

# Overview of the awarding principles of the FCR cooperation

## Abbreviations

BSP	Balancing Service Provider
CBMP	Cross Border Marginal Price
CCS	Central Clearing System
GCT	Gate Closure Time
GLEB	Guideline on Electricity Balancing
LMP	Local Marginal Price
LMPe	Local Marginal Price of exporting country
LMPI	Local Marginal Price of importing country

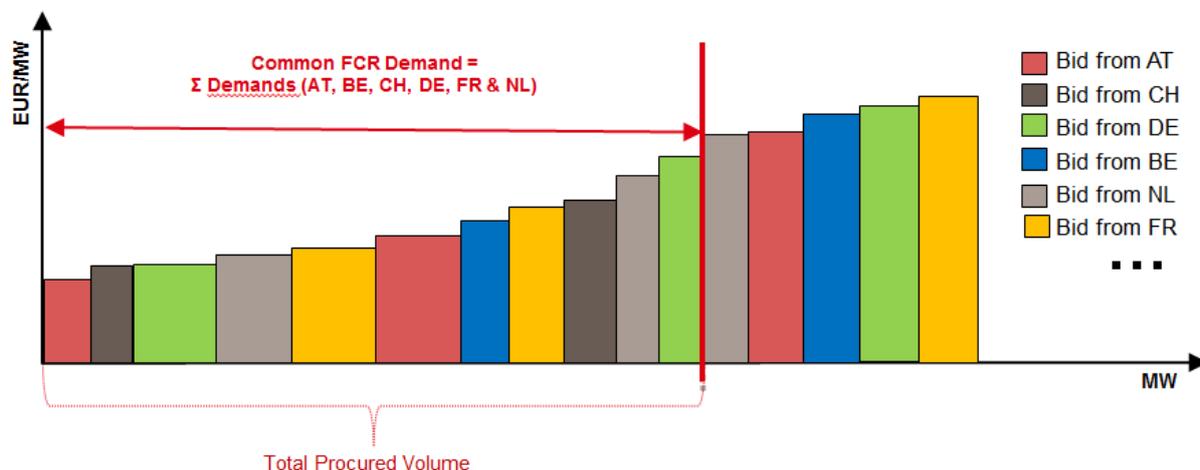
## 1. Product information on FCR

The Austrian, Belgian, Dutch, French, German and Swiss TSOs currently procure their FCR in a common market. The product characteristics in the cooperation are defined as follows:

- Symmetric product (meaning that upward and downward FCR are procured together)
- Duration of product delivery: Daily.
- TSOs allow divisible and indivisible bids. Indivisible bids can have a maximum bid size of 25 MW in all the participating countries.
- Minimum bid size is 1 MW and resolution is 1 MW as well.
- Core shares and export limits exist as limitations in the FCR market.

## 2. General optimization principle

For each country a core share is defined which represents the minimum volume of FCR which has to be procured from technical units of Balancing Service Providers (BSPs) within the borders of the LFC block. For each country, an import and export limit are defined which give an indication on how much FCR can maximally be imported from or exported to other LFC blocks of the cooperation.



All TSOs procure their required FCR demand in separate, market-based tenders on working days. GOT of the tenders is in D-14. After GCT of regional tenders (Mondays to Fridays at 15:00 CET), the bids are sent to a Central Clearing System (CCS). The CCS then calculates the optimal combination of bids to be awarded under consideration of local core shares and the maximum exchangeable

volumes (import and export limits of a country) with the goal to reduce total procurement cost of the cooperation. Results are then published latest at 16:00 CET, one hour after GCT.

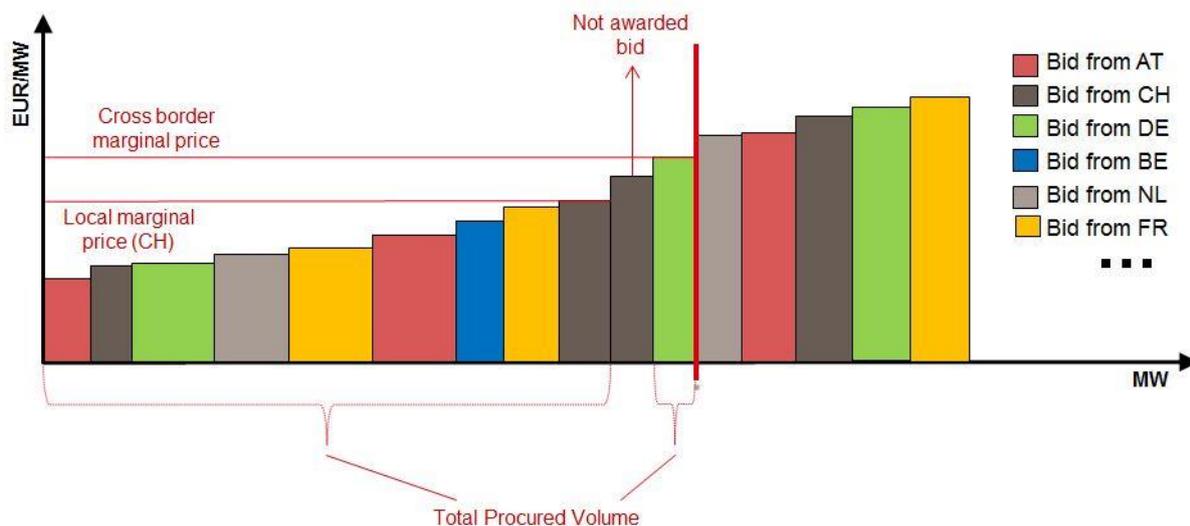
If no import and export limits are hit, one common marginal price (CBMP) will be determined equaling the most expensive awarded bid in the overall cooperation. Every BSP offering FCR in the cooperation will therefore receive the same settlement price per MW, local marginal prices (LMP) of each LFC block are therefore equal to the CBMP.

Exceptions from having one CBMP may occur once import or export limits of one or more countries of the cooperation are hit. In this case, an LMP will be determined based on the local bids within a region.

## 2.1 Case of hitting an export limit

If the export limit of a country is hit, then the local marginal price of this country is the price of the most expensive awarded bid of this country (LMPE). This LMPE is always less than or equal to the CBMP.

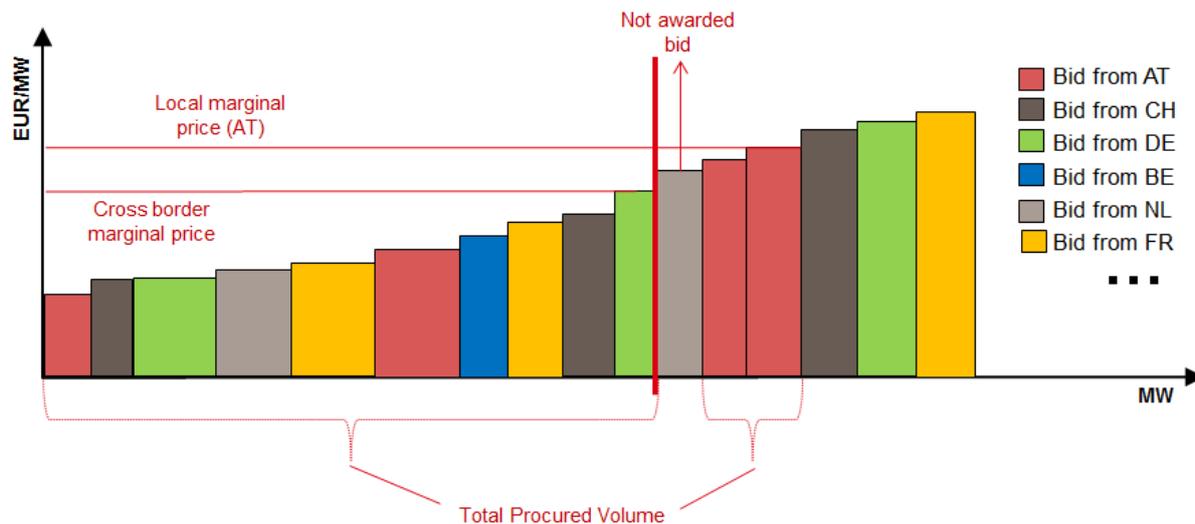
In the following illustration, Switzerland not only covers its core share but also receives high shares of cost-efficient bids within its own borders. In the example below, one Swiss bid is not awarded due to the before-mentioned limitation, even though it is still offered at a lower price than the CBMP. The LMPE is consequently set at a lower level as the CBMP and equals the highest awarded Swiss bid.



## 2.2 Case of hitting an import limit

In analogy to the case of hitting an export limit, an import limit can be hit. If this is the case, then the marginal price of this country is the maximum price of the accepted offers of this country (LMPi). This LMPi is always greater than or equal to the CBMP.

In the example below, the optimization algorithm finds an optimal solution once Austria imports volumes of FCR up to its import limit is reached. It therefore needs to procure the remainder from local bids whose price might lie above the CBMP. In many cases, there are even non-awarded cheaper bids from other LFC blocks. The LMP of Austria is therefore determined to equal the highest awarded Austrian bid.



### 2.3 Case of several optimal solutions

If there is a set of optimal solutions, the solution maximizing the producer surplus (i.e. the area between the marginal price and individual bid prices) is selected.

If then there is still more than one optimal solution, the bids which have been submitted first are prioritized.

### 2.4 Divisible and indivisible bids

The optimization algorithm allows the declaration of two different types of bids: Divisible and indivisible bids. Whereas indivisible bids can only be fully accepted or not accepted at all, any quantity between zero and the offered quantity of a divisible bid can be accepted under the condition that the accepted quantity is a multiple of 1 MW.

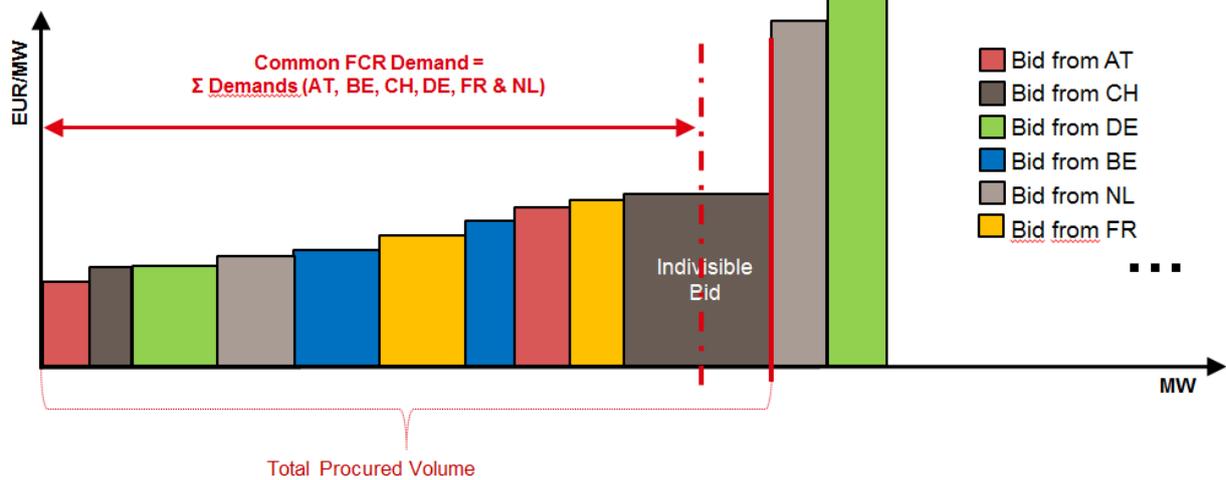
These two types of bids are treated differently by the algorithm. Indivisible bids can be “paradoxically rejected” meaning that a bid is rejected although the offered price was lower than the Local Marginal Price of the LFC block where it was submitted. Indivisible bids can be rejected if their awarding would not reduce the overall procurement cost and would lead to paradoxically rejected bids. This must not happen with divisible bids.

To sum up:

Indivisible bids are only selected if they improve the overall result of the optimization outcome.

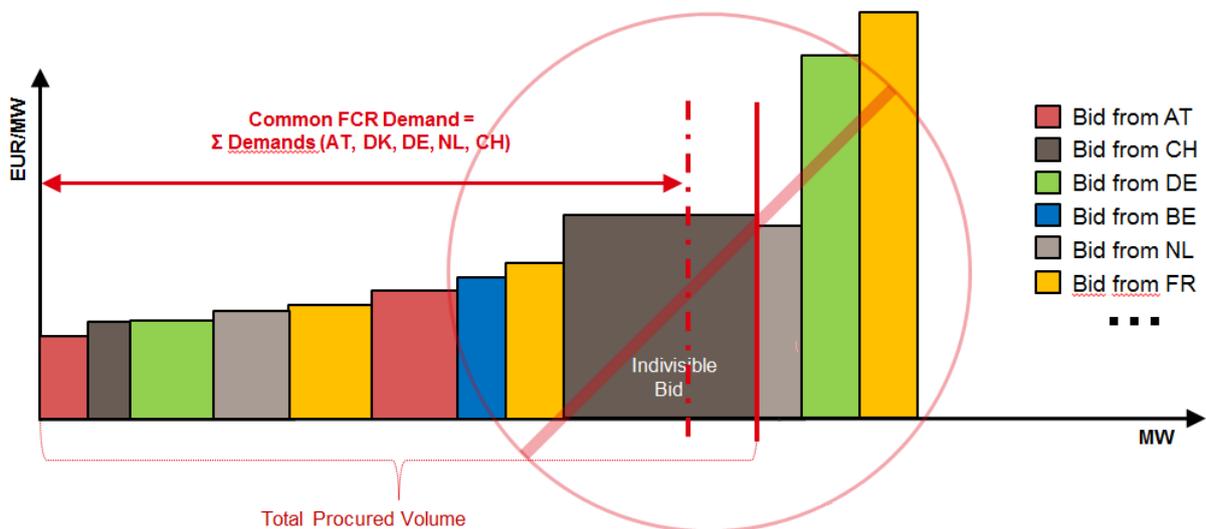
### 3. Case of over procurement because of an indivisible bid

The occurrence of indivisible bids can also lead to an over procurement of the cooperation. If it minimizes total procurement cost pursuant to Article 58(3) and (4) GLEB, the total awarded quantity in a country can – in exceptional cases – be higher than its demand plus export limit, whereby the quantity exceeding the demand plus export limit cannot be used for the coverage of the total volume of the cooperation. In this case, the sum of all awarded volumes over all countries is larger than the total demand (over procurement).



However, the acceptance of an indivisible bid must never prevent the acceptance of a cheaper divisible bid and therefore prevent paradoxically rejected divisible bids.

As an example, if there are only two bids offered in country A (with a core share of 20 MW), a low-price divisible offer of 10 MW and an indivisible high-price offer of 20 MW, both bids have to be fully accepted in order to satisfy the core share (and prevent paradoxically rejected divisible bids).



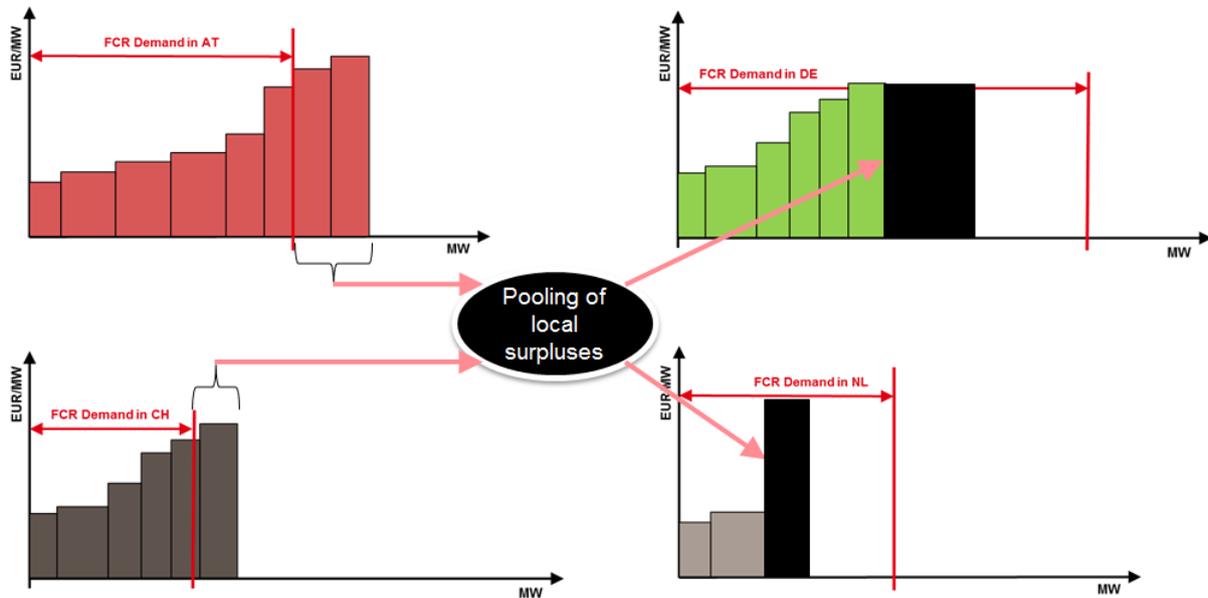
This rule also holds for bid sizes of 1 MW which are declared as indivisible by the BSP, even though such a bid complies with the minimum bid size and cannot be further divided.

Recommendation: Do not declare bids with a size of 1 MW as indivisible!

## 4. Case of under procurement

### 4.1 Shortfall of total FCR demand in the cooperation

If the total FCR demand of the cooperation cannot be covered by the overall volume of bids, all local bids stay with the country where they are submitted (connecting area). If local surplus exists, it is pooled and distributed among the cooperation, proportionally to their demand. However, export limits and core shares must be still respected. Remaining missing volumes have to be procured locally.



### 4.2 Insufficient coverage of core share of a country

If a core share of a country cannot be covered by the volume of bids of a country, the core share shall be covered as much as possible with the bids of its own country and the rest of core share, which cannot be fulfilled by the bids of its own country remains as the deficit of FCR of that country.