nationalgridESO

Auction Participation Guidance Document

Phase 2 Frequency Response Weekly Auction

Introduction

This Prequalification and EPEX Auction platform guidance document should be read in conjunction with the following documentation which is available on the Future of Balancing Services website:

- NGESO Phase 2 FR Auction Trial – Form A
- NGESO Phase 2 FR Auction Trial – Form B
- NGESO Phase 2 FR Auction Trial – Form C
- NGESO Phase 2 FR Auction Trial – Auction Rules
- NGESO Phase 2 FR Auction Trial – Service Terms – DRAFT
- NGESO Phase 2 FR Auction Trial – General Contract Terms
- NGESO Phase 2 FR Auction Trial – Glossary
- NGESO Phase 2 FR Auction Trial – LFS and Dynamic FFR Testing Guidance
- EPEX user guide

Version	Date	Change	Page
V1.1	07/11/19	Change to £/MW/hr	8
	07/11/19	Additional information regarding registering/ reallocating units	6
	07/11/19	Link to website added	1
V1.2	14/11/19	Sales order explanation	6
V1.3	21/11/19	Additional Epex auction platform information	9 onwards
V1.4	04/12/19	Update Epex link	5
V1.5	05/12/19	Update to Timeline Flow – Unit re-allocation	3

Version 1.5 05 December 2019

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Web: https://www.nationalgrideso.com/balancing-services/frequency-response-services/frequency-auction-trial?assessment-process=

Overview of Phase 2 requirements

This document provides an overview of the prequalification process for participating in the Low Frequency Static (LFS) and Dynamic Low High (DLH) product weekly auctions, as well as, a brief introduction to the design of the EPEXSPOT (EPEX) auction platform which has been built to support Phase 2 of the Frequency Response Auction Trial (FRA).

General Specifications

In the Frequency Response Auction Trial (FRA) market each order is associated with a single product type. Two product types are currently available in the FRA:

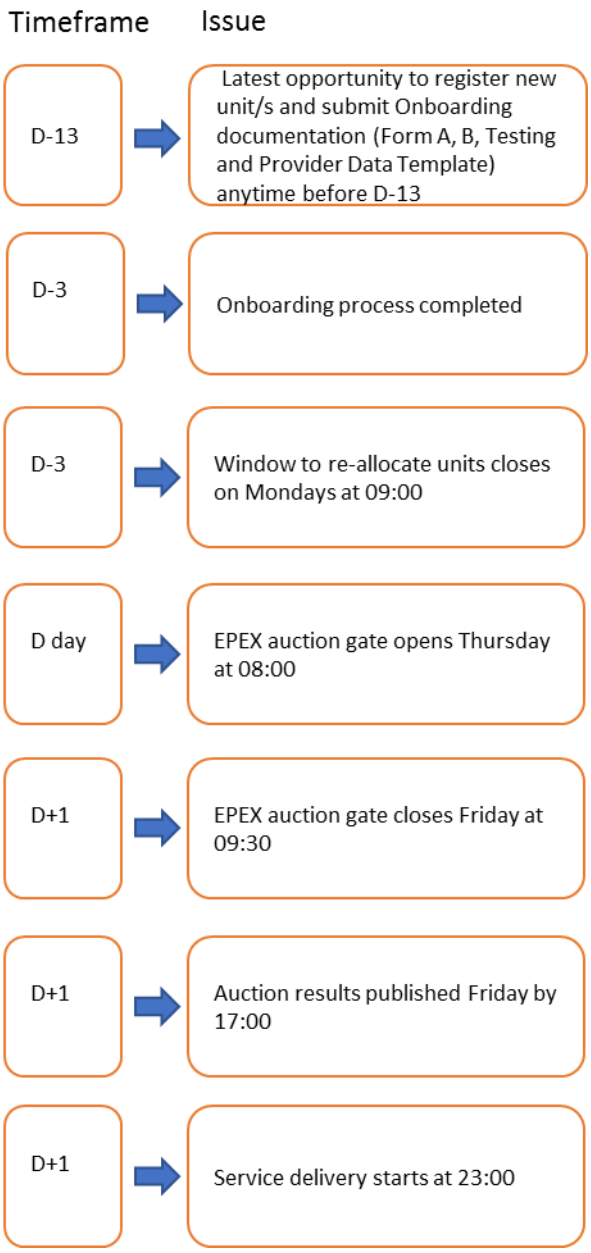
- Low Frequency Static (LFS)
- Dynamic Low High (DLH)

FRA is a weekly auction. A period is defined as an EFA block, four (4) hours in duration. Orders are therefore submitted weekly for up to 42 periods in total.

Timeline

The timeline below shows the key dates in the Phase 2 auction process. The diagram below shows that the action with the longest lead time prior to participating in an Auction is the registering of new Units as part of the onboarding process.

The following diagram is in working days, a working day is between 08:30 - 16:00.

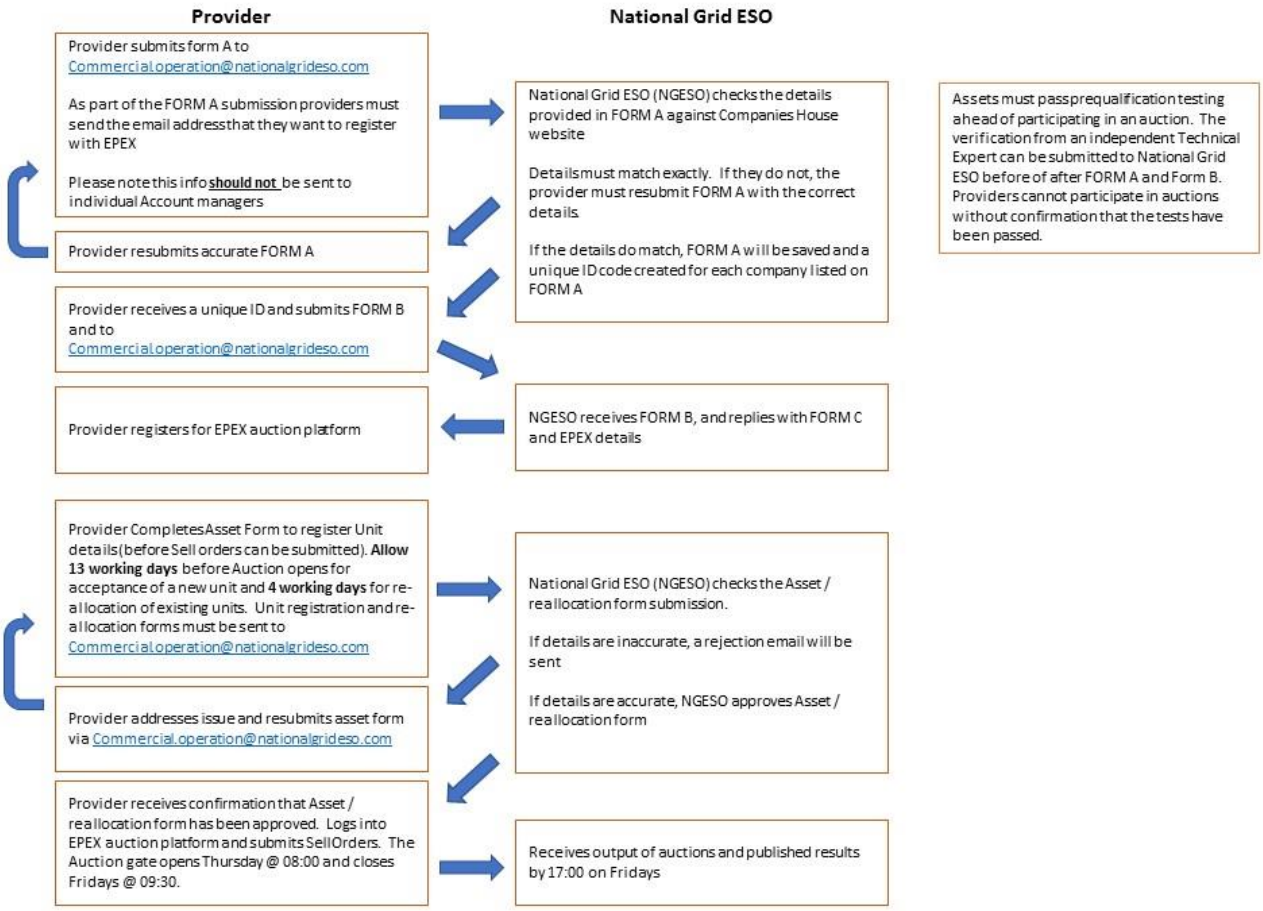


Registration

Preparation to enter a weekly auction

Prequalification to enter a weekly auction involves: demonstrating that the asset(s) delivering the services has passed the necessary testing; submitting the necessary contractual documents to National Grid ESO with accurate data (which will be checked by National Grid ESO); and registering the asset(s) to the NGESO commercial.box

In order to participate in one (or more) of the weekly auctions for Phase 2 of the frequency response auction trial, providers must complete the following steps. These steps are explained in more detail within this document.



Interested parties should submit correct testing data for any assets to us no later than D-13 (working days) before the first auction they intend to participate in – learnings from the first auction indicated more time was needed for this step in order to ensure a smooth and sustainable process for both NGESO and providers. If data provided does not pass the requirements and needs to be resubmitted, this resubmission will also need to be at least a week before the auction.

In addition to submitting correct testing data, participants must also have completed and submitted their FORM A and FORM B, and received a FORM C from NGESO. It is important that providers allow sufficient time to register and prepare for the first auction they intend to participate in as we may be processing a number of new providers and responding to queries. Following the timeline earlier in the document, providers need to ensure that they submit the forms and testing data by D-13.

Testing

Assets must pass prequalification testing, as per the LFS Testing Guidance document and the Dynamic FFR Testing Guidance document, ahead of participating in an auction. The verification from an Independent Technical Expert can be submitted to National Grid ESO before or after FORM A and FORM B, but will be required as part of the onboarding process.

- Providers who are looking to participate in the Dynamic Low High (DLH) auction that have assets which have previously passed testing to participate in the Dynamic Monthly FFR auctions will not be required to undertake testing again on these assets.

As set out in the Testing Guidance documents, in order for the prospective response provider to complete the pre-registration requirement, the following information must be submitted to National Grid Electricity System Operator (NGESO):

- The testing data
  - LFS testing guidance click here
  - Dynamic testing guidance click here
- A Test Certificate from the ITE
- A CV, setting out the qualifications and experience of the Independent Technical Expert.

Submitting FORM A and FORM B

Guidance for completing the paperwork is included within the relevant documents. When submitting FORM A you will need to specify the email address which you would like to register on the EPEXSPOT auction platform. Due to restrictions, which will be relaxed in later releases of the platform, each company is only allowed one user account. The platform can be accessed from different machines but the process for resetting the password for example will be through the nominated email account. We would therefore recommend that the email account you use is that of a person who will be likely to submit the Sell Orders on behalf of your company most weeks or use a generic, accessible to multiple people email address.

Receiving FORM C

This document is confirmation of the ability to bid for a service, to prequalify you will still need to submit testing. This is not confirmation of a contract for investment purposes.

EPEX Auction platform – Registration

The EPEXSPOT Platform (hereafter referred to as the Platform) is the vehicle by which Sell Orders and Buy Orders are submitted to enable participation in the FRA. Registration on the Platform requires a Username or “Login Name” and a Password. Those wishing to access the Platform for the first time must inform NGESO of an email address which they wish to use as their Login Name, we will then authorise this email address with EPEX and a new user account will be created.

At the time of writing the number of user accounts is limited to one per company. This restriction will be relaxed with later releases of the Platform.

Once the user account has been set up (at latest by the gate open point, Thursday at 08:00) the user can navigate to https://www.cts-fra.epexspot.com/login and set up their password for the first time. The new password process will use the email address “Login Name” to verify.

Please see the EPEX user guide for more information on the Platform and Sell Order submissions.

Throughout the week during working hours EPEX provide a support service aimed at supporting those users struggling to access the Platform. The email contact to mail is: cts-fra-operation@epexspot.com.

Prior to being able to submit Sell Orders providers will need to register their asset details via Commercial.operation@nationalgrideso.com. For registering new assets please see registering new assets section below.

Registering New Assets

Registering new assets will initially be done by submitting a completed Provider Data Template via the commercial.operation@nationalgrideso.com, the initial registration of new assets must be done no later than 13 working days (D-13) prior to the auction opening (Thursdays @ 08:00)

PLEASE NOTE: a unit must be registered against a registered service provider which can be an applicant or a related entity (who has been registered by an agent).

PLEASE NOTE: every Unit requires at least one Sub Unit. If the asset is stand alone, please complete the Sub Unit fields with the information relating to that single asset.

To re-allocate units you will need to submit the details using the (reallocation form). This must be submitted in line with the time line section of this document. The provider Data template needed to register new units and to reallocate existing units are published on the website.

EPEX Auction Platform

Sell orders

For the Frequency Response Auction, all sell orders (i.e. for offer of a product) are profile o block orders. A profile block order is defined by:

• one product type (i.e. either LFS or DLH);

• one price limit;

• set of between one and six periods within a single EFA day; and

• a profile: one volume per period, where the volume can be different for every period.

Block orders may be single period (i.e. defined on only one period) or multi-period (i.e. defined on between two and six periods). Multi-period profile block orders can cover at most six consecutive periods of the same EFA day.

Sell orders Glossary

The table below contains explanations to the data that is required when completing sales order template.

Column Title	Explanation
Portfolio	Unit ID as submitted into the Provider Data Template
Bidding Level	Either LFS or DLH depending on which service the unit volume is bidding in for in that EFA block
Order ID	A temporary ID that must be unique across the entire Sell Order file. This is then replaced once the file is successfully uploaded to the Platform. Order IDs are used to link blocks together in a linked family.
Version	Automatically infilled, please leave blank
User ID	Automatically infilled, please leave blank
Block Code	Either C01 for a non-curtailable block (may be a parent in a linked family or may be a standalone block) or C02 for a fully curtailable child block.
Block PRM	Blank for a C01 block, for a C02 block infill the Order ID of the parent.
MAR	Automatically infilled, please leave blank
Price	To 2 decimal places
1-42	Volume for the relevant EFA block in whole MW values

Linked block orders: linked family

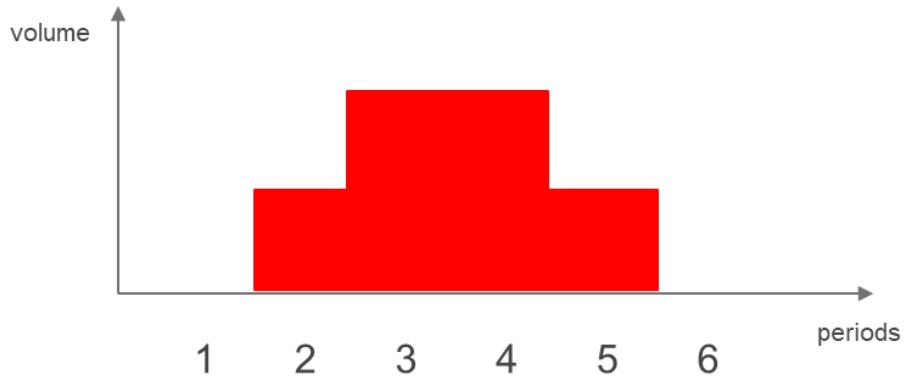
Block orders can be linked together, so that the acceptance of individual block orders can be made dependent on the acceptance of other block orders. The block whose acceptance depends on the acceptance of another block is called “child block”, whereas the block which conditions the acceptance of other blocks is called “parent block”. The block orders, parent and child, (or children) linked together are called a link family.

In the context of the FRA, the link families have a specific pattern:

- There is only one parent per family
- Parent block orders are non-curtailable orders, either single-period or multi-period blocks
- Child block orders are fully curtailable single-period block orders
- Parent and child(ren) have the same product type
- A parent can have more than one child, but at most one child per period. The child or children can be defined:
  - on one of the periods of its parent and/or
  - on the period immediately before the first period of its parent, if within the same EFA day, and/or
  - on the period immediately after the last period of its parent, if within the same EFA day.

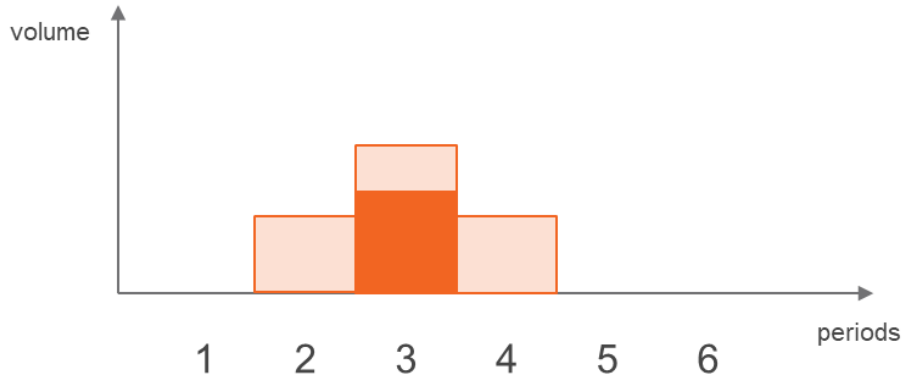
An illustration showing the interaction between parent and child(ren) block orders can be seen below. (Note: In the following examples, non-curtailable (parent) block orders are shown in full opaque colour and fully curtailable (child) block orders in the semi-transparent lighter shade.)

Example: Profile block



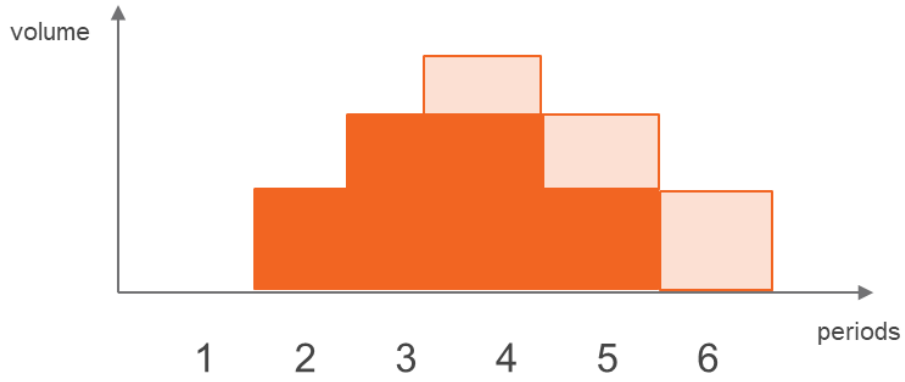
This non-curtailable profile block order spans over 4 periods (over the same EFA day), with possibly different volumes at each period. All periods of the block are either fully executed or fully rejected together, but the execution of this block is independent of other blocks.

Example: Multi-period linked family with a single period parent



Family with a single-period, non-curtailable parent block linked with 3 single-period, fully curtailable child blocks.

Example: Multi-period linked family with a multi-period parent



Family with a multi-period, non-curtailable parent block linked with 3 single-period, fully curtailable child blocks.

EPEXSPOT Algorithm

HELENA is the algorithm developed by EPEXSPOT to clear the Frequency Response Auction and calculate the results of the auction. The HELENA algorithm is a Mixed Integer Linear Program that uses a branch-and-bound algorithm to optimise the matching of the sell orders and buy order.

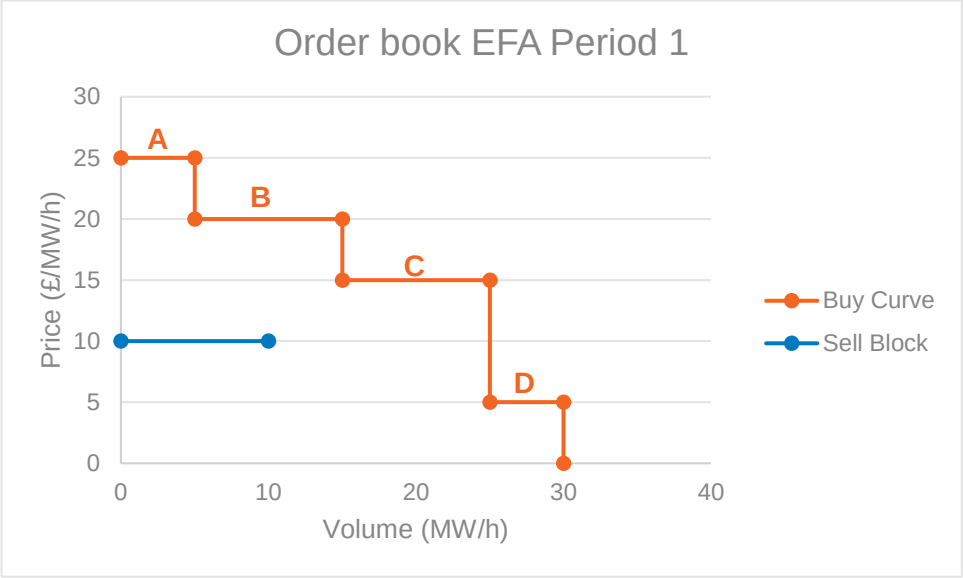
The algorithm determines the Market Clearing Price for each product in each period. The Market Clearing Price is dependent on the price of the highest-priced sell order executed in the auction. When the highest-price sell order is a single-period block order, the Market Clearing Price is the price of this order. When the highest-price sell order is a multi-period block order, the Market Clearing Prices of the periods on which the block order spans, are such that their weighted average is equal to the block order price. There is one Market Clearing Price per product per period.
The auction platform outputs the set of executed orders. For the FRA, prices are output rounded up two digits (e.g. 0.01 £/MW/hr) and volumes (executed quantities) are rounded down with no digits (e.g. 1 MW).

Clearing Conditions for Buy Orders

In the FRA, the clearing of linear demand orders satisfies the following rules:

1. A linear demand order is rejected when the Market Clearing Price is higher than the demand order price. In this situation, the linear demand order remains unmet.
2. A linear demand order can be executed – fully or partially – when the Market Clearing Price is lower than the demand order price.
3. A linear demand order can be rejected, even if the Market Clearing Price is lower than the demand order price, when there is no supply left at this price to meet the demand order.
4. A linear demand order is not executed for a quantity more than the volume limit specified in the order.

The following example illustrates these rules. In this example, the Market Clearing Price is set at 10 £/MW/h which is the price of the sell block order.



This auction would have the following results:

- Buy order A is fully executed and its price is greater than clearing price. It corresponds to rule 2.
- Similarly, buy order B is partially executed and its price is greater than the clearing price. It also corresponds to rule 2.
- Buy order C is rejected although its price is greater than the clearing price. It corresponds to rule 3.
- Buy order D is rejected and its price is lower than the clearing price. It corresponds to rule 1.
- 5 MWh of buy order A are executed given a volume limit of 5 MW/h. It corresponds to rule 4.
- Similarly, 5 MW/h of buy order B are executed given a volume limit of 10 MW/h. It also corresponds to rule 4.
- Orders C and D with unmet quantities are also compliant with rule 4.

Clearing Conditions for Sell Block Orders

Definitions

In-the-money: A block order is said to be in-the-money when the average of the rounded Market Clearing Prices over the relevant hours and weighted by the corresponding executed volume (not converted volume in case of residual auction) is higher than the price limit of the order

At-the-money: an offer block order is said at-the-money when the average of the rounded Market Clearing Prices over the relevant hours (weighted by the corresponding executed volume) is equal to the price limit of the order.

Out-of-the-money: an offer block order is said to be out-of-the-money when the average of the rounded Market Clearing Prices over the relevant hours (weighted by the corresponding executed volume) is smaller than the price limit of the order

Paradoxically Rejected Blocks: Due to block order execution constraints (i.e. fully curtailable or non-curtailable) some sell order blocks can be rejected even if their price limit is below the market clearing price, in which case they are called Paradoxically Rejected Blocks.

Surplus: The surplus of a sell order is defined as the difference between the market clearing price less the order price, times the accepted quantity of the order. Similarly, the surplus of a buy order is defined as the difference between the order price and the market clearing price, times the accepted quantity of the order. A requirement for a positive surplus means that the buy order is not accepted at a price above that the actor is willing to pay, and that a sell order is not accepted below the price that the actor is willing to receive. This definition of surplus can be extended for block orders over multiple periods.

Block order clearing conditions: non-curtailable independent block orders

In the FRA, the **clearing of single period block orders** satisfies the following "**price merit rule**": On a given period, HELENA will favour the execution of single-period orders with the most favourable price (least expensive offer order) when possible.

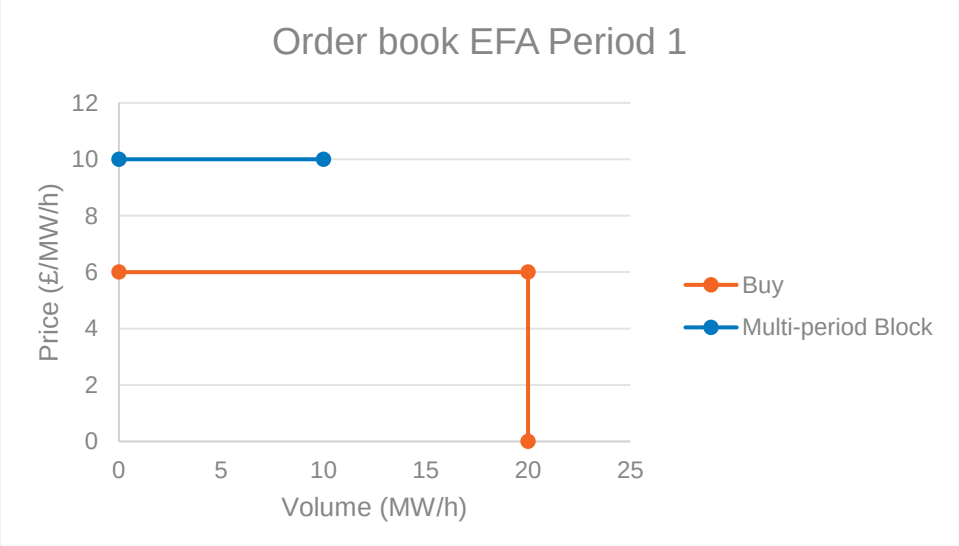
In the FRA, the **clearing of non-curtailable independent block orders** satisfies the following rules:

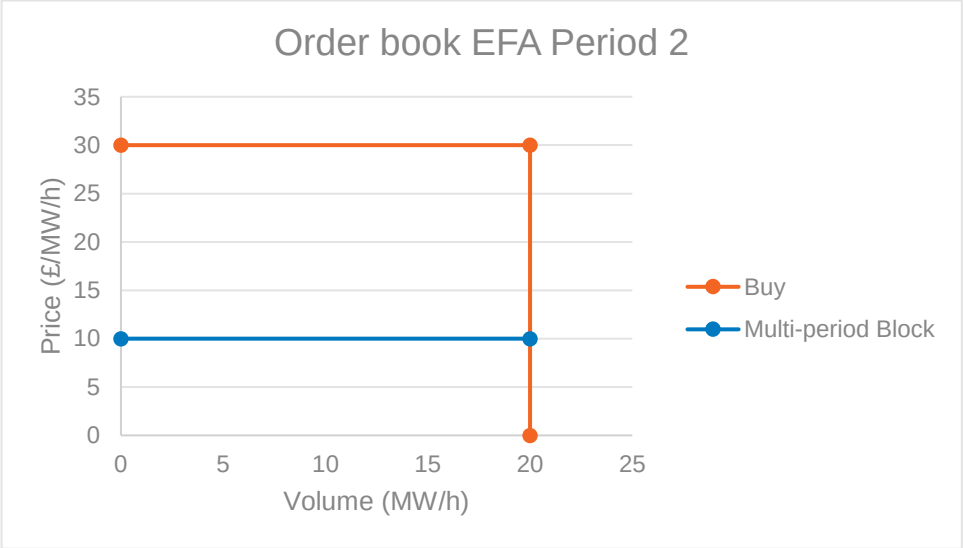
- if the block order is in-the-money, then the block order can be one of:
  - fully rejected (Paradoxically Rejected Blocks),
  - entirely accepted,
- if the block order is at-the-money, then the block order can be one of:
  - fully rejected,
  - entirely accepted,
  - partially accepted
- if the block order is out-of-the-money, then the block order must be entirely rejected (there are no Paradoxically Accepted Blocks)

Example: Clearing of a multi-period block order

In the following example, we will assume the following (simplistic) set-up:

- 2 EFA periods of four hours each
- 1 sell multi-period block order with volumes of
  - 10 MW/h on EFA period 1 and
  - 20 MW/h on EFA period 2
- Multi-period sell order submitted at 10 £/MW/h





The multi-period block order can be accepted if the weighted average of clearing prices on periods 1 and 2 is higher or equal to the price block order.

On period 1, the price can be at most 6 £/MW/h. On period 2, the price can be at most 30 £/MW/h. The weighted average price on periods 1 and 2 is at most 22 £/MW/h (equals 4h * [6 £/MW/h *10 MW/h + 30£/MW/h * 20 MW/h] / 4h * 30 MW/h) and is above the multi-period block order price.

HELENA will minimize the auction clearing prices on periods 1 and 2. A clearing price solution would be:

- 6 £/MW/h on period 1, and
- 12 £/MW/h on period 2.

With this solution, the multi-period block order would be executed “at the money”.

Block order clearing conditions: Linked block orders

In the FRA, the **clearing of linked families** satisfies the following rules:

- A child block which is out-of-the-money cannot be accepted (see example 1 below)
- A child block cannot be accepted in case its parent is rejected (see example 2 below)
- A parent block which is out-of-the-money can be accepted in case its child blocks provide sufficient surplus to at least compensate the loss of the parent. (see example 3 below). When executed, the surplus of a family is non-negative.

In an easy common configuration of two linked blocks, the rules are easy. The parent can be accepted alone, but not the child that always needs the acceptance of the parent first. The child can “save” the parent with its surplus, but not the opposite.

In the following examples, we will assume the following (simplistic) set-up:

- 2 EFA periods of four hours each
- 1 sell parent block of 10 MW/h submitted at 10 £/MW/h on EFA period 1
- 1 sell child block of 10 MW/h submitted at 20 £/MW/h on EFA period 2

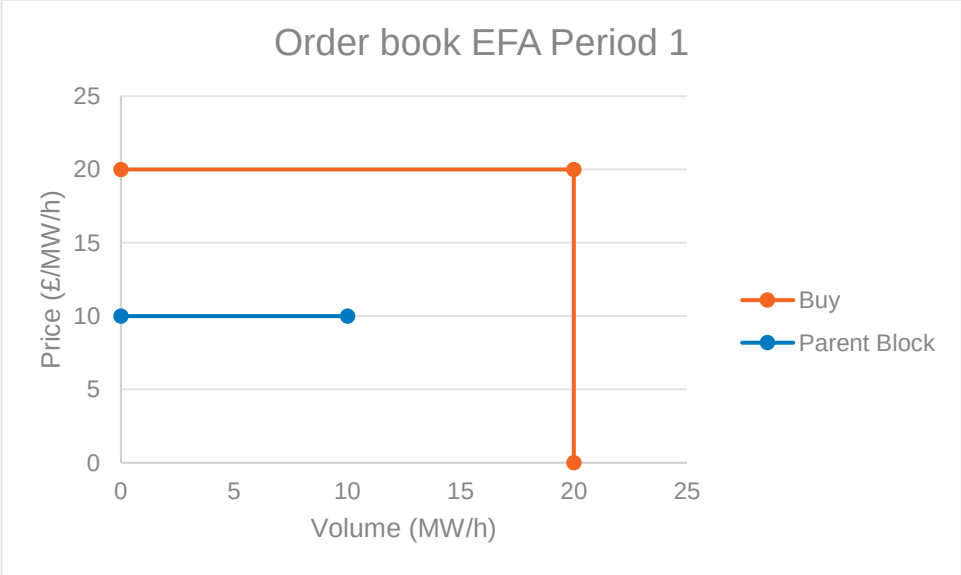
Example 1: A child block which is out-of-the-money cannot be accepted

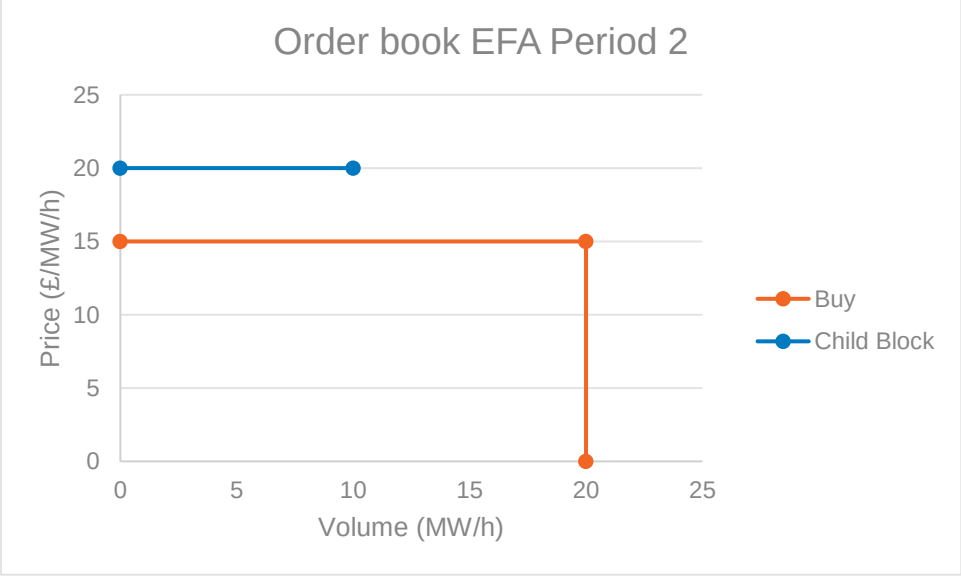
In this example, we will assume that there is:

- One buy order of 20 MW/h submitted at 20 £/MW on EFA period 1
- One buy order of 20 MW/h submitted at 15 £/MW on EFA period 2

The parent order is in-the-money and is accepted.

If the child order were accepted, the family could still generate a non-negative surplus but the child order is not accepted because it is out-of-the-money (price cannot be set above 15 £/MW/h on period 2).





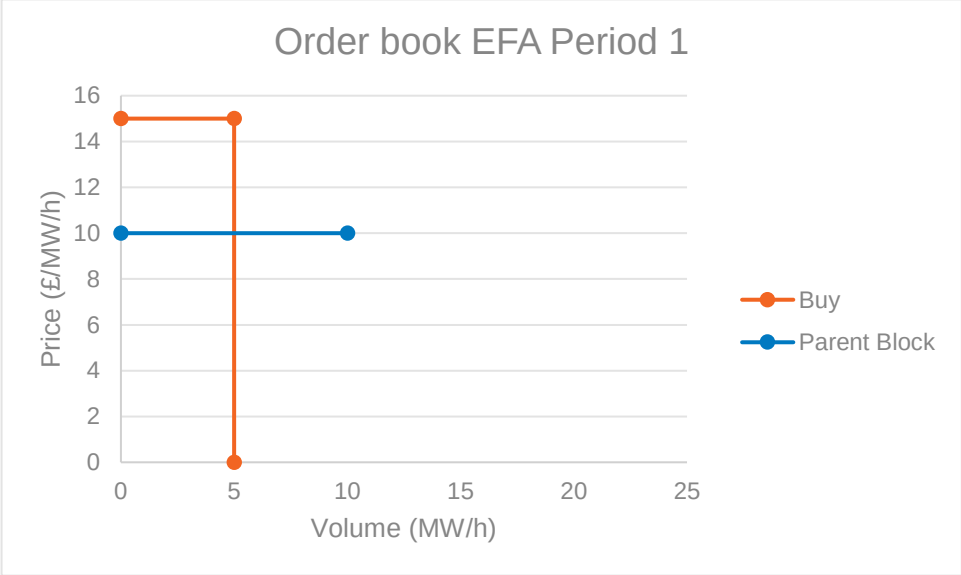
Example 2: A child block cannot be accepted if its parent is rejected

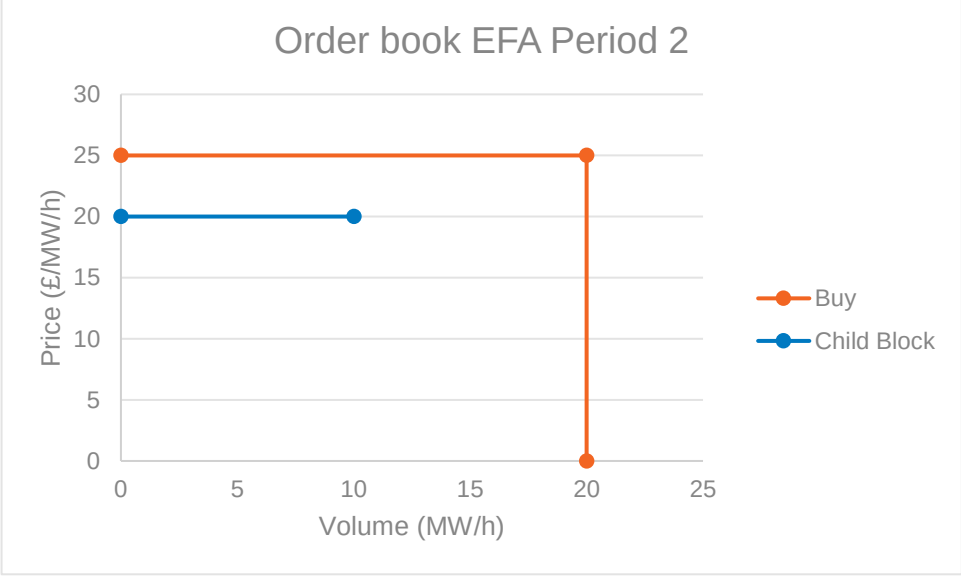
In this example, we will assume that there is:

- One buy order of 5 MW submitted at 15 £/MW on period 1
- One buy order of 20 MW submitted at 25 £/MW on period 2

The parent order is rejected because it is not curtailable and there is no sufficient demand on period 1.

Therefore, the child order cannot be accepted, **even if there is unmet demand at a compatible price.**





Example 3: A parent block which is out-of-the-money can be accepted in case its child blocks provide sufficient surplus to at least compensate the loss of the parent.

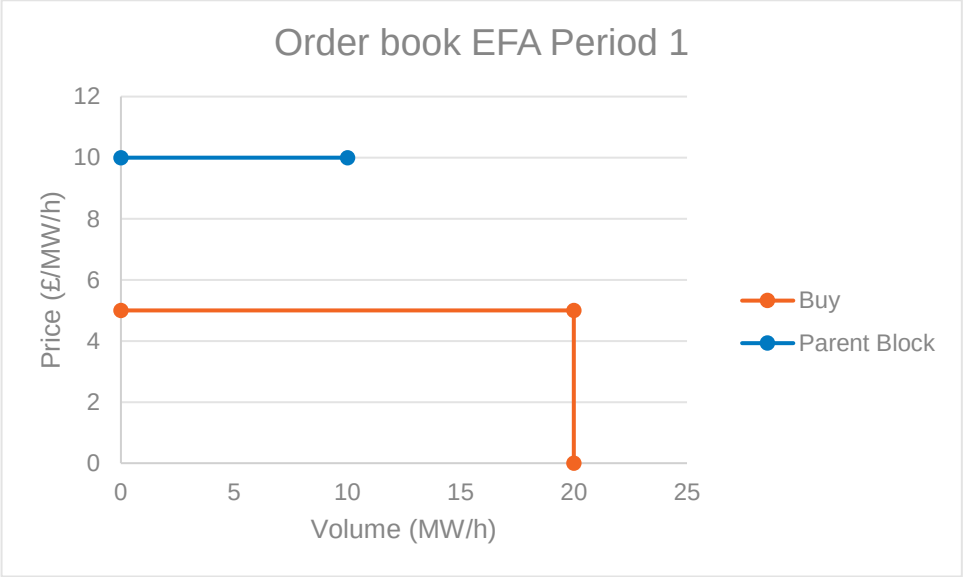
In this example, we will assume that there is:

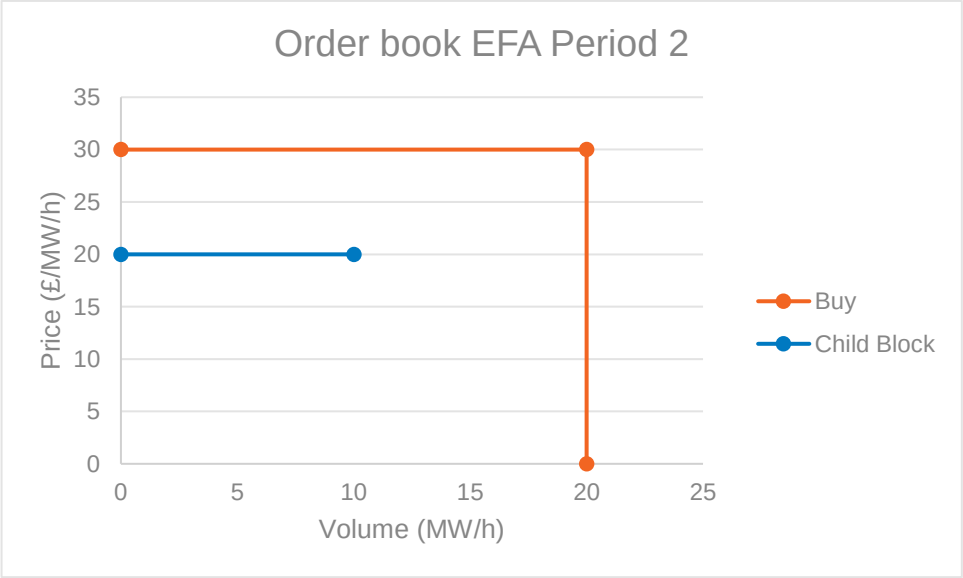
- One buy order of 20 MW/h submitted at 5 £/MW/h on period 1
- One buy order of 20 MW/h submitted at 30 £/MW/h on period 2

On period 1, the price can be at most 5 £/MW/h. The parent order would be out-of-the-money and its acceptance would generate a loss of 4h *10 MW/h * (10 – 5) £/MW/h = 200 £

On period 2, the price can be at most 30 £/MW/h. The child order maximum surplus if accepted is (4h*10 MW/h * (30 – 20) £/MW/h = 400 £) which is higher than the loss generated by the possible acceptance of the parent.

Thus, the parent block which is out-of-the-money can be accepted because its child block can provide sufficient surplus to at least compensate its loss.





End of guidance note