provide details of mFRR Instructions (issued in relation to a mFRR Activation).</p> <p>The mFRR Instruction shall have similar data content to a BOA i.e. it will consist of one or more Acceptance Volume Pairs, each with:</p> <ul style="list-style-type: none"> • a 'From' MW level and an associated 'From' time; • a 'To' MW level and an associated 'To' time; • a flag stating whether that Acceptance is relating to an mFRR Activation, and • all other relevant BOA acceptance data

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	Mapped to BSC Section Q5.3
1.4	<p>It is recognised that mFRR Activation Data, mFRR GB Need Met Data and mFRR Interconnector Schedule Data received from NGESO will contain values with an associated Position and Resolution Type whereas the equivalent data required for the purposes of settlement contain Settlement Period values. Therefore SAA shall convert such data received from the National Grid into the required Settlement Period format.</p> <p>Mapped To BSC Section T3.1.4 and T3.1.5</p>
1.5	<p>Once per day the SAA creates an Activation report detailing where the SAA has processed any Balancing Mechanism or Replacement Reserve Activation Data for a Secondary BM Unit and sent to the SVAA daily. This report shall be amended to include any mFRR Activations.</p> <p>Mapped to BSC Section T7.1.1</p>
1.6	<p>The Panel shall be given the right to suspend the right of a BSC Party to submit mFRR Bids where they have become a 'Defaulting Party' due to the occurrence of a Default as per BSC Section H.</p> <p>Mapped to BSC Section H3.2.2</p>

NGESO has identified a number of scenarios where the suspension of the MARI market shall be required (e.g. planned /unplanned maintenance outages, computer system failures, central MARI algorithm failure etc). Therefore Settlement arrangements are required to ensure that any market suspension is captured and actioned in subsequent Settlement Runs.

BR2

SAA shall receive and process MARI market suspension notifications from NGESO

2.1	<p>Upon notification from NGESO Settlement shall determine the impacted Settlement Periods and notify all BSC Parties the MARI market suspension details.</p> <p>Mapped to BSC Section Q5B.1</p>
2.2	<p>Where the operation of the MARI Market is to be suspended in relation to any Settlement Period:</p> <ul style="list-style-type: none"> (a) no communication issued by the NGESO relating to that Settlement Period shall be classed as mFRR Auction Result Data or as "mFRR Instruction Flagged" Acceptance Data; (b) accordingly none of the following provisions from Section T shall be determined <ul style="list-style-type: none"> 1) Daily Party mFRR SA Cashflow; 2) Daily Party mFRR DA Cashflow; 3) Daily Party mFRR SA Instruction Deviation Cashflow; 4) Daily Party mFRR DA Instruction Deviation Cashflow; 5) BM Unit Period Non-delivery Charge (where this charge is derived from mFRR Auction Result Data) <p>Mapped to BSC Section Q5B.2</p>

mFRR Activation Settlement

The central MARI system will inform National Grid of mFRR bids that have been accepted through mFRR Activation Data and National Grid will forward this information to settlement. The SAA will interpret this information and create Activation Type (i.e. Scheduled or Direct) specific data for each for each reported activation within the mFRR Auction Period.

The settlement of both mFRR Scheduled Activations and mFRR Direct Activations will be handled under a new set of processes whereby settlement systems multiply the Activation Volume with the Activation Price, per BM Unit.

Note that an activation may span multiple Settlement Periods. Therefore Settlement shall calculate volumes and cashflows based upon the derived Activation Period start and end times per Settlement Period.

Settlement systems will then sum both mFRR Scheduled Activation Cashflow and mFRR Direct Activation Cashflow for each Settlement Period within a Settlement Day to get the Daily Party mFRR Scheduled Activation Cashflow and Daily Party Direct Activation Cashflow.

BR3

SAA shall calculate the mFRR Scheduled Activation Cashflow and mFRR Direct Activation Cashflow for each BM Unit for each Settlement Period.

3.1	<p>SAA shall calculate mFRR Scheduled Activation Volume per Settlement Period as follows:</p> $= \text{Activated Quantity} * (\text{Activation Duration} / 60)$ <p>Where the Activation Duration represents the duration of the activation per Settlement Period.</p> <p>Mapped to BSC Section T3.9B.1</p>
3.2	<p>SAA shall calculate mFRR Direct Activation Volume per Settlement Period as follows:</p> $= \text{Activated Quantity} * (\text{Activation Duration} / 60)$ <p>Where the Activation Duration represents the duration of the activation per Settlement Period.</p> <p>Mapped to BSC Section T3.9B.2</p>
3.3	<p>SAA shall calculate mFRR Scheduled Activation Cashflow as mFRR Activation Scheduled Activation Volume multiplied the Activation Price</p> $= \text{mFRR Scheduled Activation Volume} * \text{Activation Price}$ <p>Mapped to BSC Section T3.11B.1</p>
3.4	<p>SAA shall calculate mFRR Direct Activation Cashflow as mFRR Activation Direct Activation Volume multiplied the Activation Price</p> $= \text{mFRR Scheduled Activation Volume} * \text{Activation Price}$ <p>Mapped to BSC Section T3.11B.2</p>
3.5	<p>In respect of each Settlement Period, for each BM Unit, the total payment in respect of the BM Unit as a result of mFRR Scheduled Activations in the Settlement Period shall be the Period mFRR Scheduled Activation BM Unit Cashflow</p>

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	$= \sum \text{mFRR Scheduled Activation Cashflow}$ <p>Mapped to BSC Section T3.11B.3</p>
3.6	<p>In respect of each Settlement Period, for each BM Unit, the total payment in respect of the BM Unit as a result of mFRR Direct Activations in the Settlement Period shall be the Period mFRR Direct Activation BM Unit Cashflow</p> $= \sum \text{mFRR Direct Activation Cashflow}$ <p>Mapped to BSC Section T3.11B.4</p>

The Daily Party mFRR Scheduled Activation Cashflow and Daily Party mFRR Direct Activation Cashflow will be a new Trading Charges. They will be included on Trading Charge Advice Notes that are sent to BSC Parties participating in MARI.

BR4

Daily Party mFRR Scheduled Activation Cashflow and Daily Party mFRR Direct Activation Cashflow shall be a new Trading Charges, included on Trading Charge Advice Notes that are sent to Parties participating in MARI.

4.1	<p>SAA shall calculate Daily Party mFRR Scheduled Activation Cashflow as the summation of Period mFRR Scheduled Activation Cashflow across all BM Units for which that Party is the Lead Party and across all Settlement Periods j falling within a given Settlement Date.</p> $= \sum_j \sum_{i \in p} \text{Period mFRR Scheduled Activation Cashflow}$ <p>Where \sum_j is the sum over all Settlement Periods and $\sum_{i \in p}$ is the sum of all BM Units for which Party p is the Lead Party in that day</p> <p>Mapped to BSC Section T3.26.3</p>
4.2	<p>SAA shall calculate Daily Party mFRR Direct Activation Cashflow as the summation of Period mFRR Direct Activation Cashflow across all BM Units for which that Party is the Lead Party and across all Settlement Periods j falling within a given Settlement Date.</p> $= \sum_j \sum_{i \in p} \text{Period mFRR Direct Activation Cashflow}$ <p>Where \sum_j is the sum over all Settlement Periods and $\sum_{i \in p}$ is the sum of all BM Units for which Party p is the Lead Party in that day</p> <p>Mapped to BSC Section T3.26.4</p>
4.3	<p>SAA shall send Daily Party mFRR Scheduled Activation Cashflow and Daily Party mFRR Direct Activation Cashflow to FAA alongside the other Trading Charges.</p> <p>Mapped to BSC Section T5.3.3</p>
4.4	<p>FAA shall include Daily Party mFRR Scheduled Activation Cashflow and Daily Party mFRR Direct Activation Cashflow on invoices and Advice Notes to Trading Parties and BSC Parties with the Virtual Lead Party participation capacity.</p> <p>Mapped to BSC Section N6.1.3</p>

Upon receiving the mFRR Activations from the central MARI system, National Grid will interpret the data and intend to issue an appropriate mFRR Instructions to the BSP directing them to deliver any mFRR Activations. However a number of scenarios have been identified where issuing a mFRR Instruction won't be in the best interest of the GB system. In those instances National Grid has indicated they will not issue a mFRR Instruction.

Therefore to facilitate accurate Settlement the SAA will construct a mFRR Schedule for use in settlement to account for the instances where a mFRR Instruction is not received. These mFRR Schedules are treated by settlement systems just like any other instruction (i.e. setting a new baseline), except that they do not create Accepted Volumes that are payable.

The mFRR Schedule will respect the MARI Standard Product shape and align with TSO mFRR Dispatch Principles (as defined by National Grid) including:

- Where a mFRR Activation* is deemed to be feasible;
 - mFRR Schedule will respect submitted Dynamic Data Set parameters
 - The full MW delivery will be achieved between 0-5 mins into the Activation Period
 - There will be a minimum duration of full MW delivery of the mFRR Activation of 5 mins
 - Run-Up Rates and Run-Down Rates will be dispatched symmetrical to the Activation Period boundary (where possible)
- Where the mFRR Activation* is **not** deemed to be feasible;
 - RR Schedule will not respect submitted Dynamic Data Set parameters
 - The full MW delivery will be achieved between 5 mins into the Activation Period
 - There will be a duration of full MW delivery of the mFRR Activation until 5 mins before the end of Activation Period
 - Run-Up Rates and Run-Down Rates will be determined as the maximum feasible rate

* applies to both Scheduled and Direct activations

BR5

SAA shall create an mFRR Schedule for each mFRR Activation received in regards to a MARI Auction Period per Activation Type (i.e. Scheduled and Direct) and flag it accordingly.

- | | |
|-----|---|
| 5.1 | <p>SAA shall deem mFRR Schedule based upon mFRR Activation Data and the Dynamic Data Set received from national Grid.</p> <p>Upon receipt SAA shall create mFRR Schedule Product Point Variables for each mFRR Activation received</p> <p>Point variable pairs shall be deemed for each mFRR Activation detailing:</p> <ul style="list-style-type: none"> • Ramping Period start time (t) point variable • Ramping Period end time (t) point variable (i.e. Full MW Delivery start time) • Deactivation Period start time (t) point variable (where appropriate) • Deactivation Period end time (t) point variable (where appropriate) |
|-----|---|

	<p>Note:</p> <ul style="list-style-type: none"> mFRR Schedule Product Point Variables will have the same format and structure as other BSC point variables as per BSC X-2 4.4 mFRR Schedule Product Point Variables shall be flagged to identify which Activation Type (i.e. Scheduled and Direct) they represent the mFRR Schedule shall be (where possible) consistent with Dynamic Data Set parameters by taking into account Run-Up Rates and Run-Down Rates as defined in the Grid Code and as submitted by Parties the mFRR Schedule Methodology will be contained within the mFRR Schedule Methodology Document <p>Mapped to BSC Section T1.15</p> <p>Note that mFRR Schedule Methodology Document cannot be completed until NGESO finalise the mFRR Dispatch Principles and so is not included in the draft legal text / business requirements.</p>
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Because mFRR Activations are paid under a separate mechanism, the volumes relating to mFRR Schedules are not paid at Bid Prices or Offer Prices per Bid-Offer Pair. SAA will need to calculate mFRR Schedule Volumes for each Activation Type (i.e. have equivalent calculations to those for Period Accepted Offer Volume and Period Accepted Bid Volume). This will ensure that the volumes for mFRR Activations, RR Activations and BOAs do not mix, which could result in a BSP being paid twice (e.g. once via mFRR Cashflow and again via BM Cashflow).

BR6	
	<p>SAA shall process mFRR Schedules similar to (and processed in a similar way to) any other BOA, except that:</p> <ul style="list-style-type: none"> An mFRR Schedule shall be deemed to have been accepted equal to the time of the BEGCT of the mFRR Auction rather than when the mFRR Schedule was actually created (i.e. it will be treated as if its Acceptance Number was between the last BOA issued before that point, and the first BOA issued after that point); and Settlements systems shall calculate mFRR Schedule Volumes*, separate to Accepted Bid/Offer Volumes (so the volumes will not be included in QAO^{kn}_{ij} or QAB^{kn}_{ij}, and will therefore not attract Bid Offer Payments). <p>Note that SAA shall calculate mFRR volumes per Activation Type (i.e. Scheduled and Direct). The process shall be mostly the same for each Activation Type and so in the following requirements I shall simply refer to 'mFRR Schedule' where there is no need to differentiate.</p>
6.1	<p>For the calculation for $qAO^{kn}_{ij}(t)$ and $qAB^{kn}_{ij}(t)$, the mFRR Schedule shall be treated as if it were a BOA and shall be calculated exactly the same as the current arrangements. The calculation required from SAA and BMRA is therefore as follows:</p> <ul style="list-style-type: none"> Convert the spot times in the mFRR Schedule to an Acceptance Volume $qA^{k}_{ij}(t)$ for the mFRR Schedule, in accordance with the existing provisions of BSC section T3.4 Calculate the Bid-Offer Upper Range $BOUR^{n}_{ij}(t)$ and Bid-Offer Lower Range $BOLR^{n}_{ij}(t)$ for each Bid Offer Number n, in accordance with the existing BSC provisions of T3.4A, T3.4B and T3.5 Determine the Accepted Bid-Offer Volume $qABO^{kn}_{ij}(t)$, in accordance with the existing BSC provisions of T3.6 <p>Determine the Accepted Offer Volume $qAO^{kn}_{ij}(t)$ and Accepted Bid Volume $qAB^{kn}_{ij}(t)$, in accordance with the existing BSC provisions of T3.7</p>

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6.2	<p>SAA and BMRA shall treat any mFRR Schedule received for BM Unit as if it were a BOA, with Acceptance Time equal to the time of the BEGCT of the mFRR Auction Period (i.e. it will be treated as if its Acceptance Number was between the last BOA issued before that point, and the first BOA issued after that point).</p> <p>Mapped to BSC Section T3.4.1</p> <p>In particular, SAA and BMRA shall calculate the Accepted Offer Volume $qAO^{kn_{ij}}(t)$ and Accepted Bid Volume $qAO^{kn_{ij}}(t)$ as they would for a BOA, and the mFRR Schedule therefore sets the baseline against which volumes are measured for any subsequent RRI or BOA.</p> <p>Mapped to BSC Section T3.4.1</p>
6.3	<p>For each mFRR Schedule, SAA and BMRA shall determine a Period mFRR Accepted SA Offer Volume by integrating values of Accepted Offer Volume $qAO^{kn_{ij}}(t)$ flagged as relating to an mFRR Scheduled Activation Schedule.</p> <p>Note that this calculation is exactly analogous to the calculation of Period Accepted Offer Volume ($QAO^{kn_{ij}}$) for BOAs.</p> <p>Mapped to BSC Section T3.8A.1</p>
6.4	<p>For each mFRR Schedule, SAA and BMRA shall determine a Period mFRR Accepted SA Bid Volume by integrating values of Accepted Offer Volume $qAB^{kn_{ij}}(t)$ flagged as relating to an mFRR Scheduled Activation Schedule.</p> <p>Note that this calculation is exactly analogous to the calculation of Period Accepted Offer Volume ($QAB^{kn_{ij}}$) for BOAs.</p> <p>Mapped to BSC Section T3.8A.2</p>
6.5	<p>For each mFRR Schedule, SAA and BMRA shall determine a Period mFRR Accepted DA Offer Volume by integrating values of Accepted Offer Volume $qAO^{kn_{ij}}(t)$ flagged as relating to an mFRR Direct Activation Schedule.</p> <p>Note that this calculation is exactly analogous to the calculation of Period Accepted Offer Volume ($QAO^{kn_{ij}}$) for BOAs.</p> <p>Mapped to BSC Section T3.8A.3</p>
6.5	<p>For each mFRR Schedule, SAA and BMRA shall determine a Period mFRR Accepted DA Bid Volume by integrating values of Accepted Offer Volume $qAB^{kn_{ij}}(t)$ flagged as relating to an mFRR Direct Activation Schedule.</p> <p>Note that this calculation is exactly analogous to the calculation of Period Accepted Offer Volume ($QAB^{kn_{ij}}$) for BOAs.</p> <p>Mapped to BSC Section T3.8A.4</p>
6.6	<p>In respect of each Settlement Period, for each BM Unit, the total MWh volume of Offers accepted for all acceptances flagged as relating to a mFRR Scheduled Activation Schedule shall be the Period mFRR SA Total Accepted Offer Volume and shall be established as follows:</p> <p>$= \sum^k \text{Period mFRR Accepted SA Offer Volume}$</p> <p>Where \sum^k represents the sum over all Acceptances within the Settlement Period</p> <p>Mapped to BSC Section T3.9A.1</p>

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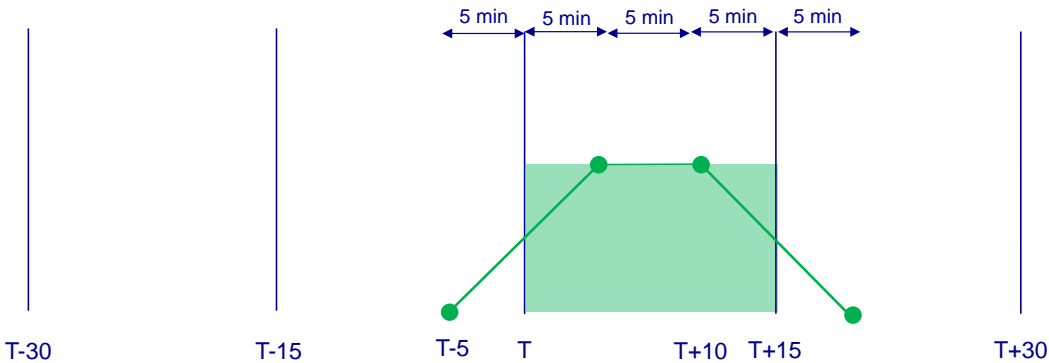
6.7	<p>In respect of each Settlement Period, for each BM Unit, the total MWh volume of Bids accepted for all acceptances flagged as relating to a mFRR Scheduled Activation Schedule shall be Period mFRR SA Total Accepted Bid Volume and shall be established as follows:</p> <p>$= \sum^k \text{Period mFRR Accepted SA Bid Volume}$</p> <p>Where \sum^k represents the sum over all Acceptances within the Settlement Period</p> <p>Mapped to BSC Section T3.9A.2</p>
6.8	<p>In respect of each Settlement Period, for each BM Unit, the total MWh volume of Offers accepted for all acceptances flagged as relating to a mFRR Direct Activation Schedule shall be the Period mFRR DA Total Accepted Offer Volume and shall be established as follows:</p> <p>$= \sum^k \text{Period mFRR Accepted DA Offer Volume}$</p> <p>Where \sum^k represents the sum over all Acceptances within the Settlement Period</p> <p>Mapped to BSC Section T3.9A.3</p>
6.9	<p>In respect of each Settlement Period, for each BM Unit, the total MWh volume of Bids accepted for all acceptances flagged as relating to a mFRR Direct Activation Schedule shall be Period mFRR DA Total Accepted Bid Volume and shall be established as follows:</p> <p>$= \sum^k \text{Period mFRR Accepted SA Bid Volume}$</p> <p>Where \sum^k represents the sum over all Acceptances within the Settlement Period</p> <p>Mapped to BSC Section T3.9A.4</p>

Under the P407 solution, a mFRR Activation (as received from the central MARI platform) will represent the theoretical volume of a mFRR Activation ‘block’. However, the physical delivery (i.e. mFRR Schedule) of the mFRR Activation will have volumes delivered outside of the Activation Period.

Project MARI has stated that mFRR Activations should be incentivized to physically deliver as close as possible to the TSO-TSO Exchanged Shape and has defined a Standard Product Shape for each Activation Type (i.e. Scheduled and Direct) to represent the desired delivery of a mFRR Activation. For clarification the MARI Standard Product has been defined as below:

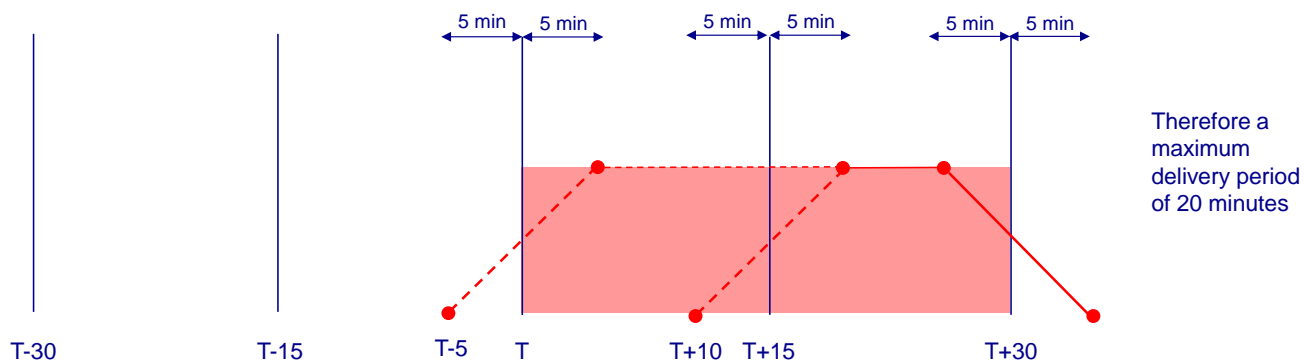
Scheduled Activation

‘Delivery of balancing energy for scheduled activations, including ramping, occurs between T-5 and T+20.



Direct Activation

'Delivery of balancing energy for direct activations, including ramping, may start at any point in time between T -5 and T+10, depending on when the demand(s) arrived on the platform. The delivery will always end at T+35.'



mFRR Activations are to be treated exactly as BOAs for Non-delivery purposes and to calculate Non-delivery Charges Settlement needs to be able to associate a price to all volumes delivered through MARI. As the physical delivery volumes will not match the theoretical 'block' mFRR Activation Volumes the Non-Delivery calculation becomes compromised. Settlement will therefore use the mFRR Activations to derive the 'Deemed Standard Product Shape' (based upon the Activation Type) and calculate appropriate 'Deemed Standard Product Offer / Bid Volumes' for use in the non-delivery calculation.

BR7

SAA shall calculate **Period mFRR SA Deemed Standard Product Offer/Bid Volumes** and **Period mFRR DA Deemed Standard Product Offer/Bid Volumes**

7.1 SAA and BMRA shall receive mFRR Activation data from national Grid. Upon receipt SAA/BMRA shall:

- For mFRR Activations with Activation Type of Scheduled create **mFRR SA Deemed Standard Product Point Variables**.
Mapped to **BSC Section T3.1.5.(c)**

- For mFRR Activations with Activation Type of Direct create **mFRR SA Deemed Standard Product Point Variables**.
Mapped to **BSC Section T3.1.5.(d)**

Note that both mFRR SA and mFRR DA Deemed Standard Product Point Variables will have the same format and structure as other BSC point variables as per BSC X-2 4.4

- Establish **mFRR SA Deemed Standard Product Shape** by linear interpretation of mFRR SA Deemed Standard Product Point Variables
Mapped to **BSC Section T3.17A**
- Establish **mFRR DA Deemed Standard Product Shape** by linear interpretation of mFRR DA Deemed Standard Product Point Variables
Mapped to **BSC Section T3.17B**

- Determine **mFRR SA Deemed Standard Product Volume** using the mFRR SA Deemed Standard Product Shape
Mapped to **BSC Section T3.18A**
- Determine **mFRR SA Deemed Standard Product Volume** using the mFRR DA Deemed Standard Product Shape
Mapped to **BSC Section T3.18B**
- Determine **mFRR SA Deemed Standard Product Offer Volume** using the mFRR SA Deemed Standard Product Volume
Mapped to **BSC Section T3.19A.1**
- Determine **mFRR SA Deemed Standard Product Bid Volume** using the mFRR SA Deemed Standard Product Volume
Mapped to **BSC Section T3.19A.2**
- Determine **mFRR DA Deemed Standard Product Offer Volume** using the mFRR DA Deemed Standard Product Volume
Mapped to **BSC Section T3.19B.1**
- Determine **mFRR DA Deemed Standard Product Bid Volume** using the mFRR DA Deemed Standard Product Volume
Mapped to **BSC Section T3.19B.2**
- Determine **Period mFRR SA Deemed Standard Product Offer Volume** and **Period mFRR SA Deemed Standard Product Bid Volume**
Established by integrating mFRR SA Deemed Standard Product Offer Volumes and mFRR SA Deemed Standard Product Bid Volumes
Mapped to **BSC Section T3.20A**
- Determine **Period mFRR DA Deemed Standard Product Offer Volume** and **Period mFRR DA Deemed Standard Product Bid Volume**
Established by integrating mFRR SA Deemed Standard Product Offer Volumes and mFRR SA Deemed Standard Product Bid Volumes
Mapped to **BSC Section T3.20B**

It is assumed that the mFRR Scheduled / Direct Activation Schedules will be consistent with the associated Deemed Standard Product Shape. In the majority of cases the MWh volume associated with mFRR Scheduled / Direct Activation Schedule will differ from the associated Deemed Standard Product Shape. This is because the mFRR

Scheduled / Direct Activation Schedule will take in account BM Unit ramping capabilities whilst the associated Deemed Standard Product Shape does not.

The SAA will calculate the MWh difference between the mFRR Scheduled / Direct Activation Schedule shape and the associated Deemed Standard Product Shape. This is to align the P344 solution and the European Electricity Balancing Guideline (EB GL) which introduced the concept of a Balancing Energy Deviation Volumes (the deviation from the standard shape as a result of the BM Unit's declared ramping rates).

BR8	
SAA shall calculate the volume difference between the mFRR Scheduled / Direct Activation Schedule and their associated Deemed Standard Product Shape.	
8.1	<p>SAA shall calculate the Total Period mFRR SA Deemed Standard Product Offer Volume</p> $= \sum \text{Period mFRR SA Deemed Standard Product Offer Volume}$ <p>SAA shall calculate the Total Period mFRR SA Deemed Standard Product Bid Volume</p> $= \sum \text{Period mFRR SA Deemed Standard Product Bid Volume}$ <p>Mapped to BSC Section T3.21A</p> <p>SAA shall calculate the Total Period mFRR DA Deemed Standard Product Offer Volume</p> $= \sum \text{Period mFRR DA Deemed Standard Product Offer Volume}$ <p>SAA shall calculate the Total Period mFRR DA Deemed Standard Product Bid Volume</p> $= \sum \text{Period mFRR DA Deemed Standard Product Bid Volume}$ <p>Mapped to BSC Section T3.21B</p>
8.2	<p>The mFRR SA Instructed Offer Deviation Volume shall be calculated as follows:</p> $= \sum \text{Period mFRR SA Total Accepted Offer Volume} - \text{Total Period mFRR SA Deemed Standard Product Offer Volume}$ <p>Mapped to BSC Section T3.22A.1</p> <p>The mFRR SA Instructed Bid Deviation Volume shall be calculated as follows:</p> $= \sum \text{Period mFRR SA Total Accepted Bid Volume} - \text{Total Period mFRR SA Deemed Standard Product Bid Volume}$ <p>Mapped to BSC Section T3.22A.2</p>

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	<p>The mFRR DA Instructed Offer Deviation Volume shall be calculated as follows:</p> $= \frac{\sum \text{Period mFRR DA Total Accepted Offer Volume} - \text{Total Period mFRR DA Deemed Standard Product Offer Volume}}{\text{Product Offer Volume}}$ <p>Mapped to BSC Section T3.22B.1</p> <p>The mFRR SA Instructed Bid Deviation Volume shall be calculated as follows:</p> $= \frac{\sum \text{Period mFRR DA Total Accepted Bid Volume} - \text{Total Period mFRR DA Deemed Standard Product Bid Volume}}{\text{Product Bid Volume}}$ <p>Mapped to BSC Section T3.22B.2</p>
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NGESO have indicated that they see benefit in being able to incentivise delivery of the Scheduled / Direct Activation Standard Product Shape. Therefore the functionality to calculate a cashflow based on the deviation of the mFRR Schedule from the MARI Standard Product Shape (i.e. the Balancing Energy Deviation Volume) has been included but with the BEDP currently set to zero. Should the BEDP need to be changed in the future a BSC Modification can be raised to address this.

BR9

SAA shall calculate the mFRR SA Period Instructed Offer / Bid Deviation Cashflow and mFRR DA Period Instructed Offer / Bid Deviation Cashflow

9.1	<p>SAA shall calculate the mFRR SA Period Instructed Offer Deviation Cashflow where:</p> $= \text{mFRR SA Instructed Offer Deviation Volume} * \text{BEDP}_j$ <p>In respect of each Settlement Period, the Balancing Energy Deviation Price (BEDP_j) shall be an amount equal to zero.</p> <p>Mapped to BSC Section T3.23.1</p>
9.2	<p>SAA shall calculate the mFRR SA Period Instructed Bid Deviation Cashflow where:</p> $= \text{mFRR SA Instructed Bid Deviation Volume} * \text{BEDP}_j$ <p>In respect of each Settlement Period, the Balancing Energy Deviation Price (BEDP_j) shall be an amount equal to zero.</p> <p>Mapped to BSC Section T3.23.2</p>
9.3	<p>In respect of each Settlement Period, for each BM Unit, the total payment in respect of the BM Unit as a result of deviation from the mFRR Scheduled Activation Standard Product Shape in the Settlement Period shall be the mFRR SA Period Instruction Deviation Cashflow and shall be determined as follows:</p> $= \text{mFRR SA Period Instructed Offer Deviation Cashflow} + \text{mFRR SA Period Instructed Bid Deviation Cashflow}$

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	Mapped to BSC Section T3.24A.1
9.4	<p>SAA shall calculate the mFRR DA Period Instructed Offer Deviation Cashflow where:</p> $= \text{mFRR DA Instructed Offer Deviation Volume} * \text{BEDP}_j$ <p>In respect of each Settlement Period, the Balancing Energy Deviation Price (BEDP_j) shall be an amount equal to zero.</p> <p>Mapped to BSC Section T3.23A.1</p>
9.5	<p>SAA shall calculate the mFRR DA Period Instructed Bid Deviation Cashflow where:</p> $= \text{mFRR DA Instructed Bid Deviation Volume} * \text{BEDP}_j$ <p>In respect of each Settlement Period, the Balancing Energy Deviation Price (BEDP_j) shall be an amount equal to zero.</p> <p>Mapped to BSC Section T3.23A.2</p>
9.6	<p>In respect of each Settlement Period, for each BM Unit, the total payment in respect of the BM Unit as a result of deviation from the mFRR Direct Activation Standard Product Shape in the Settlement Period shall be the mFRR DA Period Instruction Deviation Cashflow and shall be determined as follows:</p> $= \text{mFRR DA Period Instructed Offer Deviation Cashflow} + \text{mFRR DA Period Instructed Bid Deviation Cashflow}$ <p>Mapped to BSC Section T3.24B.1</p>

The Daily Party mFRR Scheduled Activation Instruction Deviation Cashflow and Daily Party mFRR Direct Activation Instruction Deviation Cashflow will be a new Trading Charges. It will be included on Trading Charge Advice Notes that are sent to BSC Parties participating in MARI.

BR10

Daily Party mFRR Scheduled Activation Instruction Deviation Cashflow and Daily Party mFRR Direct Activation Instruction Deviation Cashflow shall be a new Trading Charges, included on Trading Charge Advice Notes that are sent to Parties participating in MARI.

10.1	<p>In respect of each Settlement Day, for each Party p, the Daily Party mFRR Scheduled Activation Instruction Deviation Cashflow shall be determined as:</p> $= \sum_j \sum_{i \in p} \text{mFRR SA Period Instruction Deviation Cashflow}$ <p>where \sum_j is the sum over all Settlement Periods and $\sum_{i \in p}$ is the sum of all BM Units for which Party p is the Lead Party.</p> <p>Mapped to BSC Section T3.26.5</p>
10.2	<p>In respect of each Settlement Day, for each Party p, the Daily Party mFRR Direct Activation Instruction Deviation Cashflow shall be determined as:</p> $= \sum_j \sum_{i \in p} \text{mFRR DA Period Instruction Deviation Cashflow}$ <p>where \sum_j is the sum over all Settlement Periods and $\sum_{i \in p}$ is the sum of all BM Units for which Party p is the Lead Party.</p>

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	Mapped to BSC Section T3.26.6
10.3	SAA shall send Daily Party mFRR Scheduled Activation Instruction Deviation Cashflow and Daily Party mFRR Direct Activation Instruction Deviation Cashflow to FAA alongside the other Trading Charges. Mapped to BSC Section T5.3.3
10.4	FAA shall include Daily Party mFRR Scheduled Activation Instruction Deviation Cashflow and Daily Party mFRR Direct Activation Instruction Deviation Cashflow on invoices and Advice Notes to Trading Parties and BSC Parties with the Virtual Lead Party participation capacity. Mapped to BSC Section N6.1.5

As on BSP-TSO settlement, mFRR Cashflows will need to feed into the calculation of payment between settlement and National Grid (i.e. System Operator Cashflow).

SAA will calculate a total of each mFRR related Cashflows across all BM Units and this will feed into System Operator Cashflow. This also facilitates the principle that settlement calculations should net to zero on a daily basis.

BR11

Total System mFRR Scheduled Activation Cashflow and Total System mFRR Direct Activation Cashflow shall be included in the calculation of System Operator Cashflow and the Total System Residual Cashflow for each Settlement Period.

11.1	SAA shall calculate Total System mFRR Schedule Activation Cashflow across all BM Units i for Settlement Period j as follows: = Period mFRR Scheduled Activation BM Unit Cashflow + mFRR SA Period Instruction Deviation Cashflow Mapped to BSC Section T3.26.1
11.2	SAA shall calculate Total System mFRR Direct Activation Cashflow across all BM Units i for Settlement Period j as follows: = Period mFRR Direct Activation BM Unit Cashflow + mFRR DA Period Instruction Deviation Cashflow Mapped to BSC Section T3.26.2
11.3	SAA shall include Total System mFRR Scheduled Activation Cashflow (TCSS _j) and Total System mFRR Direct Activation Cashflow (TCDD _j) in the calculation of System Operator Cashflow (CSO _j), as follows: $CSO_j = (TCBM_j + TCRR_j + TCSS_j + TCDD_j) - TCND_j$ Mapped to BSC Section T4.9.1
11.4	SAA shall include include Total System mFRR Scheduled Activation Cashflow (TCSS _j) and Total System mFRR Direct Activation Cashflow (TCDD _j) when calculating the Total System Residual Cashflow (TRC _j) as follows: $TRC_j = TCII_j + CSO_j + TCND_j - TCBM_j - TCRR_j - TCSS_j - TCDD_j + TCEI_j$ Mapped to BSC Section T4.10.1

mFRR Instruction Settlement

National Grid will also forward to settlement, data on any instructions that it issues to BM Units (e.g. BOAs under the existing BM arrangements, or instructions relating to RR Activations). The P407 solution will not calculate Accepted Bid-Offer Volumes ($qABO^{kn}_{ij}(t)$) for mFRR Instructions as these volumes are already accounted for in the mFRR Schedule. The mFRR Instruction is intended to act as a baseline for subsequent acceptances and so will re-use the existing **accepted volume** methodology used for the BM. This is in order to minimise cost and complexity and align calculations for MARI with both TERRE and the BM.

The solution assumes that in almost all cases National Grid will also forward instructions that it has issued to the BM Unit pursuant to satisfying the mFRR Activation. It also assumes that in almost all cases this instruction will match the mFRR Schedule and as such there will be no difference in volume.

Cases where there is a difference in volume between the mFRR Schedule and mFRR Instruction will be captured by the existing BM processes i.e. 'under delivery' against the mFRR Schedule will be subject to existing Non-Delivery rules and 'over delivery' against the mFRR Schedule will be taken into account in a Trading Party's Imbalance position.

BR12

SAA shall process mFRR Instructions Acceptance Data differently than it would for a BOA

- 12.1 For the calculation for $qA^{k}_{ij}(t)$ the mFRR Instruction shall be treated as if it were a BOA and shall be calculated exactly the same as the current arrangements. The calculation required from SAA and BMRA is therefore as follows:
- SAA shall **not** calculate Accepted Bid-Offer Volumes ($qABO^{kn}_{ij}(t)$) for mFRR Instructions. Therefore no Period Accepted Offer Volumes (QAO^{kn}_{ij}) or Period Accepted Bid Volumes (QAB^{kn}_{ij}) will be calculated and so will not attract Bid Offer Payments.
 - Instead SAA shall **only** calculate mFRR Instruction Acceptance Volumes ($qA^{k}_{ij}(t)$) to be used as a baseline for any subsequent Acceptance Data only.

Mapped to **BSC Section T3.6.1**

BOA Settlement

Due to the delay between the submission of a mFRR bid at BEGCT and receiving the mFRR Activations there exists a possibility for the TSO to issue BOAs to a BM Unit that is then subsequently accepted for MARI. Analysis of the scenarios that result from these circumstances has identified a particular instance where the BOA acceptance is not compatible with the mFRR Schedule i.e. settlement integrity is comprised. Therefore additional logic is required to identify and amend the acceptance data so the appropriate volumes are entered into settlement.

BR13

SAA shall not calculate Acceptance Volumes ($qA^{k}_{ij}(t)$) under specified conditions

- 13.1 No Acceptance Volume ($qA^{k}_{ij}(t)$) shall be calculated for any spot times t where the following criteria are met

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	<p>(a) $qA_{ij}^k(t)$ is not flagged as relating to a RR Schedule, mFRR Scheduled Activation Schedule, mFRR Direct Activation Schedule, RR Instruction or a mFRR Instruction; and</p> <p>(b) there exists a $qA_{ij}^{k*}(t)$ flagged as relating to either a RR Schedule, mFRR Scheduled Activation Schedule or mFRR Direct Activation Schedule; and</p> <p>(c) $GCT < qA_{ij}^k(t)$ Bid-Offer Acceptance Time $< qA_{ij}^{k*}(t)$ Activation Time; and</p> <p>(d) either:</p> <p style="padding-left: 40px;">$qA_{ij}^{k-}(t) < qA_{ij}^k(t) < qA_{ij}^{k*}(t)$</p> <p style="padding-left: 40px;">or</p> <p style="padding-left: 40px;">$qA_{ij}^{k*}(t) < qA_{ij}^k(t) < qA_{ij}^{k-}(t)$</p> <p>where:</p> <p>$qA_{ij}^{k-}(t)$ represents the latest Acceptance Volume relating to the latest Acceptance issued prior to Gate Closure of the relevant Activation Period (GCT). If no such previously calculated value of Acceptance Volume $qA_{ij}^{k-}(t)$ exists, then the Acceptance Volume shall be set to the value of $FPN_{ij}(t)$ for those spot times; and</p> <p>$qA_{ij}^k(t)$, $qA_{ij}^{k-}(t)$ and $qA_{ij}^{k*}(t)$ represent the associated spot time MW values.</p> <p>Mapped to BSC Section T3.4.2A</p>
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Non-Delivery

The P407 solution requires that **Period mFRR Total Accepted Offer / Bid Volumes** (for both Scheduled and Direct Activations) are included in the calculation of Non-Delivered Volumes. This will ensure that any BSP that do not provide the necessary accepted volumes can be settled appropriately.

mFRR Deemed Standard Product Volumes* and **mFRR Instructed Offer/Bid Deviation Volumes*** will be included in the existing Non-Delivery Charge calculation to ensure all mFRR Schedule volumes* can be associated with a mFRR Activation price (where appropriate).

The **mFRR Deemed Standard Product Volumes*** will be priced at the Activation Price and the **mFRR Instructed Offer / Bid Deviation*** will be priced at the Balancing Energy Deviation Price accordingly during the allocation of Non-Delivery Order Numbers (alongside any BOAs and RR Activations) to Non-Delivered Volumes process to ensure that there is no benefit in a BSP Non-Delivering on an mFRR Activation.

* for both Scheduled and Direct Activations

BR14

SAA shall include mFRR Deemed Standard Product Volumes* and mFRR Instructed Offer/Bid Deviation Volumes* in the existing Non-Delivery Charge calculations.

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| 14.1 | <p>SAA shall include a summation of Period mFRR SA Total Accepted Offer Volume and Period mFRR DA Total Accepted Offer Volume in the calculation of Period BM Unit Non-Delivered Offer Volume ($QNDO_{ij}$).</p> <p>Mapped to BSC Section T4.8.1</p> |
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14.2	<p>SAA shall include a summation of Period mFRR SA Total Accepted Bid Volume and Period mFRR DA Total Accepted Bid Volume in the calculation of Period BM Unit Non-Delivered Bid Volume (QNDO_{ij}).</p> <p>Mapped to BSC Section T4.8.2</p>
14.3	<p>SAA shall include the following Deemed Standard Product Volumes:</p> <p>mFRR SA Deemed Standard Product Offer Volumes mFRR SA Deemed Standard Product Bid Volumes mFRR DA Deemed Standard Product Offer Volumes mFRR DA Deemed Standard Product Bid Volumes</p> <p>in the apportionment of Period Total BM Unit Non Delivered Offer Volume (QNDO_{ii}) and Period BM Unit Non Delivered Bid Volume (QNDB_{ij}) priced at the associated mFRR Activation Price.</p> <p>Mapped to BSC Section T4.8.3</p>
14.4	<p>SAA shall include the following mFRR Instructed Deviation Volumes:</p> <p>mFRR SA Deemed Instructed Offer Deviation Volumes mFRR SA Deemed Instructed Bid Deviation Volumes mFRR DA Deemed Instructed Offer Deviation Volumes mFRR DA Deemed Instructed Bid Deviation Volumes</p> <p>in the apportionment of Period Total BM Unit Non Delivered Offer Volume (QNDO_{ii}) and Period BM Unit Non Delivered Bid Volume (QNDB_{ij}) priced at the associated mFRR Activation Price.</p> <p>Mapped to BSC Section T4.8.3</p>

Imbalance Settlement

P407 proposes that the calculation of imbalance prices and Net Imbalance Volume (NIV) should include all the physical actions taken on the GB system (by Interconnectors or GB BSPs), but only those taken to meet a GB need should be treated as priced.

The physical actions to be taken into account and considered are:

mFRR Scheduled Activations

- the Volume of mFRR Schedule Activation GB need met
- the sum of mFRR Scheduled Activation Schedule volume (i.e. GB BSP despatch);
- the sum of Interconnector volumes for each Interconnector scheduled by MARI

mFRR Direct Activations

- the Volume of mFRR Direct Activation GB need met
- the sum of mFRR Direct Activation Schedule volume (i.e. GB BSP despatch);
- the sum of Interconnector volumes for each Interconnector scheduled by MARI

The central MARI platform will not state whether a given mFRR Activation is to meet a GB or foreign need, meaning that the SAA cannot isolate those taken for a foreign need and ensure they are unpriced. Therefore, P407 proposes that actions (volumes/prices) are calculated at an aggregate level, however individual actions should still be visible on BMRS and have traceability to a given imbalance price.

Therefore, SAA will determine the following actions to be included in the imbalance price calculation:

mFRR Scheduled Activations

- Volume of mFRR Scheduled Activation GB need met will enter the imbalance price calculation as an action with a price matching the MFRR clearing price;
- Settlement shall calculate a mFRR Scheduled Activation aggregated unpriced System Buy Action for any other physical action taken with volumes > 0
- Settlement shall calculate a mFRR Scheduled Activation aggregated unpriced System Sell Action for any other physical action taken with volumes < 0

mFRR Direct Activations

- Volume of mFRR Direct Activation GB need met will enter the imbalance price calculation as an action with a price matching the MFRR clearing price;
- Settlement shall calculate a mFRR Direct Activation aggregated unpriced System Buy Action for any other physical action taken with volumes > 0
- Settlement shall calculate a mFRR Direct Activation aggregated unpriced System Sell Action for any other physical action taken with volumes < 0

BR15	
SAA shall include MARI-specific actions in the calculation of the System Buy Price and System Sell Price.	
15.1	<p>For mFRR Scheduled Activation GB Need Met Positions with Activation Periods falling within a given Settlement Period j, the mFRR SA Volumes of GB need met, shall enter the calculations of System Buy Price (SBP_j) and System Sell Price (SSP_j) for that Settlement Period, as an action priced at the mFRR Scheduled Activation Price (i.e. the mFRR SA GB clearing price) and shall be calculated as follows:</p> $= \text{Activated Quantity} * \text{Activation Period Duration}^j_{ij} / 60$ <p>Where the Activated Quantity associated to the Activation Period within Settlement Period j</p> <p>Mapped to BSC Annex T-1 1.2</p>
15.2	<p>For a given Settlement Period j, SAA shall calculate mFRR Scheduled Activation aggregated unpriced System Buy Action by subtracting the (positive) Volume of mFRR Scheduled Activation GB Need met from the (positive) physical actions delivered by Interconnectors and BM Units</p> <p>Mapped to BSC Annex T-1 1.2</p>
15.3	<p>For a given Settlement Period j, SAA shall calculate mFRR Scheduled Activation aggregated unpriced System Buy Action by subtracting the (negative) Volume of mFRR Scheduled Activation GB Need met from the (negative) physical actions delivered by Interconnectors and BM Units</p> <p>Mapped to BSC Annex T-1 1.2</p>

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15.4	<p>For mFRR Direct Activation GB Need Met Positions with Activation Periods falling within a given Settlement Period j, the mFRR DA Volumes of GB need met, shall enter the calculations of System Buy Price (SBP_j) and System Sell Price (SSP_j) for that Settlement Period, as an action priced at the mFRR Direct Activation Price (i.e. the mFRR DA GB clearing price) and shall be calculated as follows:</p> $= \text{Activated Quantity} * \text{Activation Period Duration}_{ij}^1 / 60$ <p>Where the Activated Quantity associated to the Activation Period within Settlement Period j</p> <p>Mapped to BSC Annex T-1 1.2</p>
15.5	<p>For a given Settlement Period j, SAA shall calculate mFRR Direct Activation aggregated unpriced System Buy Action by subtracting the (positive) Volume of mFRR Direct Activation GB Need met from the (positive) physical actions delivered by Interconnectors and BM Units</p> <p>Mapped to BSC Annex T-1 1.2</p>
15.6	<p>For a given Settlement Period j, SAA shall calculate mFRR Direct Activation aggregated unpriced System Buy Action by subtracting the (negative) Volume of mFRR Direct Activation GB Need met from the (negative) physical actions delivered by Interconnectors and BM Units</p> <p>Mapped to BSC Annex T-1 1.2</p>
15.4	<p>SAA shall include the following MARI related volumes in the SBP / SSP Calculations:</p> <p>mFRR Scheduled Activations</p> <ul style="list-style-type: none"> • mFRR Scheduled Activation GB need me volume; • mFRR Scheduled Activation aggregated unpriced System Buy Action volume • mFRR Scheduled Activation aggregated unpriced System Sell Action volume <p>mFRR Direct Activations</p> <ul style="list-style-type: none"> • mFRR Direct Activation GB need me volume; • mFRR Direct Activation aggregated unpriced System Buy Action volume • mFRR Direct Activation aggregated unpriced System Sell Action volume <p>Mapped to BSC Annex T4.4.2</p>

mFRR Activation Volumes will need to feed into Period BM Unit Balancing Services Volume, which in turn feeds into the calculation of Non-Delivered Bid and Offer Volumes and also of Energy Imbalance Volumes.

BR16

Settlement systems shall include mFRR Activation Volumes in the calculation of Energy Imbalance Volumes.

16.1	<p>Period mFRR SA Total Accepted Offer Volume, Period mFRR SA Total Accepted Bid Volume, Period mFRR DA Total Accepted Offer Volume and Period mFRR DA Total Accepted Bid Volume shall feed into the calculation of Period BM Unit Balancing Services Volume (QBS_j).</p> <p>Mapped to BSC Section T4.3.2</p>
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	<p>Period BM Unit Balancing Services Volume (QBS_{ij}) directly impacts:</p> <ul style="list-style-type: none">• Account Period Balancing Services Volume ($QABS_{aj}$) which is used to adjust Energy Imbalance volumes• the calculation of Period Expected Metered Volume (QME_{ij}) and allow SAA to calculate Period BM Unit Non-Delivered Offer Volume ($QNDO_{ij}$)• the calculation of Period Secondary BM Unit Non-Delivered Bid Volume ($QSND_{ij}$) for Secondary BM Units.
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Reporting

The P407 Workgroup agreed that new data under MARI would be reported to BSC Parties via the existing SAA-I014 Settlement Report.

BR17	
The SAA-I014 Settlement Report shall contain new MARI-specific data items.	
17.1	The SAA-I014 Settlement Report (sub-flows 1, 2, 3 & 4) shall include new Data Groups and Data Items for the mFRR SA Activation Cashflows (Period and Daily)
17.2	The SAA-I014 Settlement Report (sub-flows 1, 2, 3 & 4) shall include new Data Groups and Data Items for the mFRR DA Activation Cashflows (Period and Daily)
17.3	The SAA-I014 Settlement Report (sub-flows 1, 2, 3 & 4) shall include new Data Groups and Data Items for the mFRR SA Instruction Deviation Cashflows (Period and Daily)
17.4	The SAA-I014 Settlement Report (sub-flows 1, 2, 3 & 4) shall include new Data Groups and Data Items for the mFRR DA Instruction Deviation Cashflows (Period and Daily)
17.5	The SAA-I014 Settlement Report (sub-flows 1, 2, 3 & 4) shall include new Data Groups and Data Items for the Total System mFRR Cashflow (Period and Daily)
17.6	The SAA-I014 Settlement Report (sub-flows 1, 2, 3 & 4) shall include a new Data Group and Data Items for mFRR bids

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17.7	The SAA-I014 Settlement Report (sub-flows 1, 2, 3 & 4) shall include a new Data Group and Data Items for mFRR GB Need (i.e. TSO requested need)
17.8	The SAA-I014 Settlement Report (sub-flows 1, 2, 3 & 4) shall include a new Data Group and Data Items for mFRR SA Activations (including Status and associated reason).
17.9	The SAA-I014 Settlement Report (sub-flows 1, 2, 3 & 4) shall include a new Data Group and Data Items for mFRR DA Activations (including Status and associated reason).
17.10	The SAA-I014 Settlement Report (sub-flows 1, 2, 3 & 4) shall include new Data Groups and Data Items for mFRR SA Activation Volumes.
17.11	The SAA-I014 Settlement Report (sub-flows 1, 2, 3 & 4) shall include new Data Groups and Data Items for mFRR DA Activation Volumes.
17.12	The SAA-I014 Settlement Report (sub-flows 1, 2, 3 & 4) shall include new Data Groups and Data Items for mFRR SA Deemed Standard Product Volumes
17.13	The SAA-I014 Settlement Report (sub-flows 1, 2, 3 & 4) shall include new Data Groups and Data Items for mFRR DA Deemed Standard Product Volumes
17.14	The SAA-I014 Settlement Report (sub-flows 1, 2, 3 & 4) shall include new Data Groups and Data Items for mFRR SA Instruction Deviation Volumes
17.15	The SAA-I014 Settlement Report (sub-flows 1, 2, 3 & 4) shall include new Data Groups and Data Items for mFRR DA Instruction Deviation Volumes
17.16	The SAA-I014 Settlement Report (sub-flows 1, 2, 3 & 4) shall include new Data Groups and Data Items for available Interconnector Transfer Capacity

Please note that the above will be included in the **BMRS Data Catalogue** and **Interface Definition Document** which have yet to be updated.

BR18

New MARI-specific data shall be published to BMRS.

18.1	<p>Upon receipt from National Grid (see requirement 1.1), BMRA shall publish mFRR bid data (including TSO requested need) to BMRS. Data items include:</p> <ul style="list-style-type: none"> • Party Id • BM Unit Id • Bid Id • Divisible [A01 Yes / A02 No] • Linking Bid Id (where applicable) • Multipart Bid Id (where applicable) • Exclusive Bid Id (where applicable) • Flow Direction [A01 = UP / A02 = Down] • Minimum quantity (MW); • Maximum quantity (MW); • Bid Resolution [PT15M] • Position • Price (£/MWh);
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	<ul style="list-style-type: none"> • Status [A06 Available / A28 unshared / A11 Restricted] • Reason
18.2	<p>Once per Auction (approximately [tbc] minutes before the hour starts) National Grid shall send to BMRA and SAA the mFRR Auction Result Data which shall compromise at least the following data sets:</p> <p>d) mFRR Activation Data</p> <ul style="list-style-type: none"> • BM Unit Id • mFRR Auction Period (start/end date and time) • Activation Type • Bid Id • Flow Direction • Resolution Type • For each Position associated to the mFRR Auction Period <ul style="list-style-type: none"> ○ an Activation Price (£/MWh) ○ an Activated Quantity (MW) ○ Status ○ Reason <p>e) mFRR GB Need Met Data</p> <ul style="list-style-type: none"> • mFRR Auction Period (start/end date and time) • Activation Type • Flow Direction • Resolution Type • For each Position associated to the mFRR Auction Period <ul style="list-style-type: none"> ○ an Activation Price (£/MWh) ○ an Activated Quantity (MW) ○ Status ○ Reason <p>f) mFRR Interconnector Schedule Data</p> <ul style="list-style-type: none"> • mFRR Auction Period (start/end date and time) • Activation Type • Flow Direction • Resolution Type • For each Position associated to the mFRR Auction Period <ul style="list-style-type: none"> ○ an Activated Quantity (MW)

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18.3	<p>Upon receipt from National Grid (see requirement 7.4), BMRA shall publish mFRR Instruction data to BMRS. The mFRR Instruction shall have similar data content to a BOA i.e. it will consist of one or more Acceptance Volume Pairs, each with:</p> <ul style="list-style-type: none"> • a 'From' MW level and an associated 'From' time; • a 'To' MW level and an associated 'To' time; • a flag stating whether that Acceptance is relating to an mFRR Activation, and • all other relevant BOA acceptance data
18.4	<p>Upon deeming (see requirement BR14), BMRA shall publish mFRR SA / DA Schedule data to BMRS. The mFRR SA / DA Schedule shall have similar data content to a BOA i.e. it will consist of one or more Acceptance Volume Pairs, each with:</p> <ul style="list-style-type: none"> • a 'From' MW level and an associated 'From' time; • a 'To' MW level and an associated 'To' time; • a flag stating whether that Acceptance Data is relating to an mFRR SA Schedule or mFRR DA Schedule, • and all other relevant associated Acceptance Data

Please note that the above will be included in the **BMRS Data Catalogue** which has yet to be updated.

The BMRA shall determine on an estimated basis for the purposes of enabling indicative values of such terms to be reported on the BMRS before all of the necessary data to calculate such term is available MARI related data items

BR19

New indicative MARI-specific data shall be calculated by BMRS

19.1	<p>The BMRA shall calculate:</p> <ul style="list-style-type: none"> (a) Indicative Period mFRR SA Total Accepted Bid Volume; (b) Indicative Period mFRR DA Total Accepted Bid Volume (c) Indicative Period mFRR SA Total Accepted Offer Volume; (d) Indicative Period mFRR DA Total Accepted Offer Volume; (e) Indicative Period mFRR SA Accepted Bid Volume; (f) Indicative Period mFRR DA Accepted Bid Volume; (g) Indicative Period mFRR SA Accepted Offer Volume (h) Indicative Period mFRR DA Accepted Offer Volume
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	In accordance the rules in Section T
19.2	<p>The BMRA shall calculate:</p> <ul style="list-style-type: none"> (a) the Indicative Net Imbalance Volume; (b) the Indicative System Buy Price; and (c) the Indicative System Sell Price <p>in accordance with the rules in Annex T-1</p>
19.3	<p>The BMRA shall calculate:</p> <ul style="list-style-type: none"> (a) the Indicative mFRR SA Cashflow, (b) the Indicative mFRR DA Cashflow, (c) the Indicative Period mFRR SA Cashflow (d) the Indicative Period mFRR DA Cashflow <p>in accordance with the rules in Section T</p>

Please note that the above will be included in the **BMRS Data Catalogue** which has yet to be updated.

Credit

The BSC credit calculations will need to include Daily Party mFRR Cashflows and mFRR Instruction Deviation Cashflows, as these are new Trading Charge and all Trading Charges are included in the calculation of Actual Energy Indebtedness.

BR20

Daily Party mFRR Cashflows and mFRR Instruction Deviation Cashflow shall be included in the calculation of Actual Energy Indebtedness.

20.1 SAA shall include Daily Party mFRR SA Cashflow, Daily Party mFRR SA Instruction Deviation Cashflow, mFRR DA Cashflow and Daily Party mFRR SA Instruction Deviation Cashflow when passing Trading Charges to ECVA for the purposes of calculation Actual Energy Indebtedness (AEI_p).

Mapped to **BSC Section T5.3.3 & T5.3.5**

Requirements Table

Area	Ref	Business Requirement
TSO Interface	BR1	Settlement systems shall receive, validate and process new MARI-specific data from National Grid.
TSO Interface	BR2	SAA shall receive and process MARI market suspension notifications from NGESO
mFRR Activation Settlement	BR3	SAA shall calculate the mFRR Scheduled Activation Cashflow and mFRR Direct Activation Cashflow for each BM Unit for each Settlement Period.
mFRR Activation Settlement	BR4	Daily Party mFRR Scheduled Activation Cashflow and Daily Party mFRR Direct Activation Cashflow shall be a new Trading Charges, included on Trading Charge Advice Notes that are sent to Parties participating in MARI.
mFRR Activation Settlement	BR5	SAA shall create an mFRR Schedule for each mFRR Activation received in regards to a MARI Auction Period per Activation Type (i.e. Scheduled and Direct) and flag it accordingly.
mFRR Activation Settlement	BR6	SAA shall process mFRR Schedules similar to (and processed in a similar way to) any other BOA
mFRR Activation Settlement	BR7	SAA shall calculate Period mFRR SA Deemed Standard Product Offer / Bid Volumes and Period mFRR DA Deemed Standard Product Offer / Bid Volumes
mFRR Activation Settlement	BR8	SAA shall calculate the volume difference between the mFRR Scheduled / Direct Activation Schedule and their associated Deemed Standard Product Shape.
mFRR Activation Settlement	BR9	SAA shall calculate the mFRR SA Period Instructed Offer / Bid Deviation Cashflow and mFRR DA Period Instructed Offer / Bid Deviation Cashflow
mFRR Activation Settlement	BR10	Daily Party mFRR Scheduled Activation Instruction Deviation Cashflow and Daily Party mFRR Direct Activation Instruction Deviation Cashflow shall be a new Trading Charges
mFRR Activation Settlement	BR11	Total System mFRR Scheduled Activation Cashflow and Total System mFRR Direct Activation Cashflow shall be included in the calculation of System Operator Cashflow
mFRR Instruction Settlement	BR12	SAA shall process mFRR Instructions Acceptance Data differently than it would for a BOA
BOA Settlement	BR13	[tbc]
Non-Delivery	BR14	SAA shall include mFRR Deemed Standard Product Volumes and mFRR Instructed Offer/Bid Deviation Volumes* in the existing Non-Delivery Charge calculations
Imbalance Settlement	BR15	SAA shall include MARI-specific actions in the calculation of the System Buy Price and System Sell Price.

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Imbalance Settlement	BR16	Settlement systems shall include mFRR Activation Volumes in the calculation of Energy Imbalance Volumes
Reporting	BR17	The SAA-I014 Settlement Report shall contain new MARI-specific data items.
Reporting	BR18	New MARI-specific data shall be published to BMRS.
Reporting	BR19	New indicative MARI-specific data shall be calculated by BMRS
Credit	BR20	Daily Party mFRR Cashflows and mFRR Instruction Deviation Cashflow shall be included in the calculation of Actual Energy Indebtedness.