P407 ‘Project MARI’ including GC0145

Workgroup meeting 5

15 September 2020

Agenda

Agenda item	Lead
Welcome and meeting objectives	Lawrence Jones (Chair)
Fourth Workgroup meeting summary and actions update	Nathan Flood (Lead Analyst)
Brexit update and derogations	Chris Wood
SA/DA shapes discussion	Louise Trodden (NGESO)
ESO-DNO interactions	Louise Trodden
BSC Solution (including cashflows and MARI reporting)	Matthew Roper
Next steps	Nathan Flood
Meeting close	Lawrence Jones

Meeting objectives

- Consider outcomes of actions taken at the last meeting
- Assess the options for P407/GC0145 and agree the way forward with regard to Dispatch and Settlement – cashflows and Reporting and Performance Assurance.

SUMMARY OF WORKGROUP MEETING 4

P407: Workgroup 1 Summary

- Reviewed progress against the GC0145 Terms of Reference. Actions taken to get a DNO representative to attend a Workgroup meeting and to request the GC0144 Workgroup to change their Terms of Reference to include MARI so both issues can be dealt with consistently
- Grid Code draft legal text presented. No major concerns were shared by the Workgroup on the legal text
- Slides on cashflows and imbalance settlement presented. Elexon took an action away to consider the benefits of ‘profiled’ settlement.

P407: Actions and updates

Action Number	Raised	Owner	Action	Comment	Due by	Status
6	WG1	LT	Agree the scope for a separate issue group for interconnectors – with aim to prevent discussions had on MARI being duplicated in bilateral agreements	Review this after WG4 to see if a separate workshop is required.	TBC	Open
13	WG2	MR / LT	'Accepting the bids' – slide. Interconnectors and NGESO's ramping restrictions. Update slide which was previously shared for TERRE		WG4	Open
10	WG2	LT	'Submission of bids' – slide Confirm if 1MW is the step increment for bids or whether 0.1MW is possible	Remains 1MW at this point but there are meetings outside of this workgroup where this is being discussed.	Ongoing	Open
17	WG2	LT	Share any updates from NGESO internal IT working group		Ongoing	Open
21	WG3	LT / KP / JG	Create a table to capture the discussion on the points raised on slide 6 of the interconnector settlement processes slides - share with workgroup		WG5	Open
23	WG3	JG	Schedule time for further discussion on dispatch principles	To cover in WG5. If the data is going to be cleaned before it goes into the platform - how this interacts with the dispatch principles	WG5	Open
25	WG3	LT	Confirm whether it is OK to ramp for less than 10 minutes (including interconnectors)	Examples / more info to be shared with WG	WG4	Open
27	WG3	MR	Clarify how the auction results impact subsequent auctions	Nothing in the legal text to stop users from participating in subsequent auctions	WG4	Open
28	WG3	LT	Clarify question 3 on slide 10 - re: transfer capacity calculation	LT to liaise with Neil from ESO to confirm	WG4	Open
29	WG4	JG	Get a DNO to participate in the WG to get a DNO view on Term L of the ToR	Re: constraints	WG5	Open
30	WG4	TJ	Raise ToR change with GC0144 workgroup to cover MARI re: market suspension		WG5	Open
31	WG4	LT	Share defined terms with workgroup		WG5	Open
32	WG4	LT	Re-share Legal text following amendments		WG5	Open
33	WG4	LT	Provide more clarity on feasability bids and filtering - how interconnectors are treated and whether this is included in the Grid Code		WG5	Open
34	WG4	Workgroup	Workgroup to consider whether the mFRR Standard Product Shape should be incentivised, and if so whether it should be harmonised with RR. And, to consider whether separate instruction deviation cashflows are required for Scheduled and Direct Activiations		WG5	Open
35	WG4	LT / MR	Provide clarifty on deviation volumes for Interconnectors		WG5	Open
36	WG4	MR	Consider the benefits of profiled settlement			Open

SA/DA SHAPES DISCUSSION

GC0145- Work Group 5

Reporting & Performance Assurance and Despatch and Settlement

Updating the Grid Code to include the Manually Activated Reserve Initiative (MARI)

Louise Trodden and Tony Johnson

nationalgridESO

Stacking Scheduled Activations (SA) and Direct Activations (DA) across a border

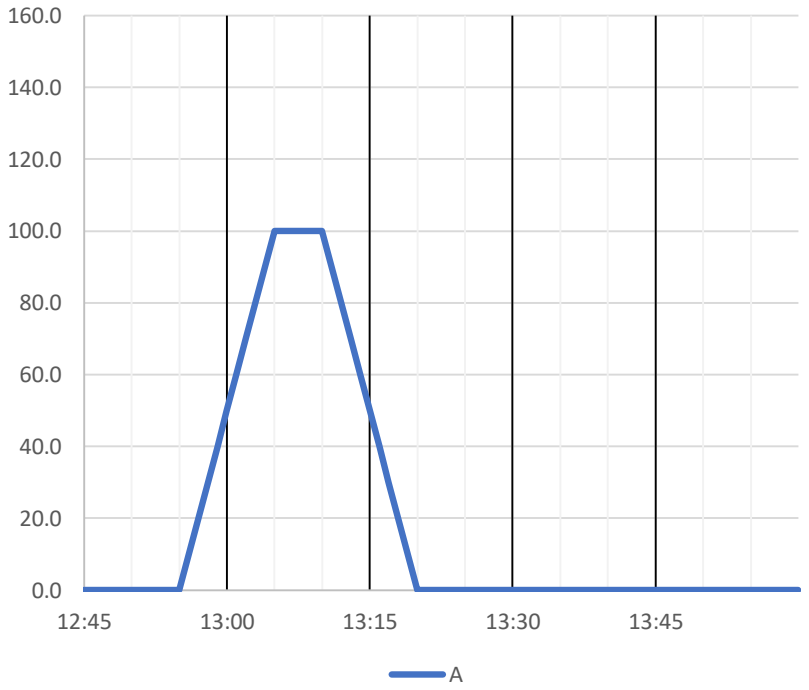
- Workgroup discussion (examples on slides 3-9)
- Please note:
- The examples on the slides taken from the MARI project attached are to help illustrate the complexity of MARI and how SA and DA can stack against each other.
- We do need to do some work on this to define how this will work in practice.
- This does not happen with TERRE as the timeframes are greater.

Example scenario from MARI project

A. Scheduled Activation of 100 MW from 13:00 to 13:15 (QH1)
B. Direct Activation of 50 MW from 13:07 to 13:30 (QH1+QH2)
C. Direct Activation of 20 MW from 13:10 to 13:30 (QH1+QH2)
D. Scheduled Activation of 11 MW from 13:15 to 13:30 (QH2)
E. Direct Activation of 33 MW from 13:21 to 13:45 (QH2+QH3)

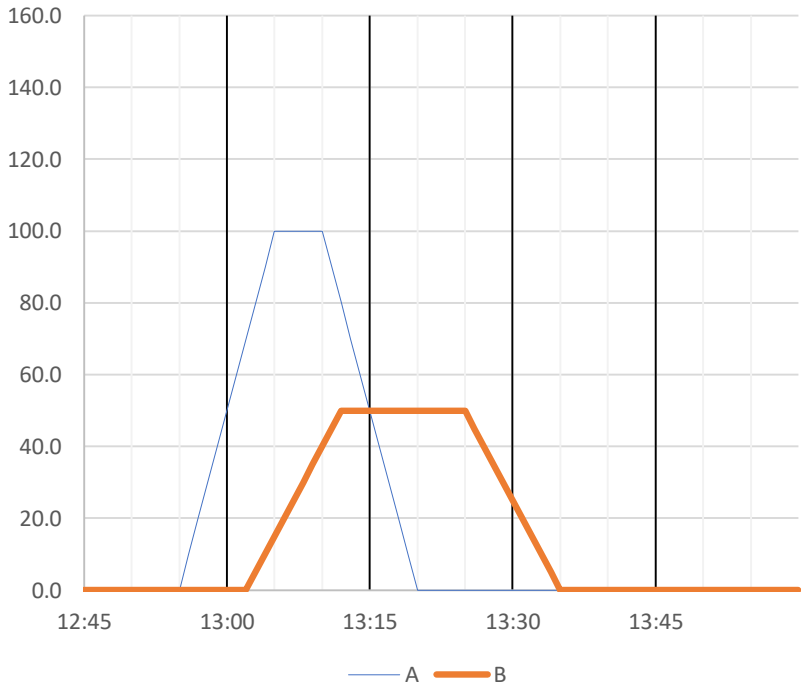
Calculation of VTL and PTL (A)

- VTL and PTL is calculated from the sum of all Scheduled and Direct Activation for a given period
- Ramping rules are applied, starting 5 minutes before delivery, ramp for 10 minutes and similar for ramping back
- A single Scheduled Activation will be a simple shape as shown



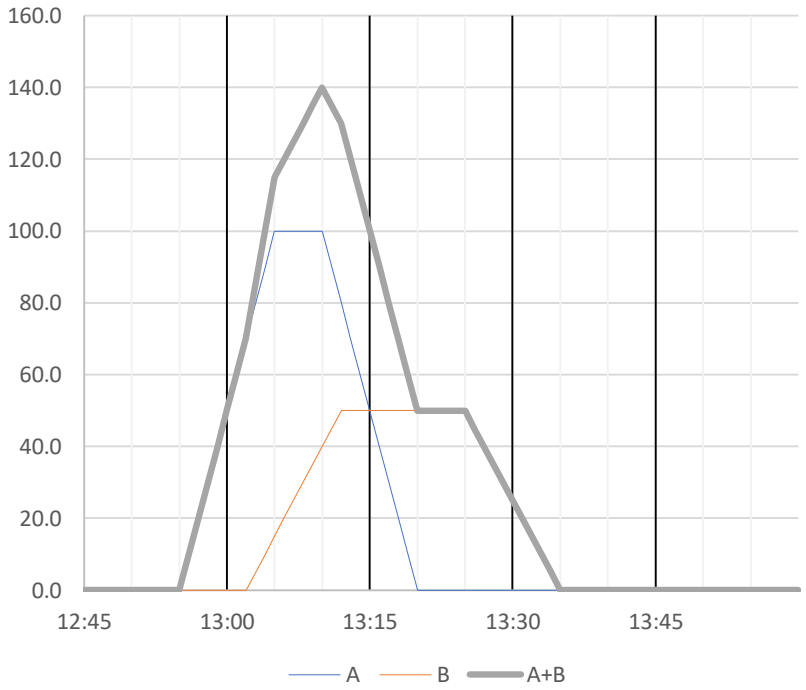
Calculation of VTL and PTL (B)

- A Direct Activation will have the same shape (10 minutes ramp in each direction), but a longer delivery time and the start can be anywhere within a quarter hour



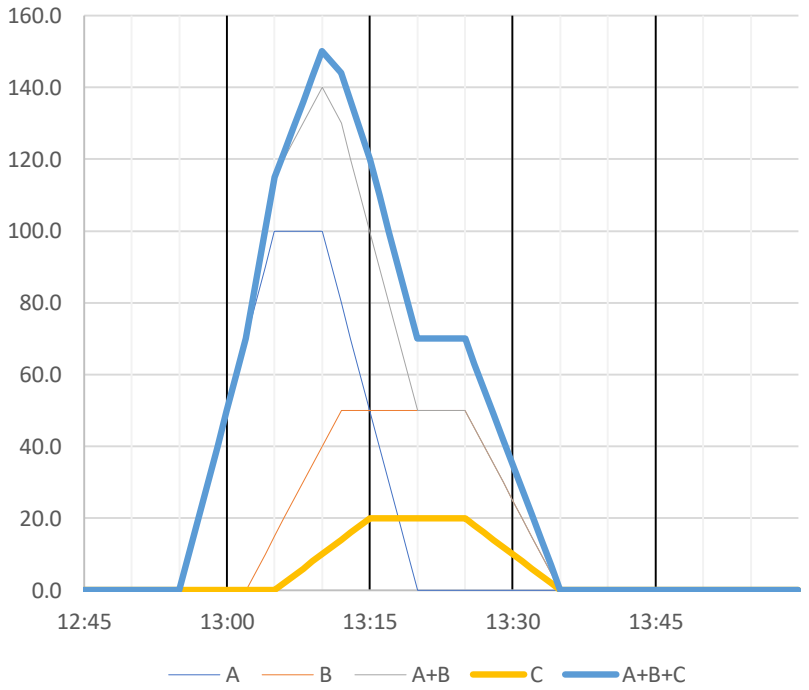
Calculation of VTL and PTL (B)

- After a Scheduled Activation (A) and a subsequent Direct Activation (B), the combined plan will be a sum of these
- Even though the shapes themselves are uniform, the combined plan is less well formed due to different ramping rates, start and duration



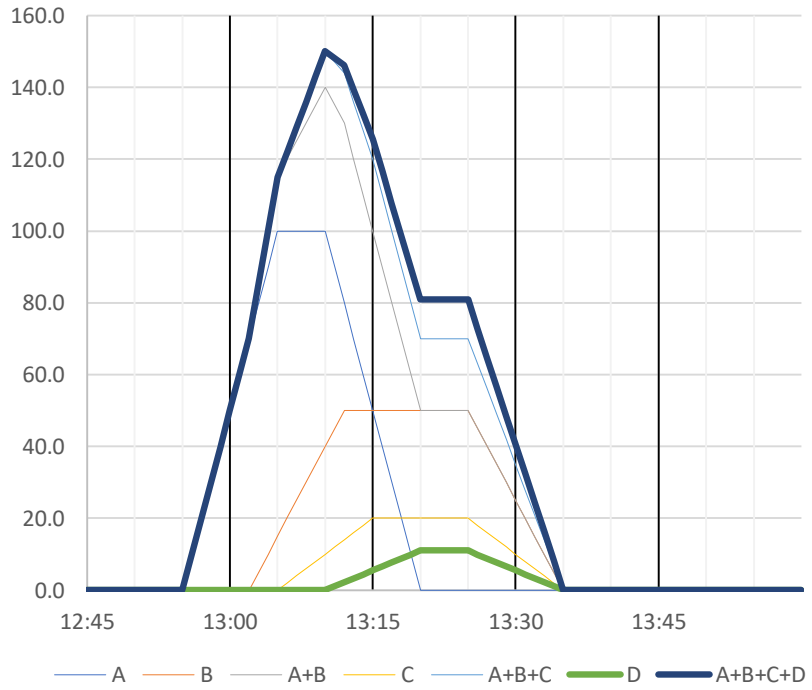
Calculation of VTL and PTL (C)

- The next Direct Activation (C) will have the same shape and be added in the same way



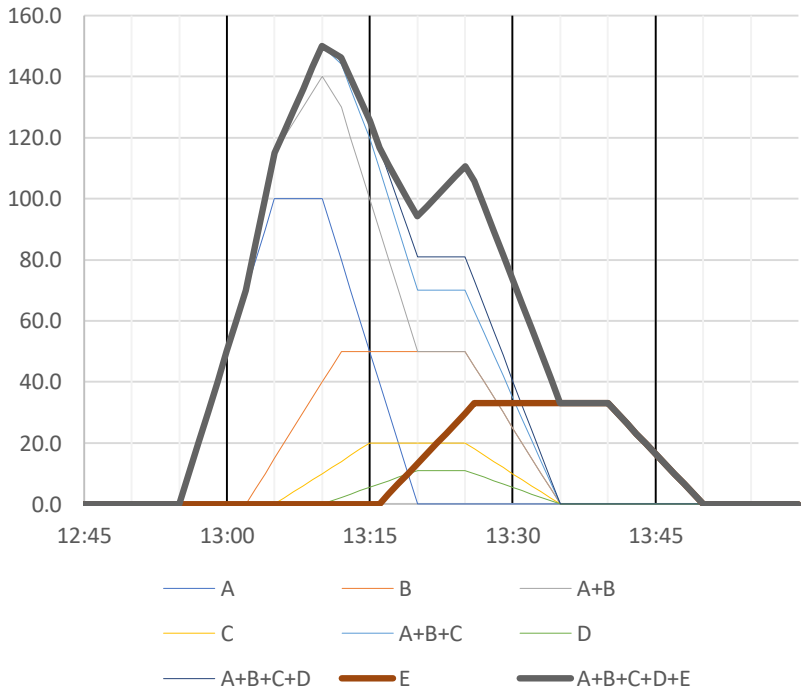
Calculation of VTL and PTL (D)

- The next Scheduled Activation will be added in the same way



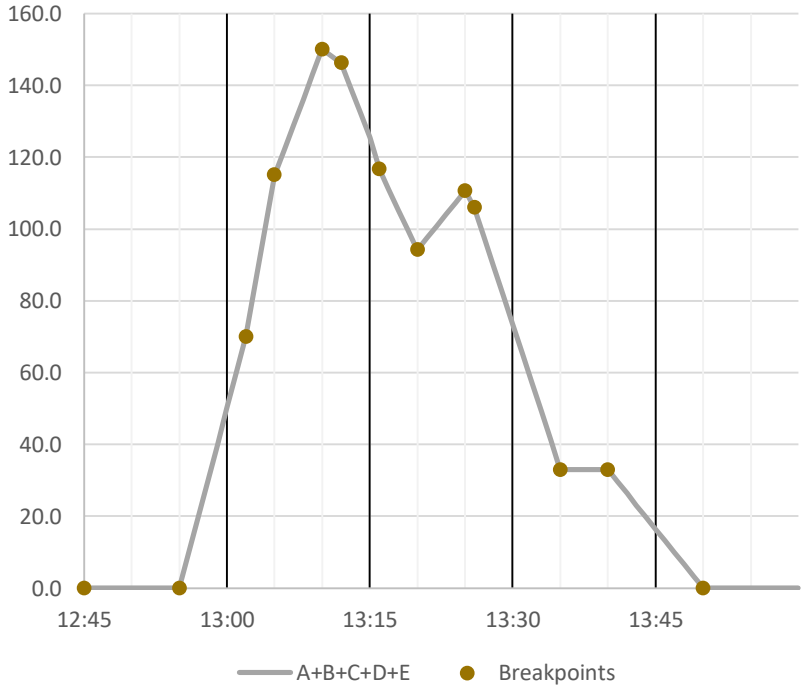
Calculation of VTL and PTL (E)

- The next Direct Activation will ramp up within one quarter hour and down in the next quarter hour



Representation of VTL and PTL as breakpoints

- The plan can be represented using breakpoints
- A value at any time between two breakpoints can be linearly interpolated



Working Group Discussion

Action log Item 34

Consider whether the mFRR Standard Product Shape should be incentivised, and if so whether it should be harmonised with RR. And, to consider whether separate instruction deviation cashflows are required for Scheduled and Direct Activation's.

ESO-DNO INTERACTIONS

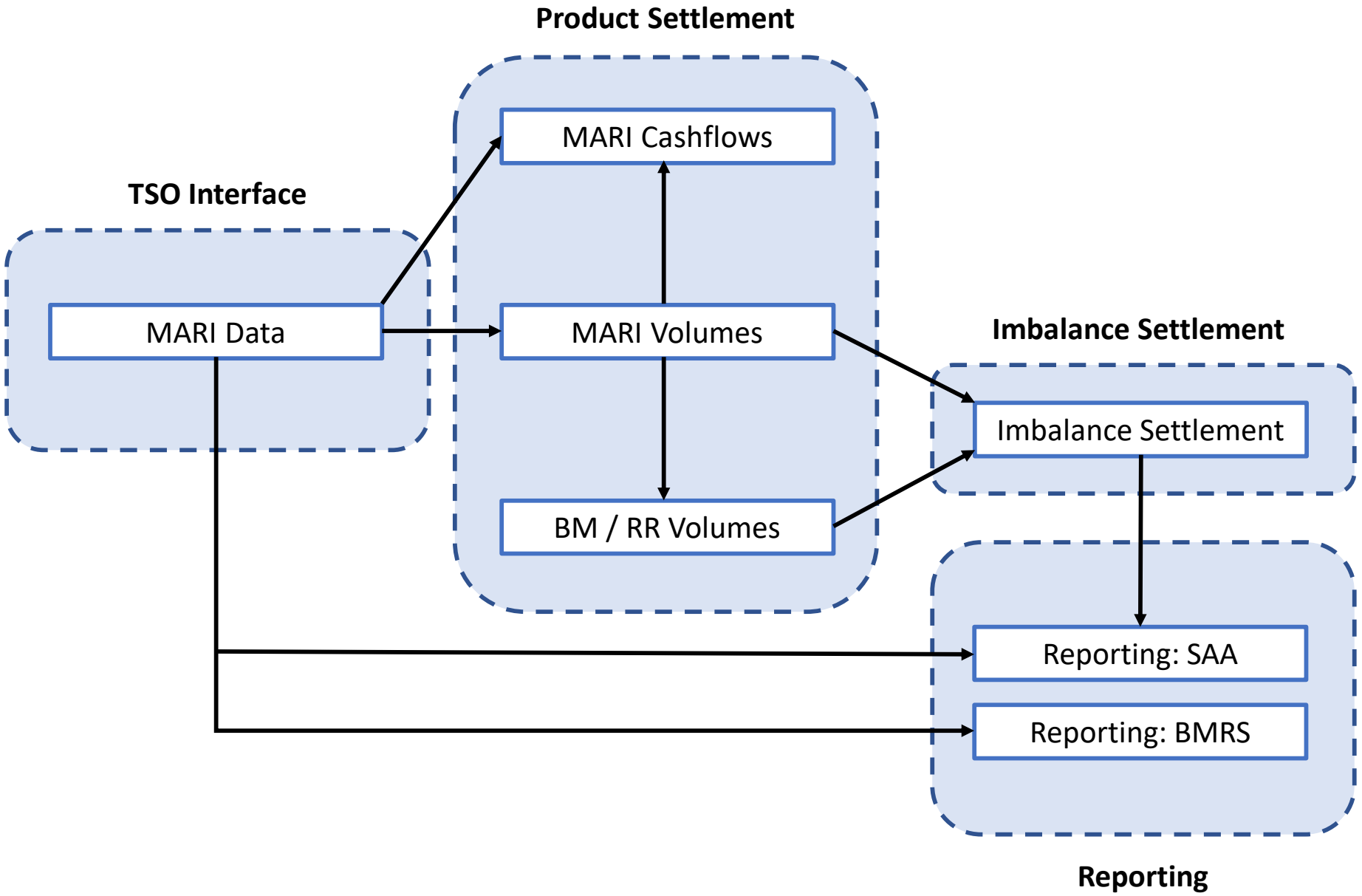
DNO Workgroup Discussion

TOR (L)

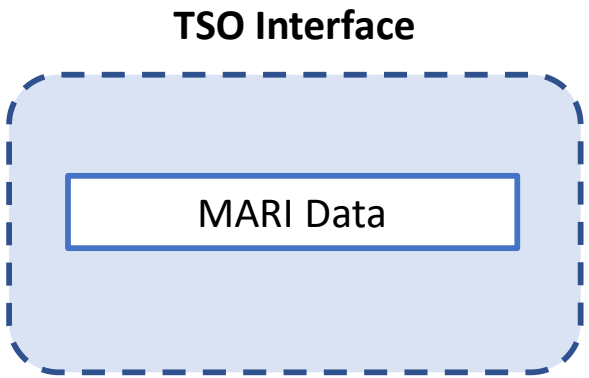
Consider if there are any implications, for example specific connection requirements, information / data exchange, for DNOs where the assets providing a MARI service are connected to a distribution network

BSC SOLUTION (INCLUDING CASHFLOWS AND MARI REPORTING)

Settlement Solution Overview

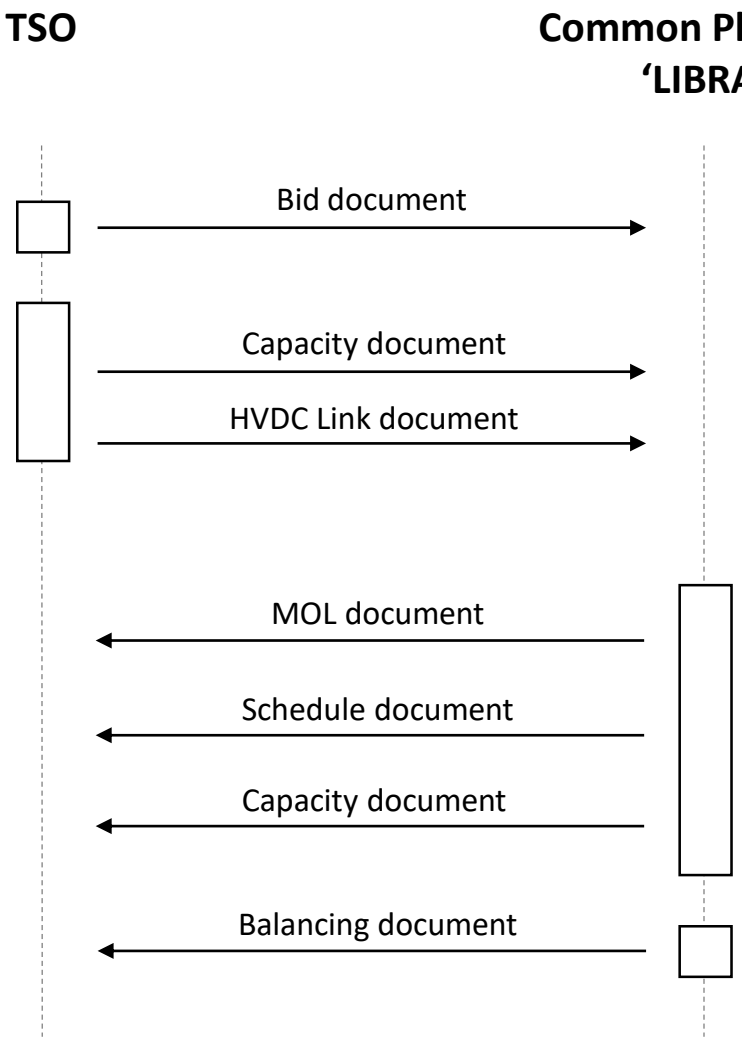


Settlement Solution Overview



Ref	Business Requirement
BR01	SAA & BMRA shall receive, validate and process new MARI-specific data from National Grid.

BR1: MARI-specific data from National Grid



What does it contain?

Data on both SA & DA bids

Data on available interconnector capacity (ATC)

Data on any interconnector desired flow range (DFR)

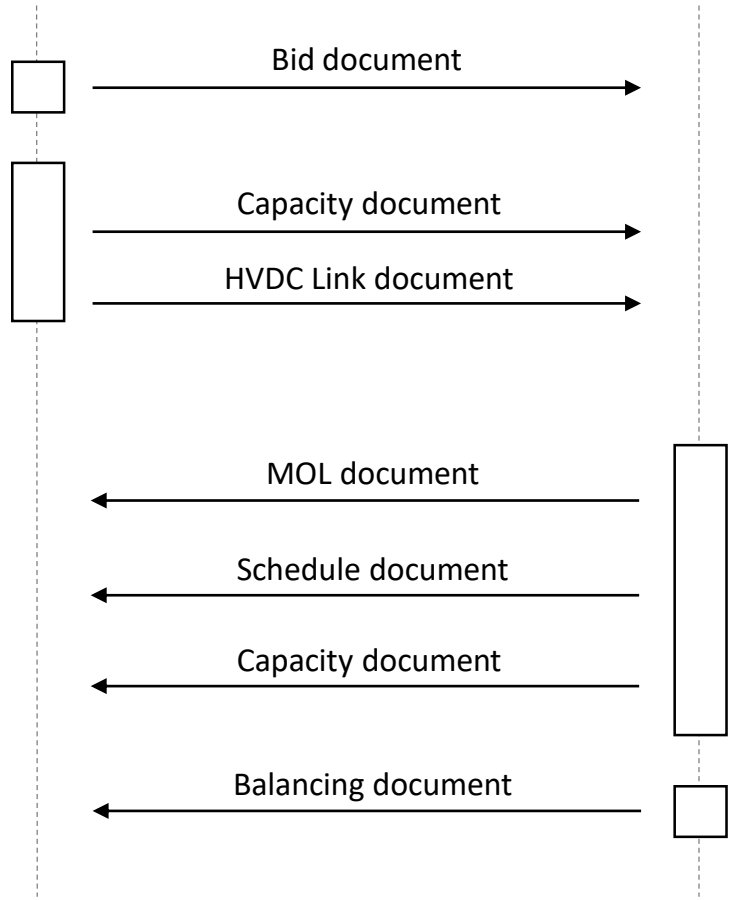
Data on mFRR activations (SA & DA separately)

Data on interconnector cross border flows

Data on used interconnector capacity (ATC)

Data on marginal prices

BR1: MARI-specific data from National Grid



How will the data be used?

Bid document: Published on BMRS and included in SAA Reporting

Capacity document: Published on BMRS and included in SAA Reporting

HVDC Link document: Published on BMRS and included in SAA Reporting

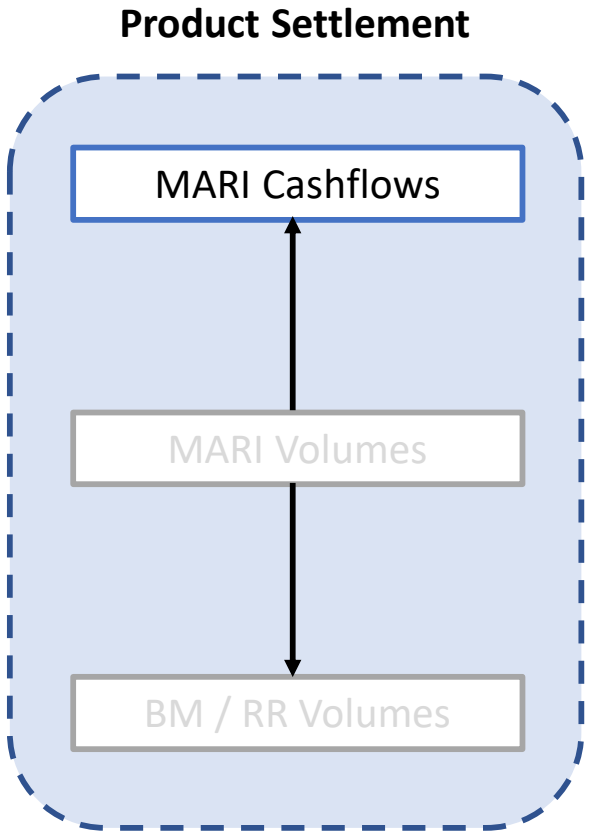
MOL document: Used to Calculate mFRR Cashflows and mFRR Schedule

Schedule document: Used in Imbalance Price calculation

Capacity document: Published on BMRS and included in SAA Reporting

Balancing document: Used to Calculate mFRR Cashflows and in the Imbalance Price Calculation

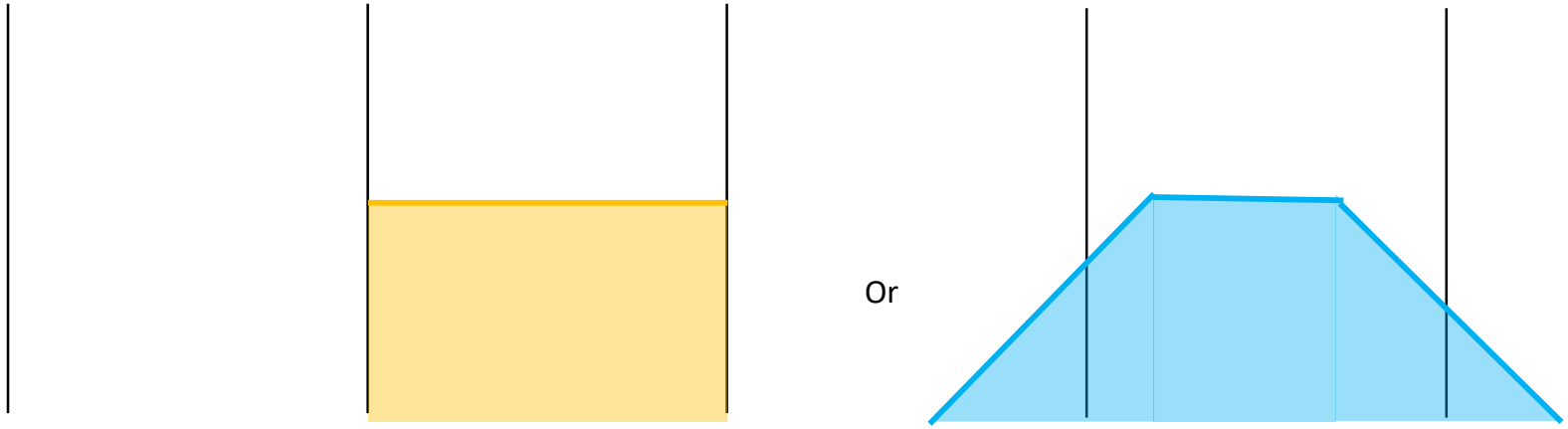
Settlement Solution Overview



Ref	Business Requirement
BR02	SAA shall calculate the mFRR Cashflow for each BM Unit for each quarter-hour (SA & DA)
BR03	Daily Party mFRR Cashflow (SA & DA) shall be a new Trading Charges.
BR06	SAA shall calculate Deemed Standard Product Shape Volumes (SA & DA)
BR08	SAA shall calculate the difference between the mFRR Schedule (BR05) and the MARI Deemed Standard Product Shape (BR06)
BR09	SAA shall calculate the MARI Period Instruction Deviation Cashflow
BR10	Daily Party MARI Instruction Deviation Cashflow shall be a new Trading Charge
BR11	Total System mFRR Cashflow shall be included in the calculation of the System Operator Cashflow or each Settlement Period

BR2: SAA shall calculate the mFRR Cashflow

£ mFRR Cashflow = volume * Activation Price

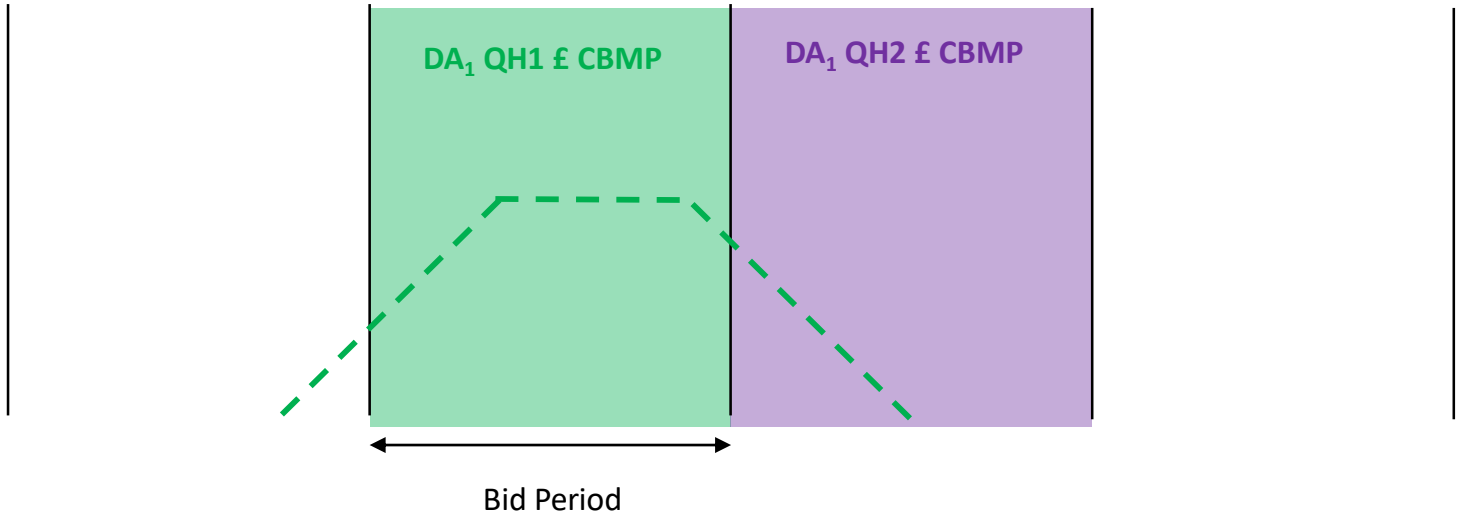


The workgroup expressed a preference that:

- Scheduled and Direct Activations should have separate cashflows
- 'Block' cashflow settlement to be used for SA
- 'Block' cashflow settlement to be used for DA

Direct Activation Pricing

The workgroup rejected the proposal for a ‘profiled’ cashflow on the basis the solution was too complicated and would reduce market transparency and ultimately be a barrier to market participation.



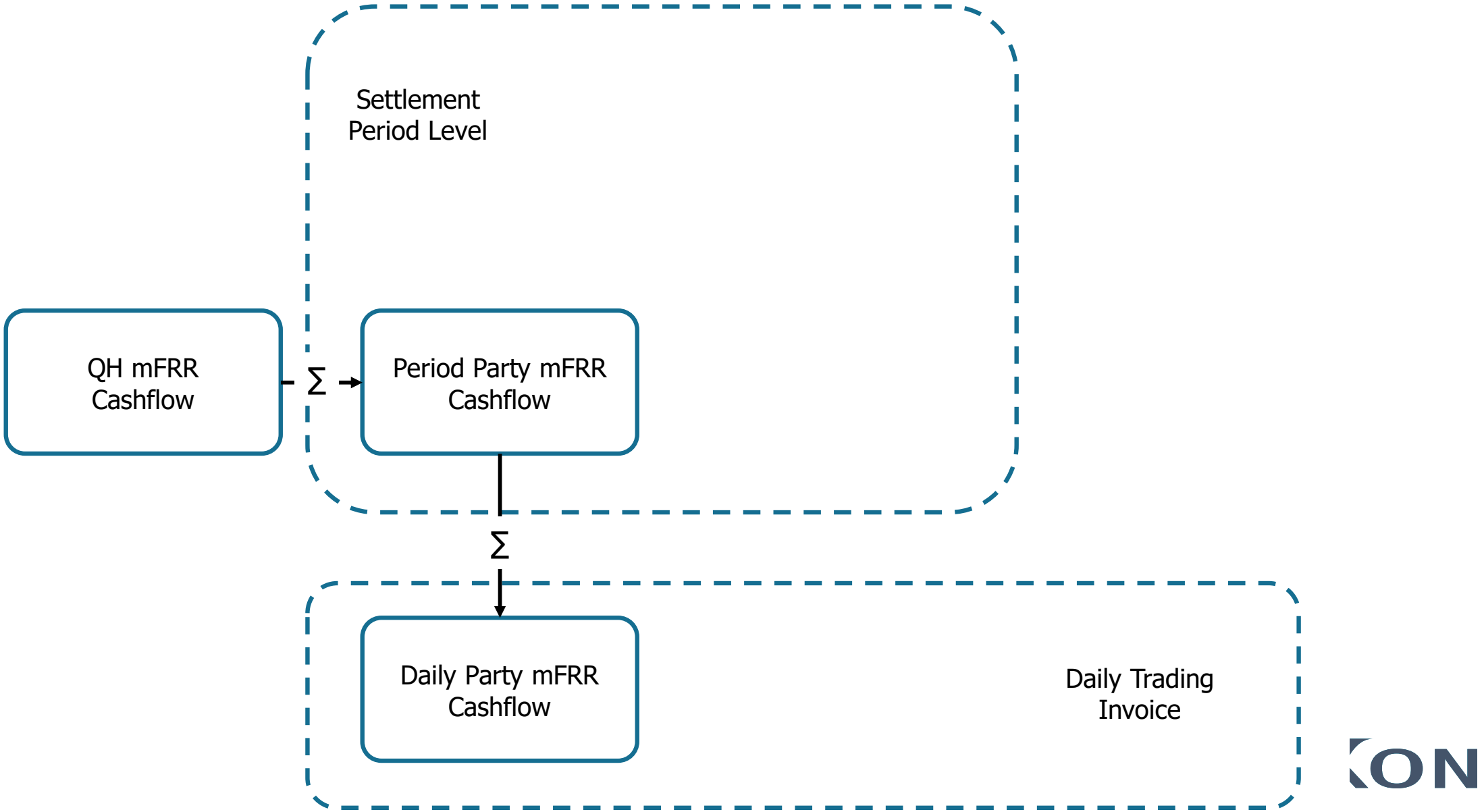
Example:

QH1 DA positive in QH1 £ CBMP = max (DA £ positive , QH1 SA £ CBMP)

QH1 DA positive in QH2 £ CBMP = max (DA £ positive , QH2 SA £ CBMP)

Q: Should this be included as a consultation question?

BR3: Daily Party mFRR Cashflow

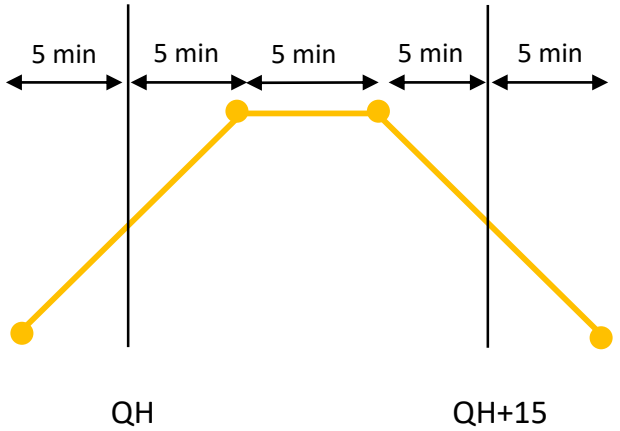


BR6: SAA shall calculate Deemed Standard Product Shape

Schedule Activations

Point variables will be created with a defined logic (i.e. they will create a standard shape) e.g. For each SA the SAA will deem:

- a point variable at QH-5 to be the start of the trapezoid
- a point variable to equal mFRR Acceptance MW Level at QH+5
- a point variable to equal mFRR Acceptance MW Level at QH+10
- a point variable at QH+5 to be the end of the trapezoid



Direct Activations

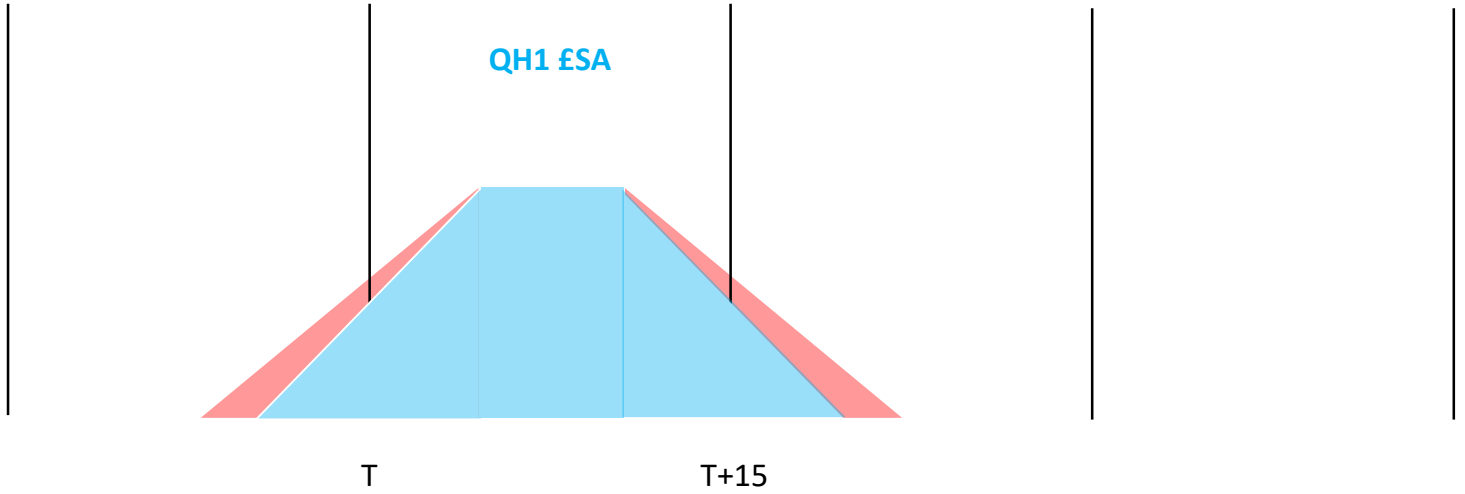
Same process as SA however the reference point for DA needs to be identified (i.e. cannot use QH boundary as DA point of activation can be any point between QH – 7.5 and QH + 7.5).

Therefore the reference point will be the DA point of Activation.

Dependency: Need to review proposed mFRR MOL file to identify DA point of activation

BR8 & BR9: FRR Instruction Deviation Cashflow

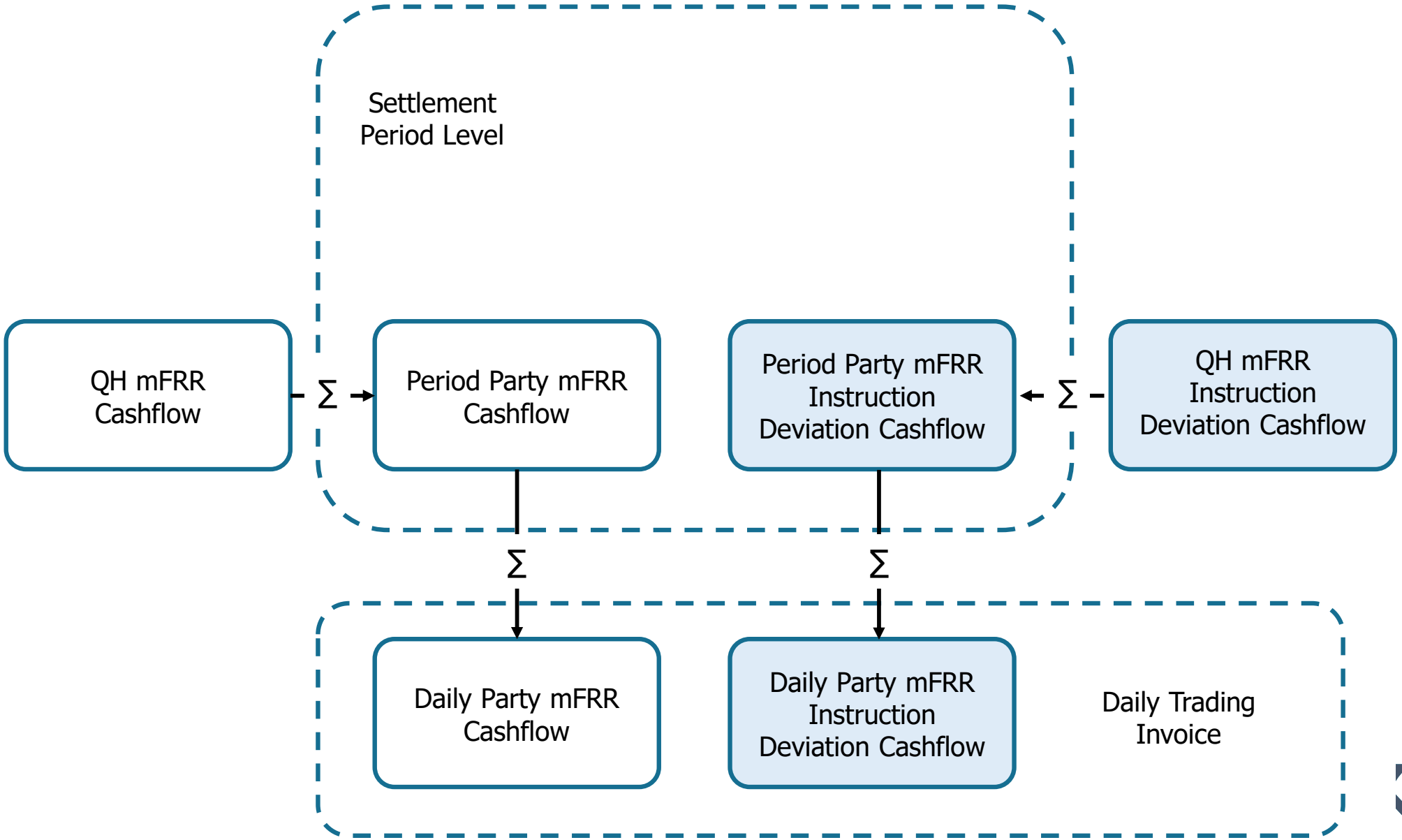
£ mFRR Cashflow = Deviation Volume * BEDP (£0)



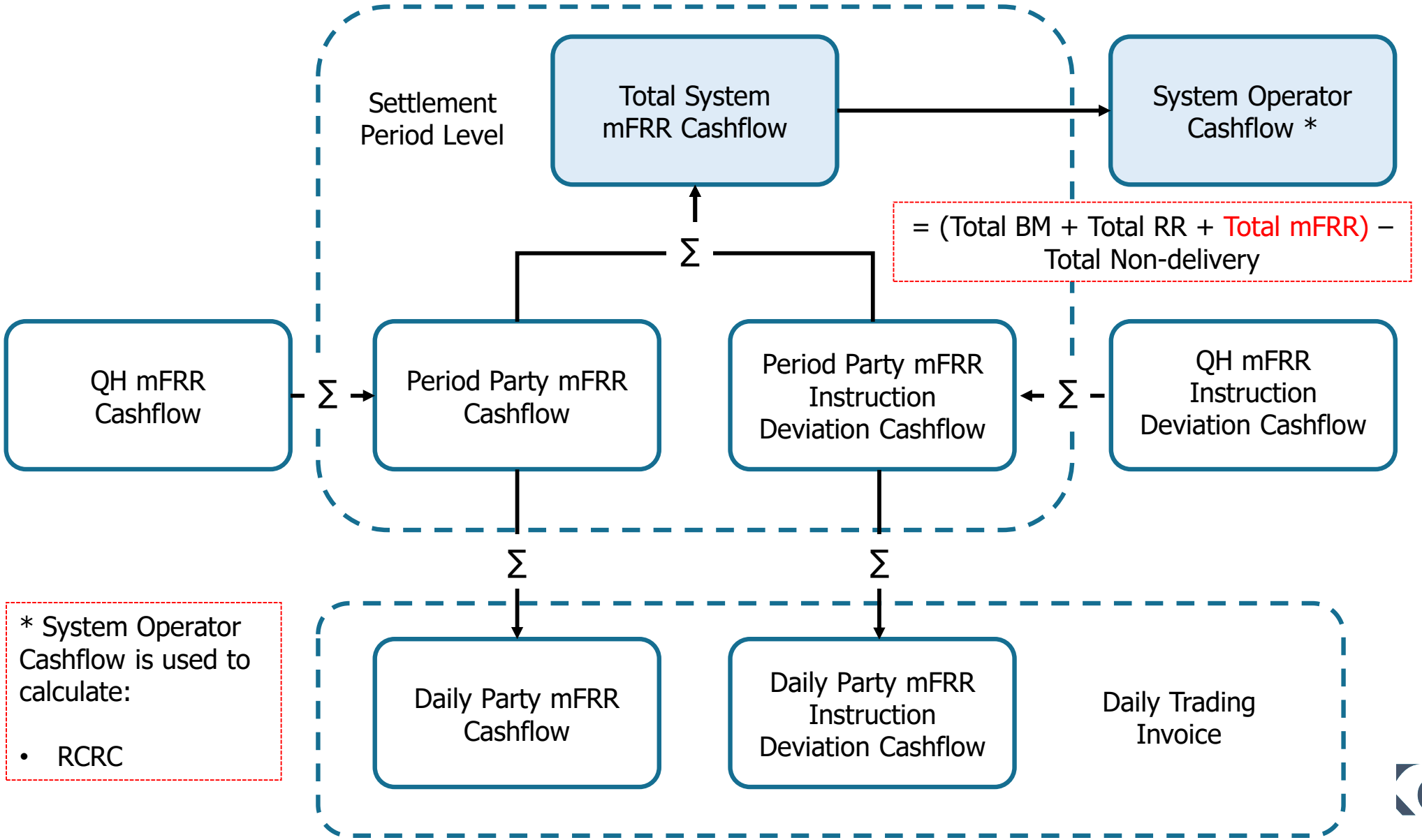
Outstanding questions:

- Do we want to incentivise the mFRR Standard Product Shape?
  - **Note** that non-delivery change calculation will calculate the Standard Product Shape in order to function correctly
  - Should we harmonise incentivisation with Replacement Reserve? I.e. BEDP = £0
- Do we need separate instruction deviation cashflows for Scheduled and Direct Activations?
  - If we harmonise incentivisation with Replacement Reserve then NO

BR10: Daily Party MARI Instruction Deviation Cashflow

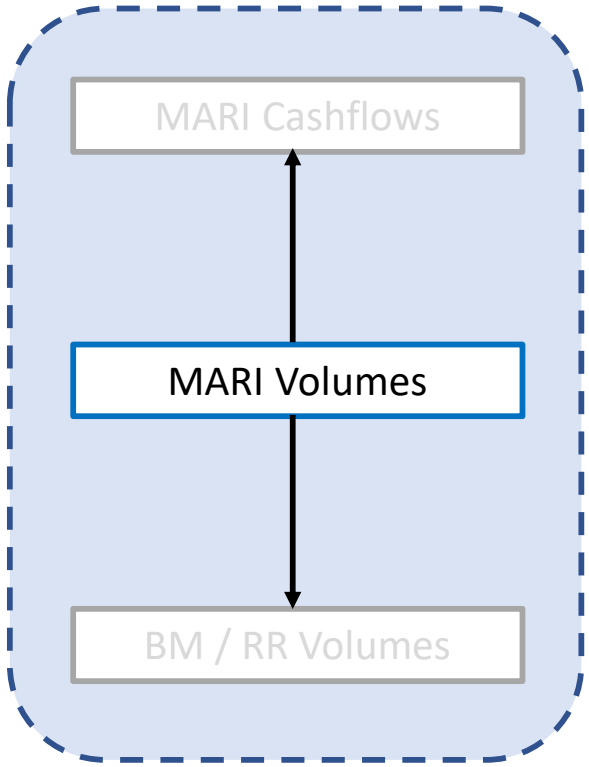


BR11: System Operator Cashflow



Settlement Solution Overview

Product Settlement

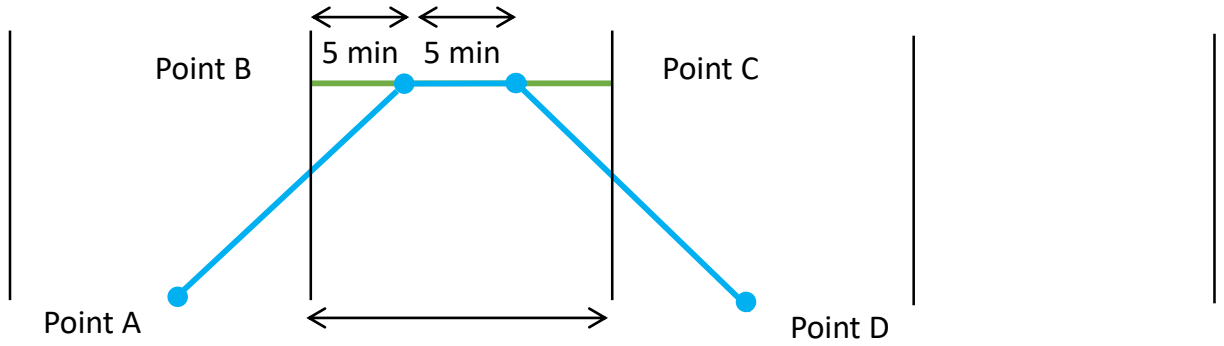


Ref	Business Requirement
BR04	SAA shall create a mFRR Schedule for each MARI Auction (SA & DA)
BR05	SAA shall process the derived mFRR Schedule to calculate MARI volumes.
BR07	SAA shall receive and process mFRR Instructions from National Grid for baselining purposes only.
BR13	SAA shall include mFRR Deemed Standard Product Shape volumes (BR06) and MARI Instructed Deviation Volumes (BR08) in the existing Non-Delivery Charge calculations.

BR04: mFRR Schedule

For each BM Unit with [SA or DA] QH mFRR Activation SAA will construct a **mFRR Schedule**

The mFRR Schedule represents the fulfilment of an RR Acceptance



The mFRR Schedule will:

- Respect the MARI Standard Product shape; and
- Respect (where possible) the BMU Dynamic Data; and
- Align with NGESO mFRR Dispatch Principles
- The Acceptance Time will be Deemed to have been GCT of the Auction

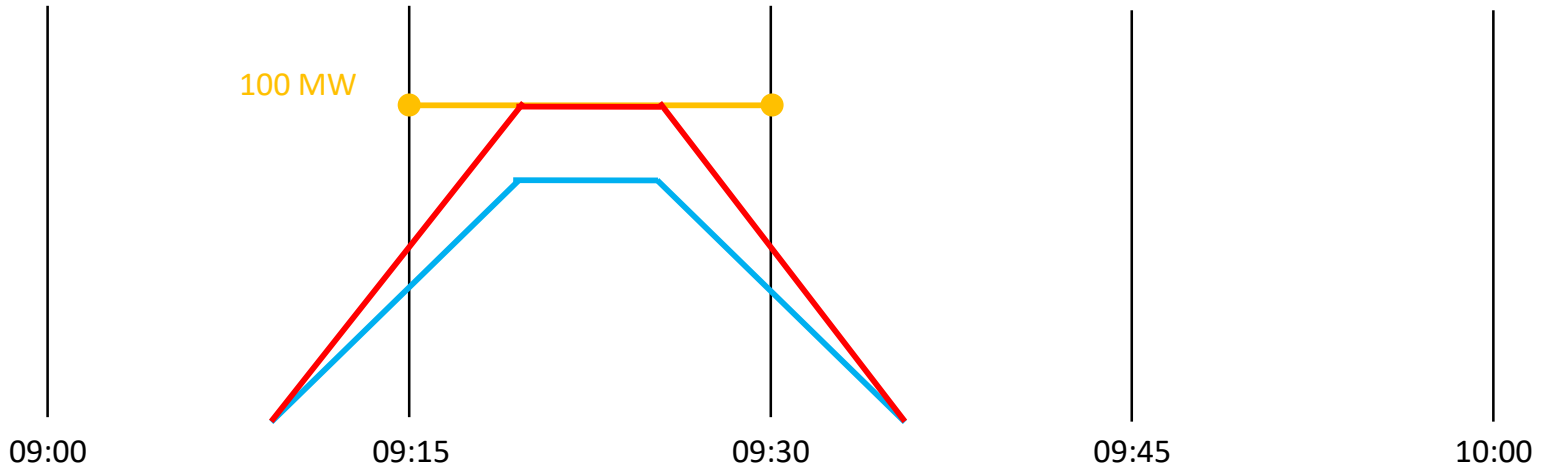
Note: At this time NGESO has not completed the internal workshops to share the mFRR Dispatch Principles and so **P407 will not include a mFRR Schedule Methodology** but will reference one.

mFRR Dispatch Scenarios

	Scenario	Likely Action
1	**BM / RR before mFRR Activation** In opposite direction	No mFRR instruction sent
2	**BM / RR before mFRR Activation** In same direction	mFRR instruction sent for deviation from BM / RR
3	**Ramping between mFRR Activation's** Ramping < 10 min will be dispatched symmetrical Ramping > 10 min deemed unfeasible	mFRR instruction sent respecting dynamic data mFRR instruction cannot fulfil RRA
4	**Solo mFRR Activation** Ramping > 12.5 min * deemed unfeasible	mFRR instruction sent respecting dynamic data mFRR instruction cannot not fulfil RRA
5	**Variable FPN** Results in ramps consistent with dynamic data Results in ramps not consistent with dynamic data however not deemed unfeasible	mFRR instruction sent respecting dynamic data mFRR instruction may not fulfil RRA

Example: Unfeasible mFRR Activation

In Scenario **4** the BMU cannot physically fulfil the activation. P407 proposes to limit the ramp time to 12.5 minutes * (to effectively be the max ramping period) like below:

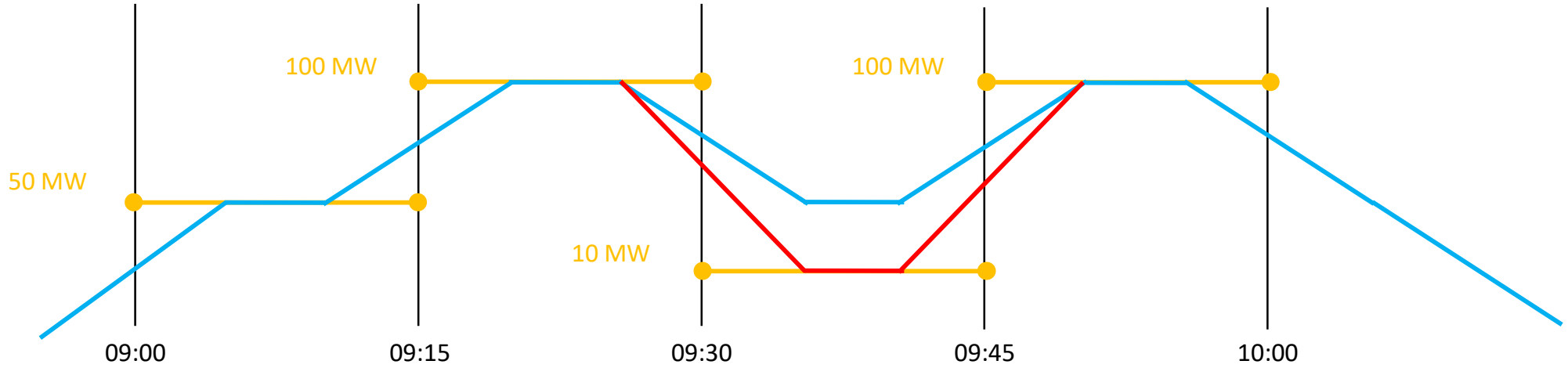


The blue line represents the mFRR Instruction (which respects the dynamic data) and the red line (here shown only where it deviates from the blue line) representing the mFRR Schedule which does not

The volume difference between the red and blue line would therefore be unfulfilled procured volume and be exposed to non-delivery charges

Example: Scenario 3

Scenario **3** results in an unfeasible bid Settlement proposes to limit the ramp time to 10 minutes (to effectively be the Standard Product Shape) like below:



The blue line represents the mFRR Instruction (which respects the dynamic data) and the red line (here shown only where it deviates from the blue line) representing the mFRR Schedule which does not

The volume difference between the red and blue line would therefore be additional unwanted volume and be exposed to energy imbalance charges

BR05: mFRR Volumes

SAA shall process mFRR Schedules similar to (and processed in a similar way to) any other BOA, except that:

- A mFRR Schedule shall be deemed to have been accepted equal to the time of the BEGCT of the mFRR Auction
- Settlements systems shall calculate mFRR Schedule Volumes, separate to Accepted Bid/Offer Volumes (so the volumes will not be included in BM or RR Volumes)
- For each mFRR Schedule, SAA and BMRA shall determine a Period mFRR Activation Volumes. Note that this calculation is exactly analogous to the calculation of Period Accepted Volume for BOAs and Period RR Activation Volume

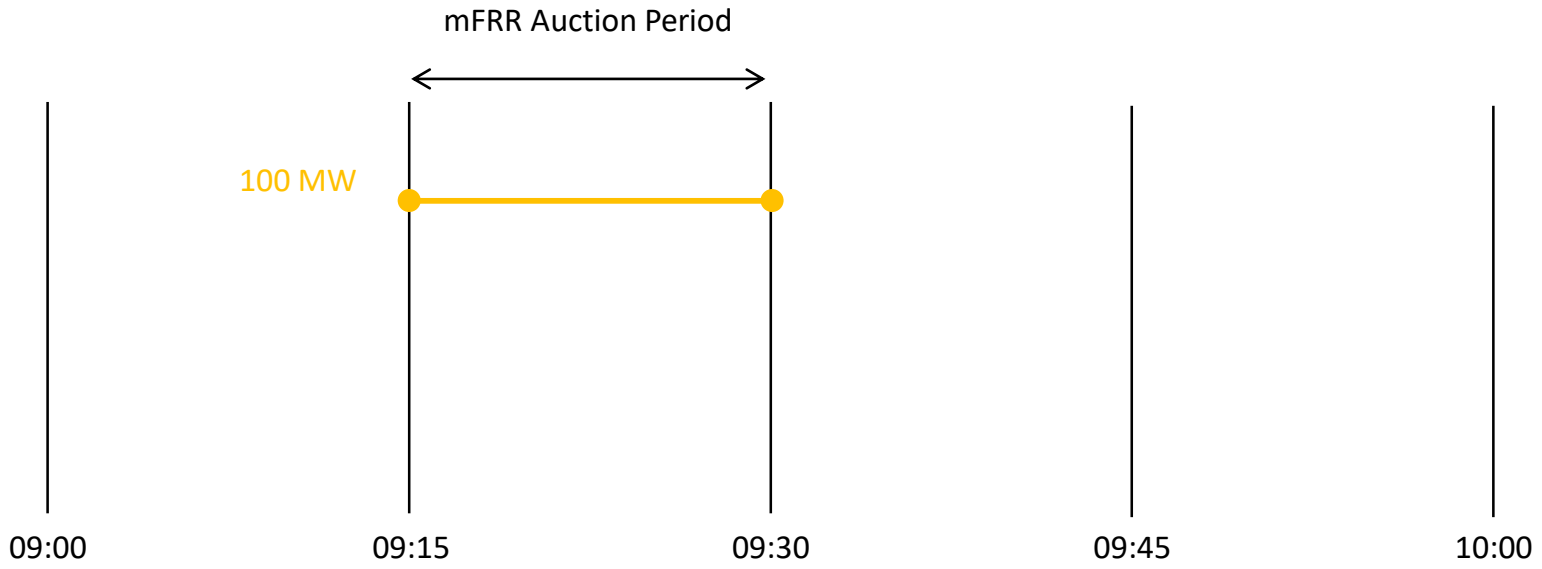
BR07: mFRR Instructions

SAA shall process mFRR Instructions Acceptance data exactly the same as any other BOA, except that:

- SAA shall **not** calculate Accepted Bid-Offer Volumes for mFRR Instructions. Therefore no Period Accepted Offer Volumes (QAOknij) or Period Accepted Bid Volumes (QABknij) will be calculated and so will not attract Bid Offer Payments.

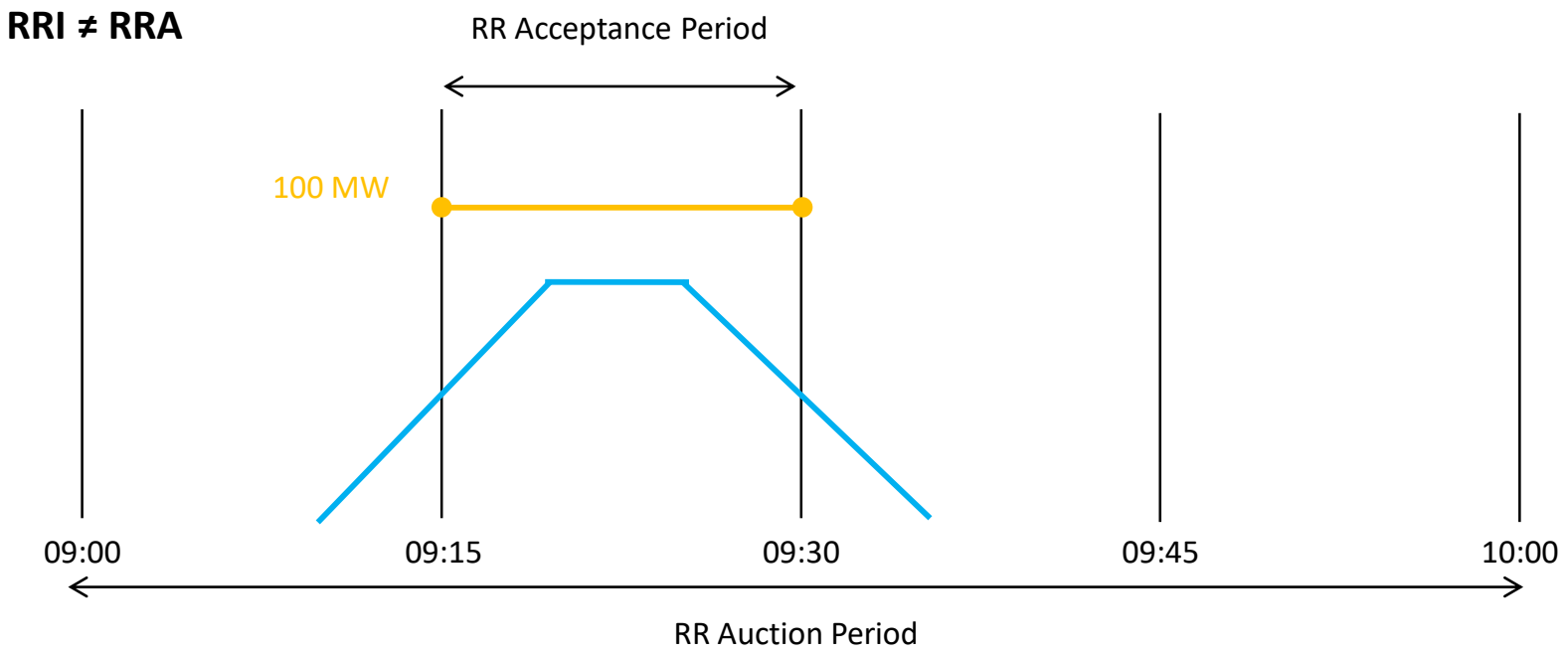
Instead SAA shall **only** use the mFRR Instruction Acceptance data as a baseline for any subsequent Acceptance Data.

Example: Unfeasible mFRR Activation



(1) 09:06 **mFRR Activation** received from TSO

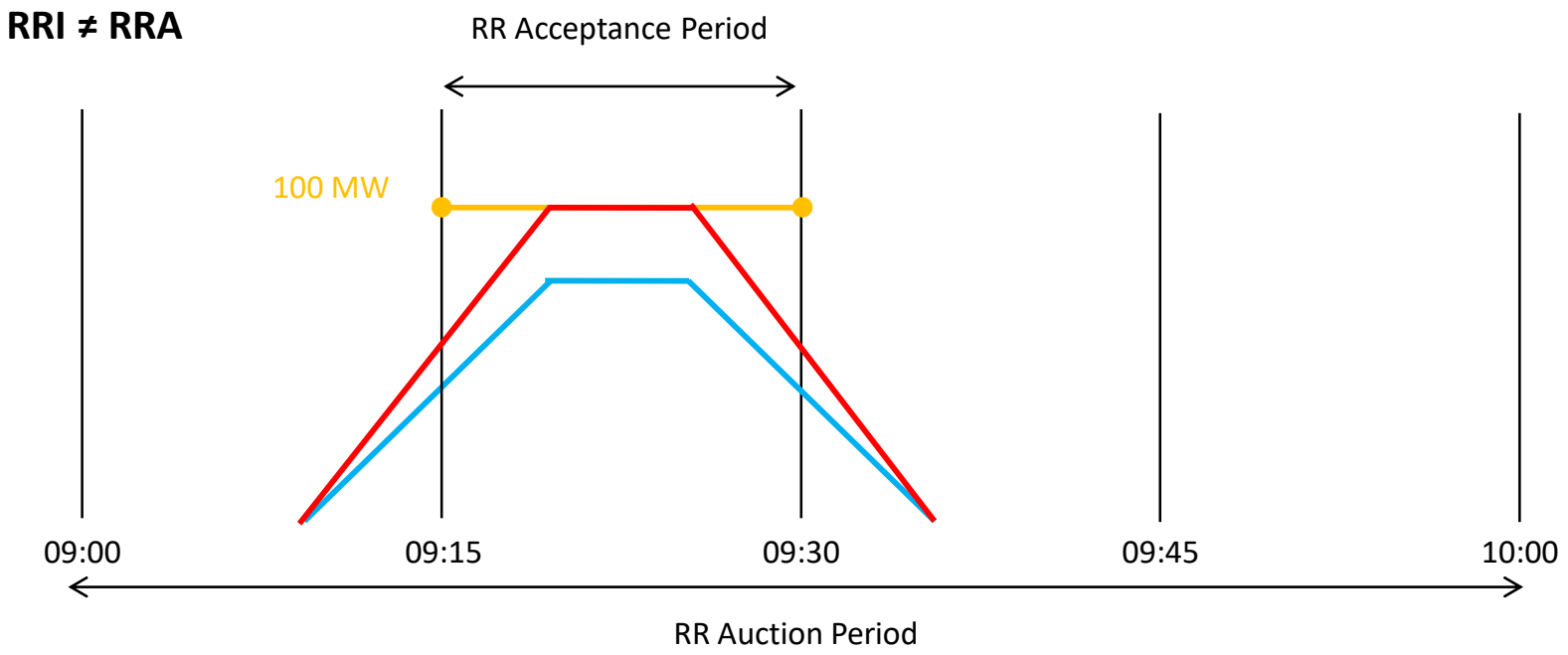
Example: Unfeasible First RRA



(1) **09:06** **mFRR Activation** received from TSO

(3) **09:07** **mFRR Instruction** received from TSO using Dynamic Data Set => **Unfeasible**

Example: Unfeasible First RRA

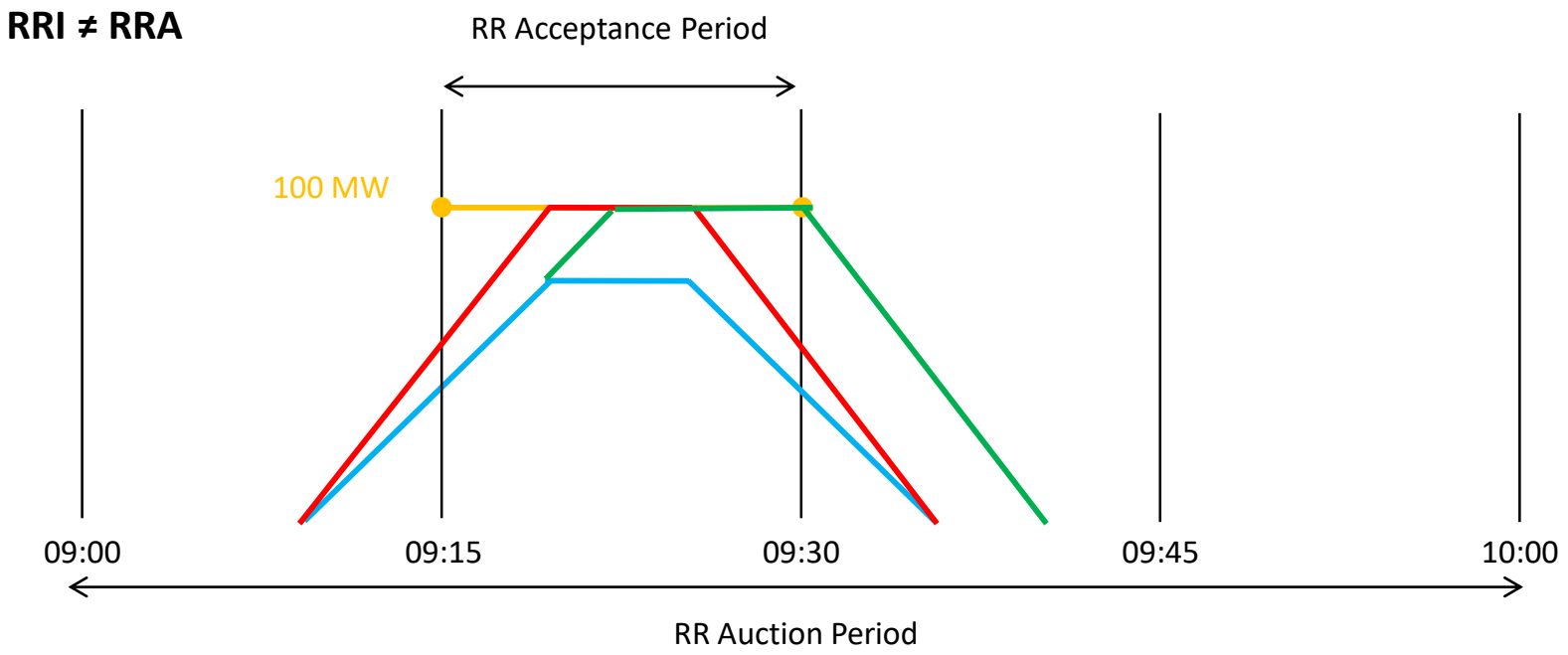


(1) **09:03** **mFRR Schedule** deemed **not** Dynamic Data Set => **Unfeasible**

(2) **09:06** **mFRR Activation** received from TSO

(3) **09:07** **mFRR Instruction** received from TSO using Dynamic Data Set => **Unfeasible**

Example: Unfeasible First RRA



(1) **09:03** **mFRR Schedule** deemed **not** Dynamic Data Set => **Unfeasible**

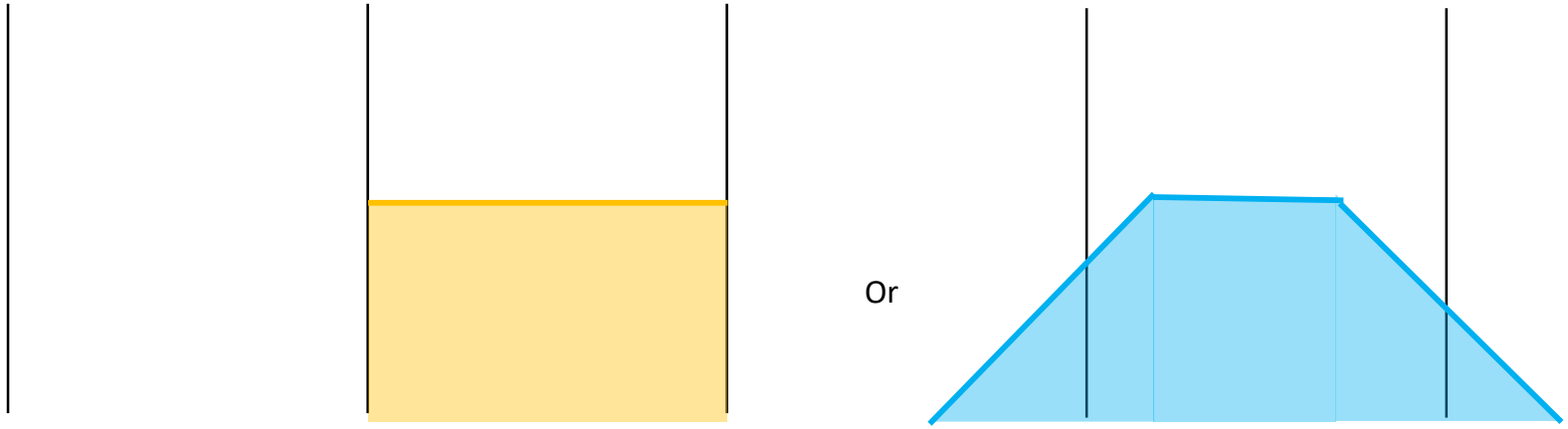
(2) **09:06** **mFRR Activation** received from TSO

(3) **09:07** **mFRR Instruction** received from TSO using Dynamic Data Set => **Unfeasible**

(4) **09:15** **BOA** received from TSO

BR13: Non-delivery calculation

£ mFRR Cashflow = volume * Activation Price



The workgroup expressed a preference that:

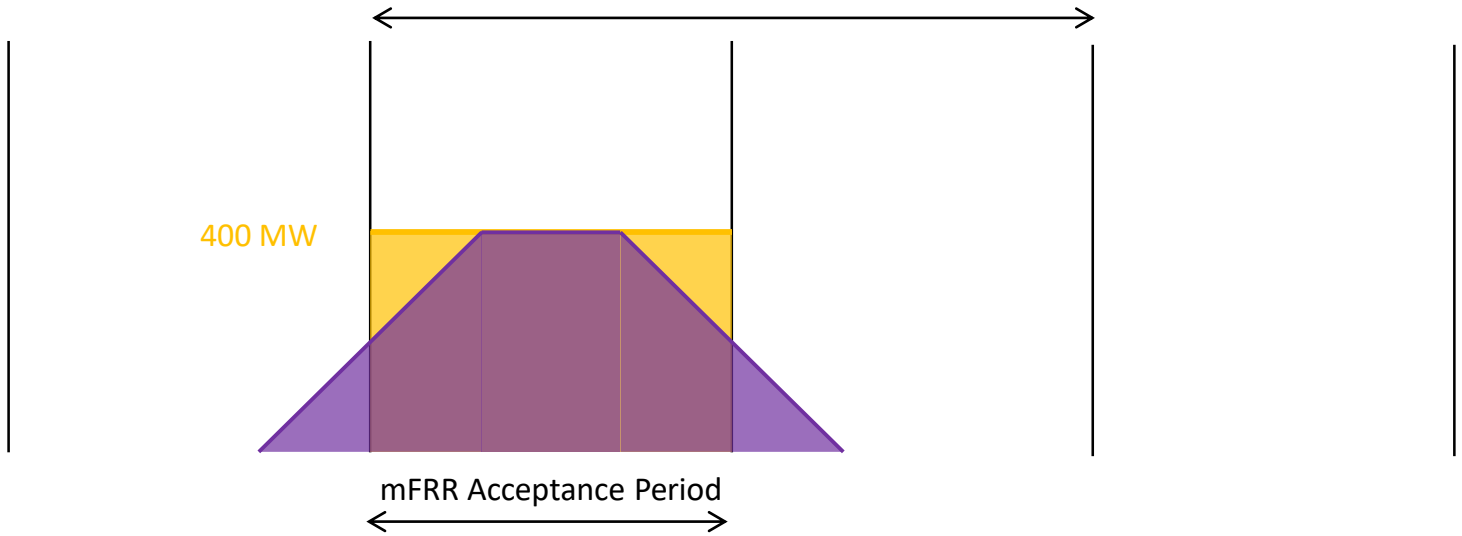
- Scheduled and Direct Activations should have separate cashflows
- 'Block' cashflow settlement to be used for SA
- 'Block' cashflow settlement to be used for DA

P407 Non Delivery Issue

'Block' used for cashflow ≠ Volume physically delivered for any given Settlement Period.

– The determination of Non-Delivered Volume (QNDO) uses mFRR Schedule Volumes (mFRRAO)

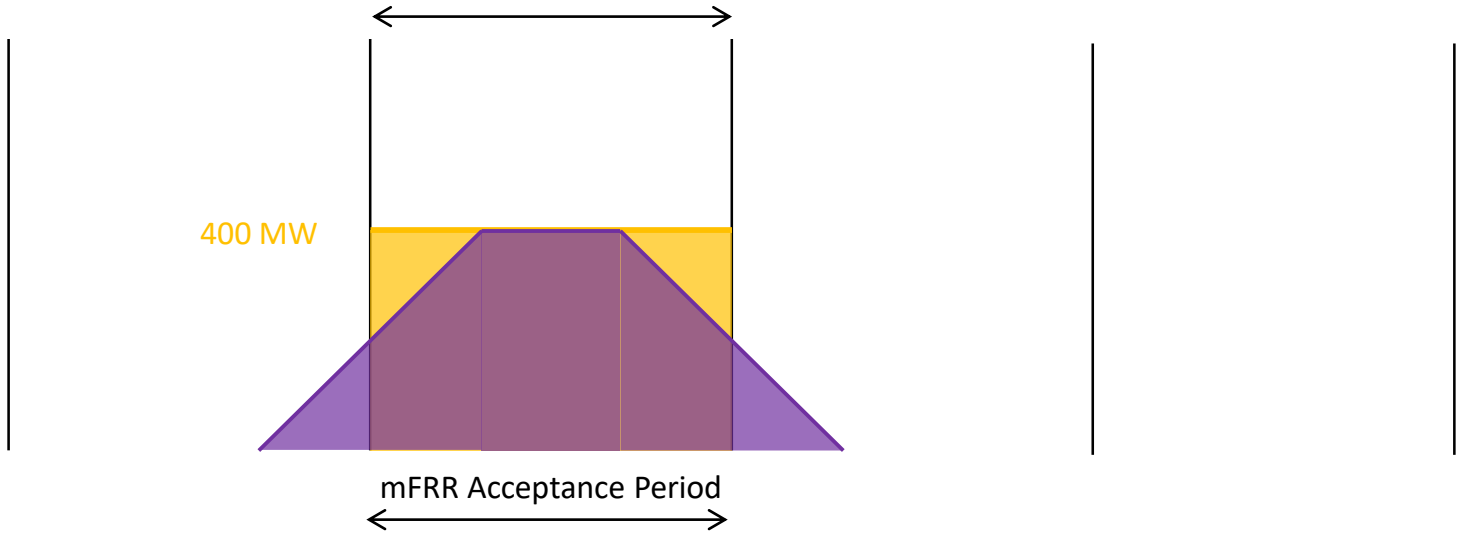
– The allocation process of Non-Delivered volume (QNDO) uses accepted 'block' mFRR Activation Volumes (mFRRAV)



mFRRAO	= 6.67	mFRRAO	= 93.33
QNDO	= 6.67	QNDO	= 93.33
mFRRAV	= 0	mFRRAV	= 100
6.67 MWh unallocated		0 MWh unallocated	

P407 Non Delivery Issue

Therefore a potential exists for a Party to have make financial profit from Non Delivery



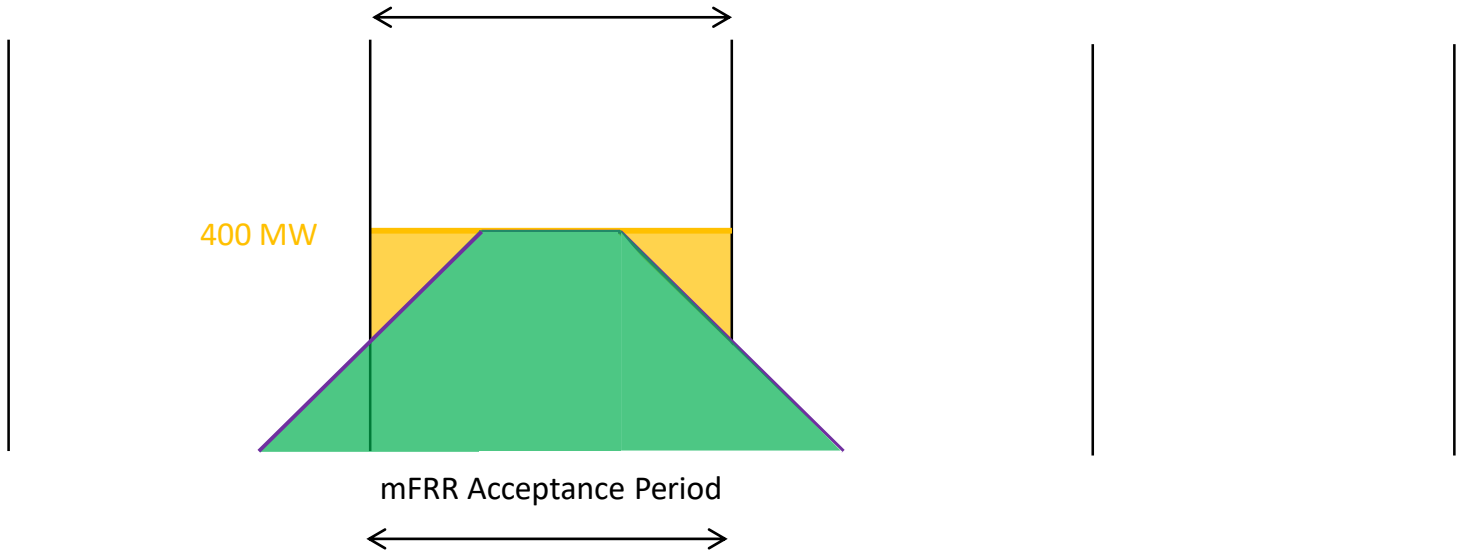
mFRR Cashflow = $mFRRAV_{iJ}$ * TCP_J	mFRR Cashflow = $mFRRAV_{iJ}$ * TCP_J	
= £0	= £10,000	Paid £10,000
As $mFRRAV_{iJ}$ = n/a	As $mFRRAV_{iJ}$ = 100	
Non Delivery = £0	Non Delivery = 93.33 * £40	Charges £9,733.20
	= £3,733.20	
Imbalance = 6.67 * £60	Imbalance = 93.33 * £60	**Net** **£266.80 profit**
= £400.20	= £5,599.80	

P407 Non Delivery Solution

Using Deemed Standard Product Shape and Instruction Deviation Volumes we can associate a £ price for all volumes within mFRR Schedule.

The determination of Non-Delivered Volume (QNDO) uses mFRR Schedule Volumes (mFRRAO) however the allocation process of Non-Delivered volume (QNDO) shall use:

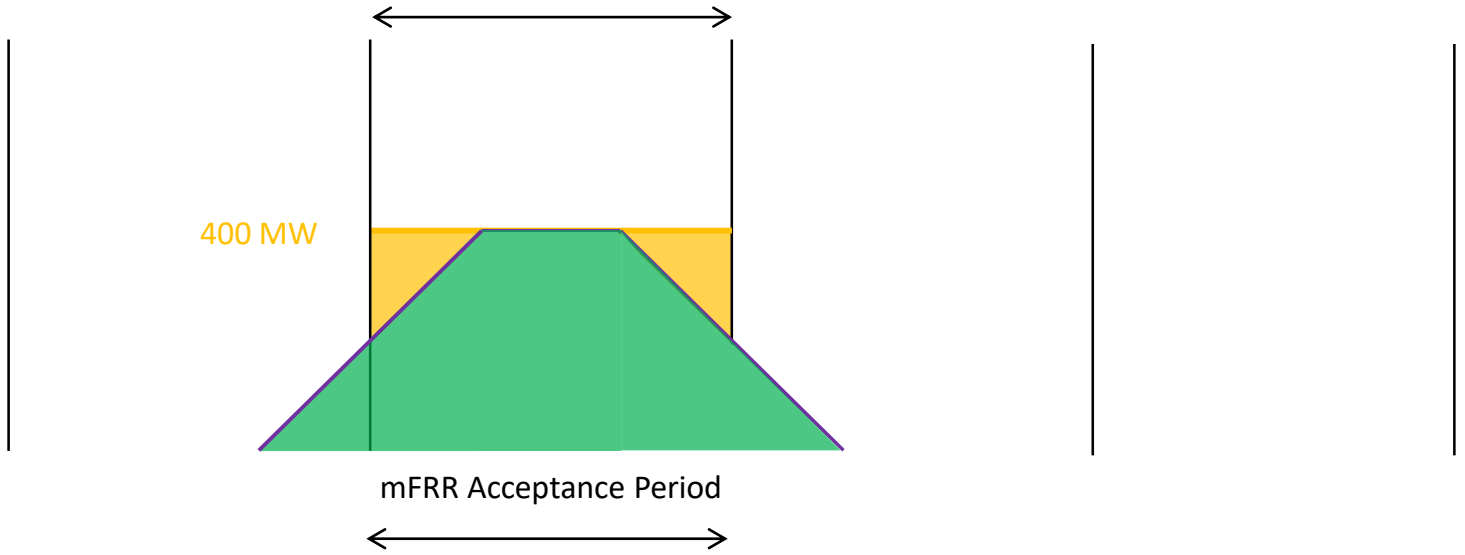
- Deemed Standard Product Shape (DSPO)
- Instruction Deviation Volumes (IOD)



RRAO	= 8.5	$RRAO^{n}_{ij}$	= 95.16
QNDO	= 8.5	$QNDO_{ij}$	= 95.16
DSPO	= 6.67	DSPO	= 93.33
0 MWh unallocated		**0 MWh unallocated**	

P344 Non Delivery Issue Revisited

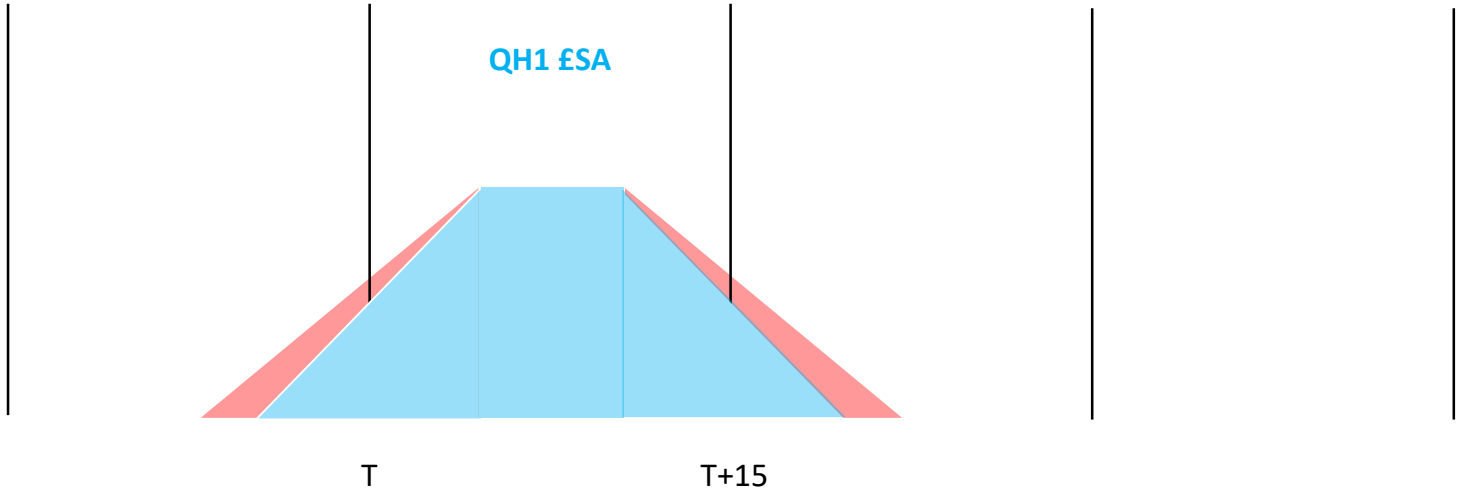
Lets look at how this affects the cashflow where there is a TCP of £100 per MWh and Imbalance Price of £60 per MWh



mFRR Cashflow = $mFRRAV_{iJ}$ * TCP_J	mFRR Cashflow = $mFRRAV_{iJ}$ * TCP_J	
= £0	= £10,000	Paid £10,000
As $mFRRAV_{iJ}$ = n/a	As $mFRRAV_{iJ}$ = 100	
Non Delivery = 6.67 * £40	Non Delivery = 93.33 * £40	Charges £10,000
	= £3,733.20	
Imbalance = 6.67 * £60	Imbalance = 93.33 * £60	**Net £0 No benefit**
= £667	= £5,599.80	

BR8 & BR9: FRR Instruction Deviation Cashflow

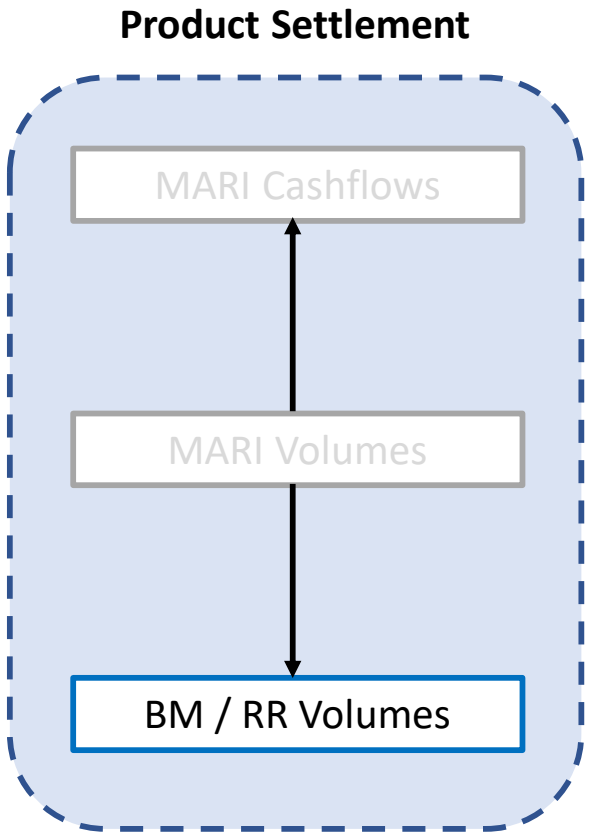
£ mFRR Cashflow = Deviation Volume * BEDP (£0)



Considerations:

- Do we want to incentivise the mFRR Standard Product Shape?
  - **Note** that non-delivery change calculation will calculate the Standard Product Shape in order to function correctly
  - Should we harmonise incentivisation with Replacement Reserve? I.e. BEDP = £0
- Do we need separate instruction deviation cashflows for Scheduled and Direct Activations?
  - If we harmonise incentivisation with Replacement Reserve then NO

Settlement Solution Overview



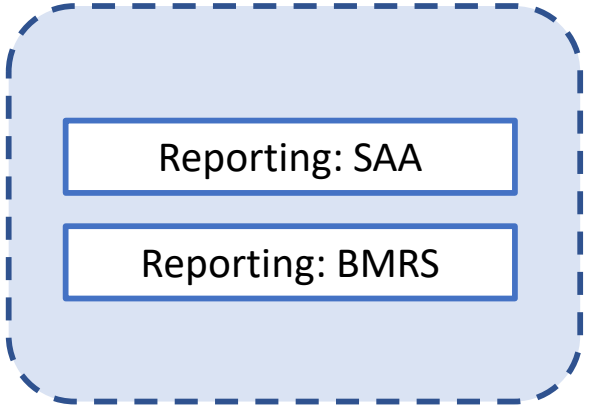
Ref	Business Requirement
BR12	TBC – NGESO dependency

BR12: mFRR Volume Interaction with BM / RR Volumes

Settlement Solution Overview

Imbalance Settlement

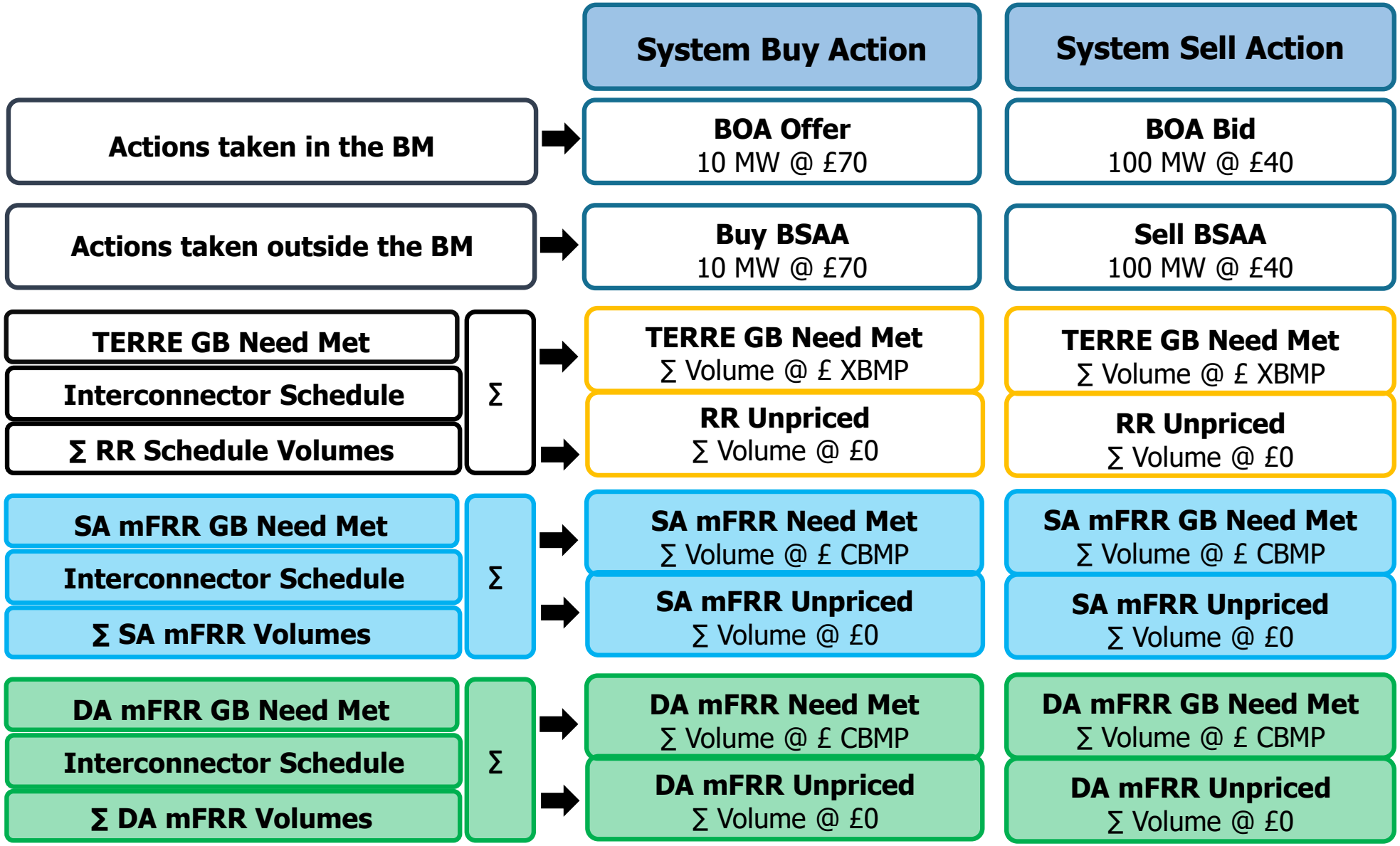
Ref	Business Requirement
BR14	SAA shall include MARI-specific actions in the calculation of the System Buy Price and System Sell Price.
BR15	SAA shall include mFRR Activation Volumes in the calculation of Energy Imbalance Volumes.



Reporting

Ref	Business Requirement
BR16	The SAA-I014 Settlement Report shall contain new MARI-specific data items.
BR17	New indicative MARI-specific shall be published on BMRS
BR18	New indicative MARI-specific data shall be calculated by BMRS
BR19	Daily Party mFRR Cashflow shall be included in the calculation of Actual Energy Indebtedness.

BR14: Imbalance Price Update

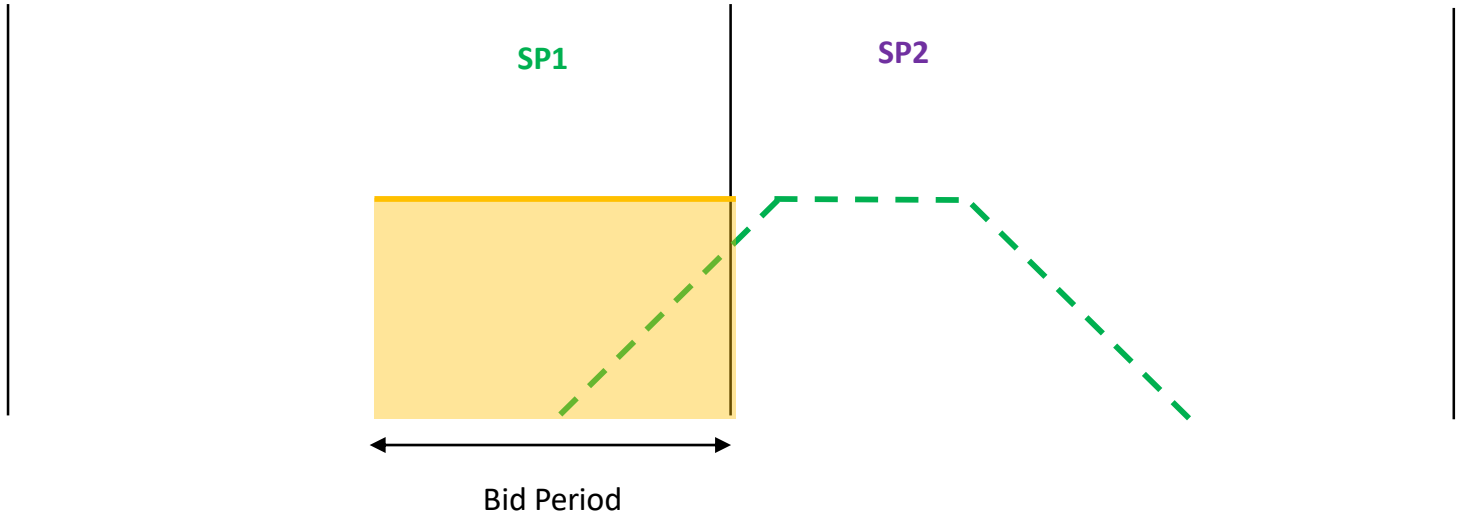


BR14: Imbalance Price examples

	Priced Action			Unpriced Action		
Description	**VGB**	**mFRR Schedule**	**Interconnector**	**Buy Action**	**Sell Action**	
GB Need met by GB BSP	100	120	0	20	0	100 MWh buy action priced at TCP 20 MWh unpriced buy action
GB Need met by GB BSP with surplus	100	170	-50	20	0	100 MWh buy action priced at TCP 20 MWh unpriced buy action
GB Need met by GB & foreign BSP	100	75	40	15	0	100 MWh buy action priced at TCP 20 MWh unpriced buy action
GB Need met by Foreign BSP	100	0	100	0	0	100 MWh buy action priced at TCP

Direct Activation Pricing

The workgroup rejected the proposal for a 'profiled' cashflow on the basis the solution was too complicated and would reduce market transparency and ultimately be a barrier to market participation.

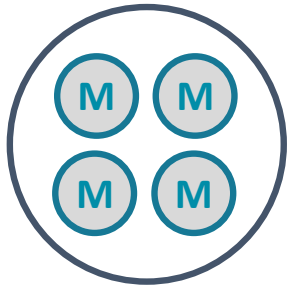


Must be noted that for with a 'block' profile it is possible that within any particular SP the Imbalance Price Ranked set a DA action may be included that predominantly was delivered in a different settlement period (E.g. as per above when initiated at T+7.5 minutes).

Q: Does this treatment of DA represent the true cost of balancing for each Settlement Period?

Q: Should this be included in the consultation?

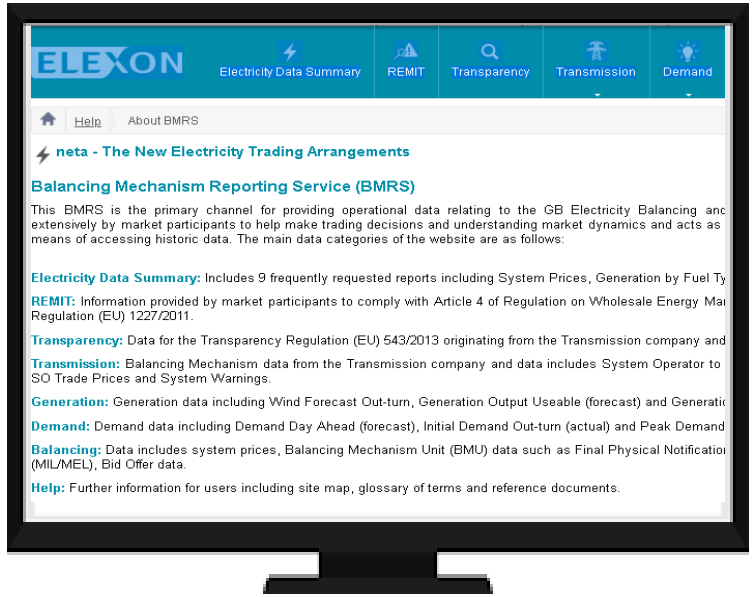
BR15: Calculating Energy Imbalance Volumes

Lead Party	Energy Imbalance Volume Adjustment?
Supplier / Trading Party Primary BM Unit 	Yes Adjusted for all mFRR Schedule volumes mFRR Accepted Offer / Bid volumes will feed into BM Unit Balancing Service Volumes (QBS_{ij})
Virtual Lead Party Secondary BM Unit 	Yes Only adjusted for any Non-Delivered Volumes VLP will be exposed to imbalance as an incentive to deliver any accepted bids

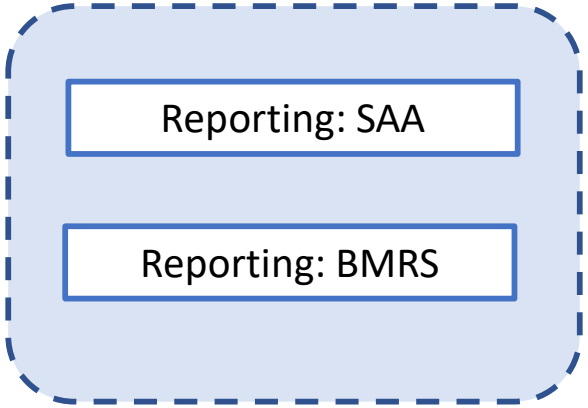
BR16/BR17/BR18: MARI Reporting

SAA – MARI data to be published post event via the SAA-I014: Settlement Report

BMRS – MARI data to be published in real time including Indicative MARI cashflows/volumes



- MARI bids
- Interconnector Available Transfer Capacity (ATC) & Constraints
- MARI Activations
- Interconnector Schedule
- MARI Clearing Prices (SA/DA)



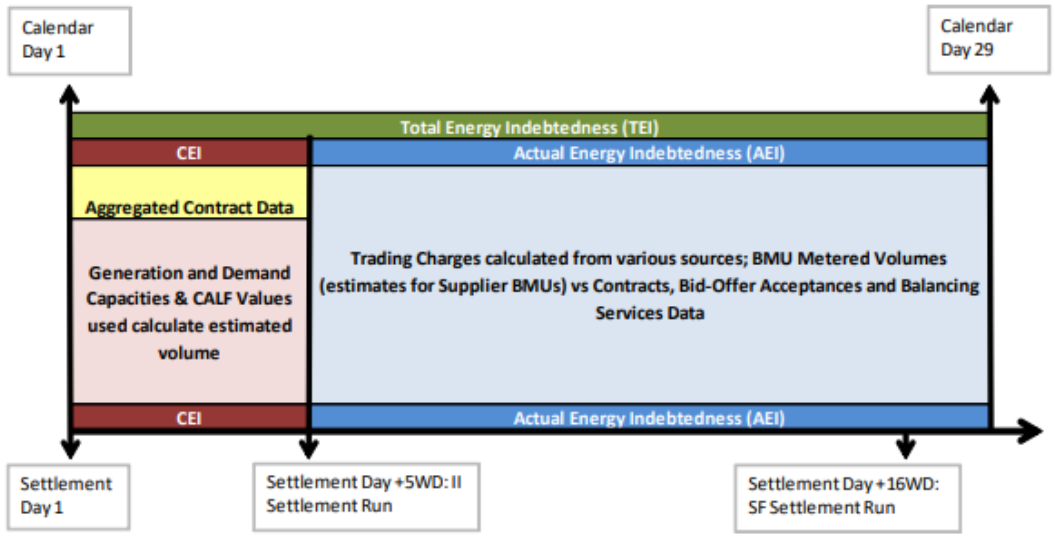
Reporting

BR19: Credit Arrangements

What is Credit Cover?

Credit Cover is needed because Trading Charges are paid approximately 29 calendar days after a Settlement Day occurs. Over this period a Parties' Credit Cover ensures it has enough collateral to cover these payments in case of default.

Figure 1: The Credit Calculation for non-Credit Qualifying Primary BM Units.



Therefore

SAA shall include Daily Party mFRR Cashflow and Daily Party mFRR Instruction Deviation Cashflow when passing Trading Charges to ECVAA for the purposes of calculation Actual Energy Indebtedness (AEI_p)

P407 BSC Legal Text Impact Matrix

Document	BR1	BR2	BR3	BR4	BR5	BR6	BR7	BR8	BR9	BR10	BR11	BR12	BR13	BR14	BR15	BR16	BR17	BR18	BR19
BSC Section A																			
BSC Section B																			
BSC Section C																			
BSC Section D																			
BSC Section E																			
BSC Section F																			
BSC Section G	Y																		
BSC Section H																			
BSC Section I																			
BSC Section J																			
BSC Section K																			
BSC Section L																			
BSC Section M																			Y
BSC Section N			Y							Y									
BSC Section O																			
BSC Section P																			
BSC Section Q	Y																		
BSC Section R																			
BSC Section S																			
BSC Section S1																			
BSC Section S2																			
BSC Section T		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				
BSC Section U																			
BSC Section V																Y	Y	Y	
BSC Section W																			
BSC Section X																			
BSC Section X1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
BSC Section X2		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				

BREXIT UPDATE AND DEROGATIONS

NEXT STEPS

ELEXON

THANK YOU

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15 September 2020