nationalgridESO

Frequency Response Auction Trial – Phase 2

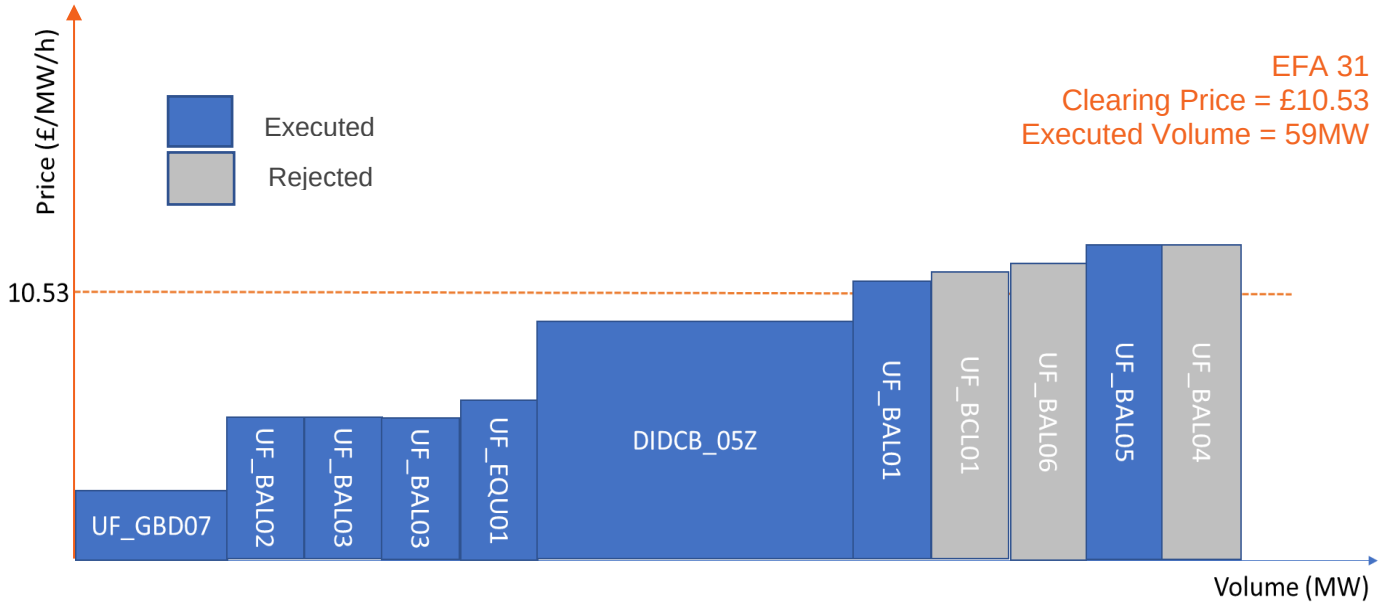
Analysis of Mock Auction results: EFA 31-36

Date: 27/11/2019

Following the results of the Mock Auction on Friday 22nd November 2019. A potentially anomalous result was observed in the results. Two identical block orders had been submitted for the duration of EFA blocks 31-36 with the same volume and same price. Only one of the blocks had been accepted by the algorithm despite sufficient volume remaining below the volume cap to accept both blocks.

After re-running the algorithm to confirm the results were consistent and conducting a thorough analysis EPEX SPOT recognised it as a case of the "merit order constraint" acting to remove the option of accepting both blocks in the eventual optimised solution.

The Merit Order constraint prevents the acceptance of a greater volume than that of a block which was rejected yet more attractive in the merit order than the block in question.



Analysis

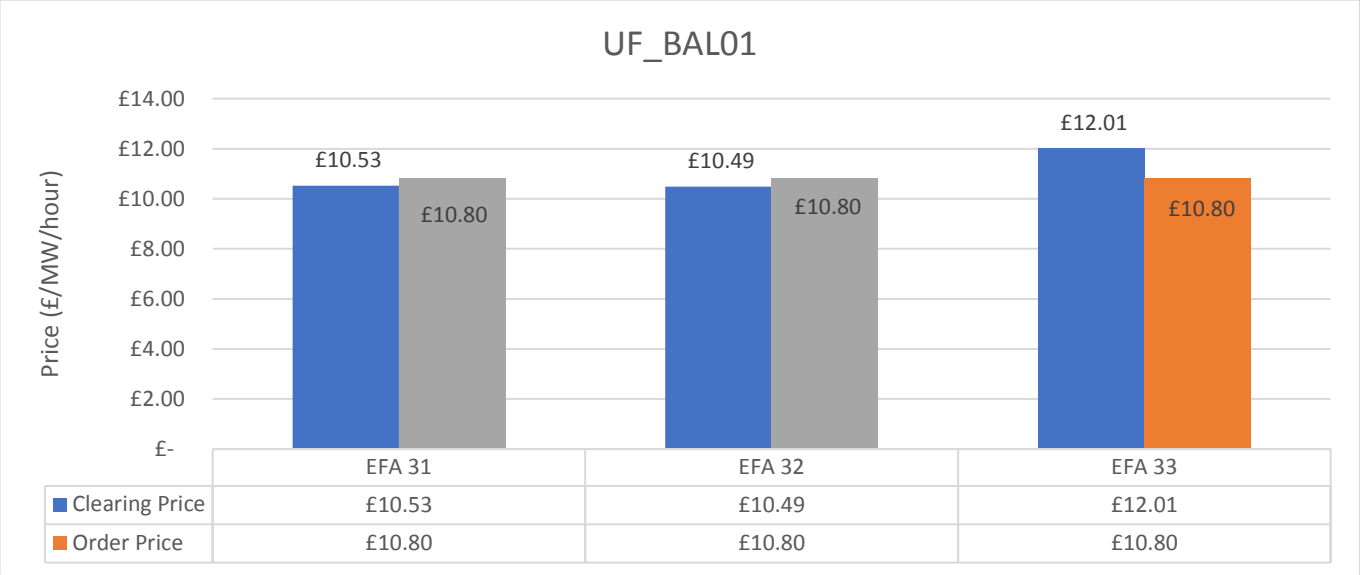
The diagram above demonstrates the bids for the Mock Auction for the Dynamic Low High (DLH) product during EFA block 31. For reference EFA block 31 for the given service week would have commenced at 23:00 Wednesday 27th November and concluded at 03:00 Thursday 28th November for successful units.

All blue blocks were accepted. For the blue volumes that are below the ESO buy order price cap of £10.53/MW/hour their acceptance is intuitive. Two other block orders were accepted with a price above the £10.53/MW/hour limit, to explain this result requires more explanation of the constraints placed on the optimal solution.

UF_BAL01 and the Parent/Child Constraints

The Block Order submitted for UF_BAL01 over EFA Block 31 was a multi-period parent (C01) block at a price of £10.80/MW/hour. The volume pertaining to this order was of 5MW in both EFA 31 and EFA 32. According to multi-period block constraints the volume must be executed over both EFA blocks or rejected over both blocks.

The block is also part of a linked family. A single period child (C02) block was linked to this parent block at a price of £10.80/MW/hour in EFA 33. The parent/child constraints dictate that a Child block cannot be executed when it is above the clearing price but if a child is "in the money" then it can "save" the parent.



	EFA 31	EFA 32	EFA 33
Clearing Price	£10.53	£10.49	£12.01
Order Price	£10.80	£10.80	£10.80

In this example the block order can be accepted as the surplus for the provider over the linked family is positive:

$$(10.53 - 10.80) * 5MW * 4hours = \ -£5.40$$

$$(10.49 - 10.80) * 5MW * 4hours = \ -£6.20$$

$$(12.01 - 10.80) * 5MW * 4hours = £24.20$$

$$£24.20 - £5.40 - £6.20 = £12.60$$

The linked family is in surplus, and there remains excess volume in the NGESO buy order. Therefore, both the parent and child block orders are accepted. This is a commonly found situation in the Phase 2 auction.

UF_BAL04 and 05 and the Merit Order Constraints

These two block orders are identical. The same price and same volume and linked together over the six EFA blocks 31-36.

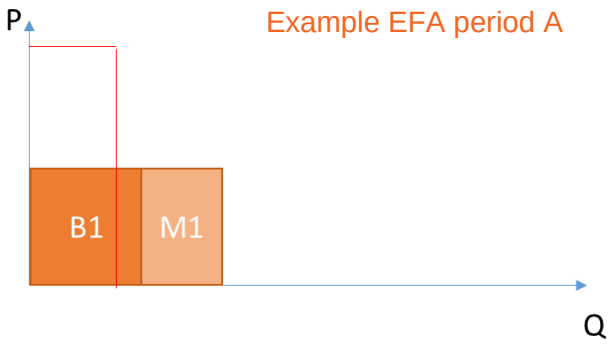
The total surplus for the block orders over the six EFA blocks is exactly £0.00. This indicates that the provider was indifferent between being contracted to provide response at the clearing prices offered and not being contracted at all.

The algorithm considers the constraint that no provider can be made worse off to be met in such a situation where she is indifferent to either outcome.

In EFA 31 and 32 the identical blocks were both “out of the money”. There were blocks further in merit than them that were not accepted (UF_BCL01 and UF_BAL06) as they too were out of the money.

The Merit Order constraint exists in the Phase 2 auction to prevent the acceptance of a greater volume than that of a block which was rejected yet more attractive in the merit order than the block in question. The constraint also acts to prioritise single period blocks over multi-period blocks as six single period blocks provide more granularity in outcome and therefore more possibilities than an identical volume submitted as a six-period looped block.

The example below shows how the Merit Order constraint works in the context of the volume limits:



Where a multi-period block and a single-period block are submitted at equal price the “basic” block would take preference over the multi-period. However, in this example, there is insufficient volume remaining in EFA period A and given as the multi-period block is smaller in volume terms than the basic block it can take precedence here. If all other constraints are met the multi-period block is accepted.

The constraint is designed to find efficiencies in a highly liquid and competitive situation where many parties are operating well below the price cap. In such situations, the volume cap comes into play and despite basic blocks taking priority in the merit order in the event of a price tie it is important not to preclude potentially higher welfare scenarios by omitting a smaller multi-period block from the solution.

In the Mock Auction conducted by NGESO and EPEX SPOT on 22nd November the Merit Order condition was followed in EFA 31 where the identical linked blocks were “out of the money”. As there were blocks preferable in the merit order but still rejected then it was not acceptable to execute both blocks as this would exceed the volume of the block which was rejected. Therefore, the two blocks were in a tie situation and only one could be accepted.

A tie situation is settled in the Phase 2 auction contingent upon the Order ID granted to the block order when it is processed into the Platform. In this situation, the UF_BAL05 block had the “winning” Order ID and therefore was executed whilst the identical UF_BAL04 was rejected. If the two blocks preceding them in the merit order had not existed, then both blocks would have been executed. If the volume of both block orders was less than or equal to that of the smallest rejected block, then they again would have both been executed.

Conclusion

The Phase 2 auction contains a number of complexities and therefore sometimes results are obtained which might at first seem counter intuitive but through this analysis of the Mock Auction we have examined various auction constraints in practice and reconfirmed results as expected.

We will continue to monitor the auction constraints to ensure that they are working effectively and make changes if required.