

# **Public consultation on “FCR cooperation” potential market design evolutions**

2 January 2017

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# 1. Introduction

## 1.1 Description of the FCR cooperation

To support the implementation of the Electricity Balancing Guideline (EB GL), several pilot initiatives have been set up. The common market for procurement and exchange of Frequency Containment Reserve (FCR) constitutes such a project. The Austrian, Swiss, Dutch, Belgian, and German TSOs currently procure their FCR in a common market<sup>1</sup>. Extension towards France is planned mid January 2017 and extension towards Denmark is currently foreseen.

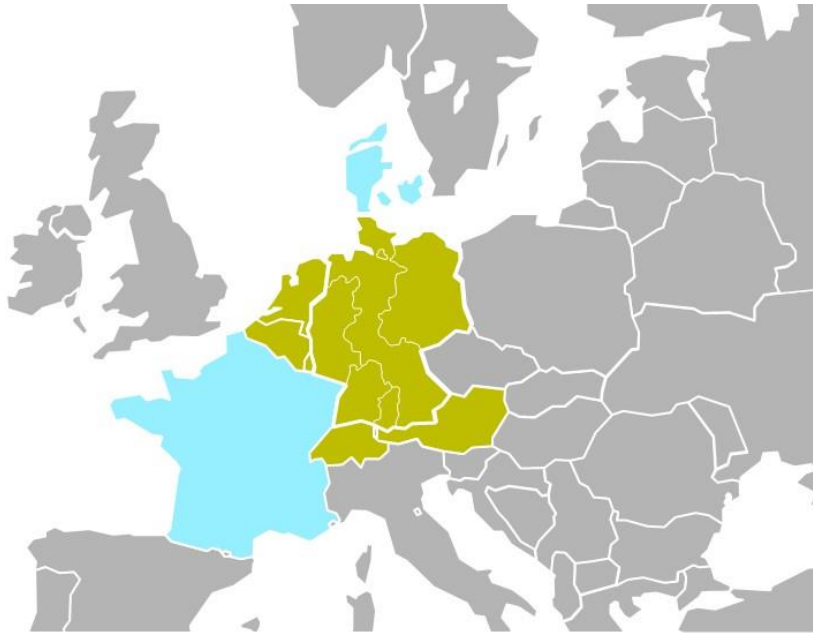


Figure 1: FCR cooperation map

The FCR cooperation is a weekly auction with only one product i.e. a weekly symmetric product. The auction takes place on Tuesday afternoon and applies for the next delivery week.

The cooperation is organized with a TSO-TSO-model<sup>2</sup>, where the FCR is procured through a common merit order list where all TSOs pool the offers they each received. The interaction with BSPs and the contracts between the TSOs and BSPs are handled on a national basis.

<sup>1</sup> In Belgium and the Netherlands, a part of FCR balancing capacity is currently procured through a national tender. In Denmark, a part of FCR balancing capacity is procured through a long term contract with Norway.

<sup>2</sup> See " Guideline on Electricity Balancing"  
[https://ec.europa.eu/energy/sites/ener/files/documents/informal\\_service\\_level\\_ebgl\\_10-10-2016nov.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/informal_service_level_ebgl_10-10-2016nov.pdf)

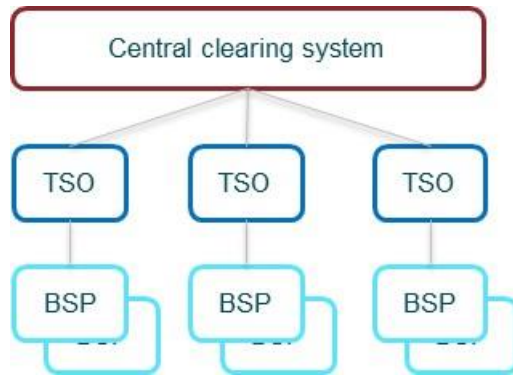


Figure 2: FCR cooperation is built according to a TSO-TSO model

Each TSO defines a bidding platform the BSPs in its Control Area should use to place their bids:

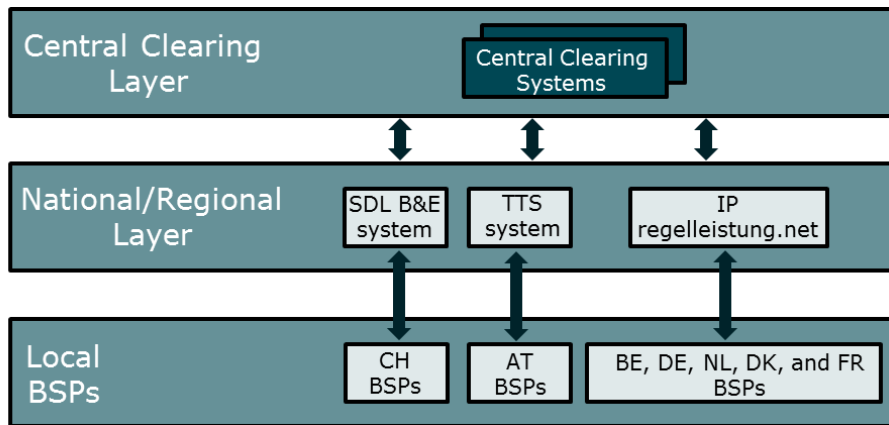


Figure 3: FCR bidding platforms configuration

The contracted FCR volume in the FCR cooperation is the sum of each TSO FCR demand. The offers are selected with an algorithm which minimizes the total procurement cost, while respecting FCR import/export limits per country. The following graph represents the import/export limit in MW per country according to system operation guidelines based on 2017 values<sup>3</sup>. The values in purple for each country represent the FCR volume in MW procured in the FCR cooperation for each country based on 2017 values<sup>4</sup>.

<sup>3</sup> These values represent the System Operation Guideline limits. The actual import/export limits can be lower, such as for 6 months after France coupling (France FCR imports limited to 30% of RTE FCR demand, and FCR exports limited to 15% of RTE FCR demand).

<sup>4</sup> The values procured by BE, DK & NL in the FCR cooperation are lower than their total FCR need, since a part of the FCR need is procured through different mechanism. BE demand is variable.

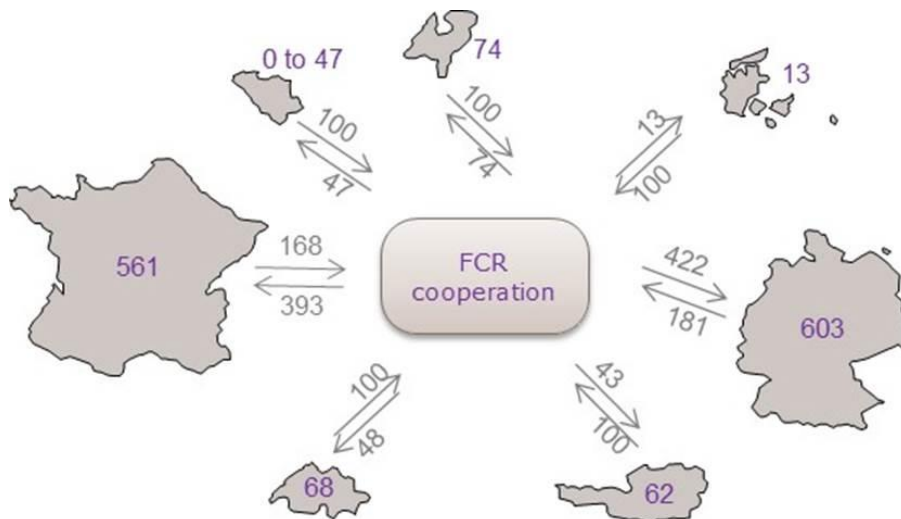


Figure 4: FCR import/export limits per country according to SO GL (Year 2017)

## 1.2 Legal framework

The common market is a voluntary collaboration among the TSOs, but requirements for FCR are governed by the System Operation Guideline (SO GL) for the technical related topics and EB GL for the market related topics.

Each LFC<sup>5</sup>-block is obliged to procure a certain amount of FCR, which is fixed on a yearly basis. In addition, Operational Handbook (OH) Policy 1 today as well as the SO GL stipulate import and export limits on the crossborder exchange of FCR, which means part of the reserves still need to be provided/kept locally. The scope of the present consultation is covering the common market for FCR. This means that this public consultation does not cover national procurement of FCR, where it is in place.

In the informal service level version of the EB GL provided by the European Commission for the October 13<sup>th</sup> 2016 Cross border Committee meeting, several provisions directly impact the FCR cooperation consultation process:

- Article 3 defines the objectives to be pursued
- Article 4 defines the TSOs process for making joint proposals
- Article 5 defines the NRAs joint approval process and rules
- Article 10 defines the public consultation rules
- Articles 32, 33 and 34 define the high level principles for the exchange of balancing capacity.

The TSOs will make their best endeavours to respect all these draft provisions before the entry into force of the EB GL.

## 1.3 Consultation objective

With the ongoing changes in the technology mix, e.g. increased share of renewable, demand side response, and storage technologies, TSOs and NRAs decided to assess the current status of the cooperation and study the possible market design evolutions. The assessment aims at clarifying if the current market design is sufficient or if changes are justified. When considering changes to the market design, the TSO's objectives are facilitation of participation of all technologies including new entrants, increased competition, European integration of balancing markets, and increase of social welfare, level playing field to the ex-

<sup>5</sup> Load Frequency Control

tend possible. The objectives must be met under consideration of secure grid operation and security of supply.

### 1.4 Consultation content

The TSOs and NRAs are specifically interested in stakeholder’s input on six main topics that together constitute the market design. Within each of the six main topics, there are several sub-topics. Interdependencies between the topics may exist and TSOs also are keen to know stakeholder’s input on these interdependencies. An overview of the topics where stakeholder input is welcome, is illustrated in the figure below.

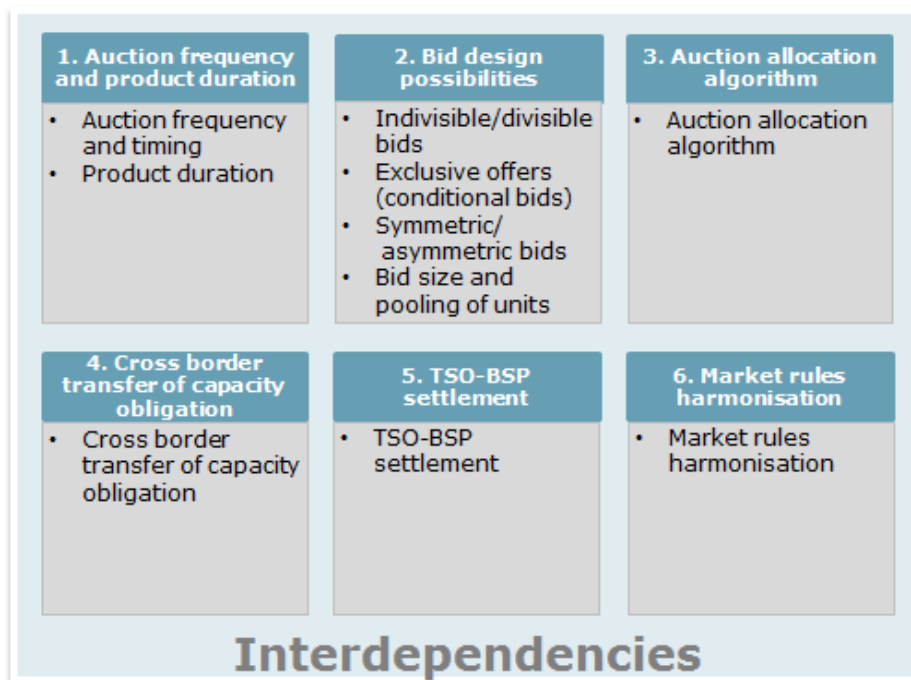


Figure 5: Overview of topics that will be investigated in future market design options.

This document describes each of the topics in detail and specific questions aimed at stakeholders are presented (highlighted in boxes). TSOs encourage stakeholders to answer the questions and explain their answers.

### 1.5 Overall process

The process of this consultation is based on a close cooperation between all the TSOs and NRAs of the involved countries.

TSOs conducted a joint workshop in October 2016 where approximately 50 participants attended. The objective of this workshop was to present to perimeter of the consultation to the stakeholders and gather initial feedback. These valuable feedbacks have been integrated in the present consultation document.

After the public consultation, TSOs will make a joint implementation roadmap proposal to the NRAs, based on the received comments. NRAs will then jointly assess TSOs proposal. Due to approval and implementation time, the earliest market design changes are expected in 2018, but could also occur later in case of important implementation effort for TSOs & stakeholders.

The timeline for 2017 is indicative, regarding the timing of joint NRA approval. TSOs plan to submit the proposal for implementation to NRAs by May 15<sup>th</sup>, 2016.



Figure 6: Consultation timeline

### 1.6 Disclaimer regarding public consultation

The TSOs stress herewith that the present public consultation does not represent a binding commitment from the TSOs to implement the consulted topics. The results of the present consultation will be considered by the TSOs when making a proposal to the NRAs. The aim of the present consultation strives at developing the market further in consideration to the answers of the market participants and the requirement of the TSOs, providing maximum security, increasing European social welfare, ensuring fair competition, being compliant with all regulatory requirements, considering technological developments and changing market conditions.

Several items addressed in this public consultation require a deeper analysis concerning the technical feasibility and applicability from the side of the TSO, amongst other with regards to the grid and supply security and security of operation as well as the currently applied concept of the load frequency control and regulation.

In each section the TSOs provide a first analysis on each market design topic, taking into account the feedback gathered in the October 2016 FCR workshop. Stakeholders are invited to criticize and complement these first analyses.

### 1.7 Consultation logistics

The consultation lasts 5 weeks.

Consultation answers can only be submitted through the ENTSO-E consultation interface. TSOs will only consider submissions in the predefined question fields. In case of any question regarding ENTSO-E consultation interface, please contact [market@entsoe.eu](mailto:market@entsoe.eu).

The TSOs will organize national meetings or teleconferences with stakeholders during the consultation period in order to answer any question regarding the public consultation.

In case of any question regarding the public consultation, please contact your local TSO representative:

Country	Contact email
AT	<a href="mailto:frontoffice.sdl@apg.at">frontoffice.sdl@apg.at</a>
BE	<a href="mailto:usersgroup@elia.be">usersgroup@elia.be</a>
CH	<a href="mailto:sdl-ausschreibung@swissgrid.ch">sdl-ausschreibung@swissgrid.ch</a>
DE	<a href="mailto:kontakt@regelleistung.net">kontakt@regelleistung.net</a>
DK	<a href="mailto:info@energinet.dk">info@energinet.dk</a>
FR	<a href="mailto:marketservices@rte-france.com">marketservices@rte-france.com</a>
NL	<a href="mailto:PCR@tennet.eu">PCR@tennet.eu</a>

## 1.8 Introduction question

General questions to stakeholders:

1. Could you briefly present your company or association and its involvement in the FCR market (volume, technologies...)?
2. Do you have some general comments on this public consultation?
3. Do you have some comments regarding the consultation process?

## 2. Auction frequency and product duration

### 2.1 Introduction

Some of the main parameters of the market design are the lead time, product duration, and the auction period. The lead time is the period between the moment when the auction is performed until start of delivery of the product. Product duration is the time period for which a product has to be delivered. And auction period is the entire delivery time covered by the auction, which could be several product durations. The relations among the three parameters are illustrated in the figure below.

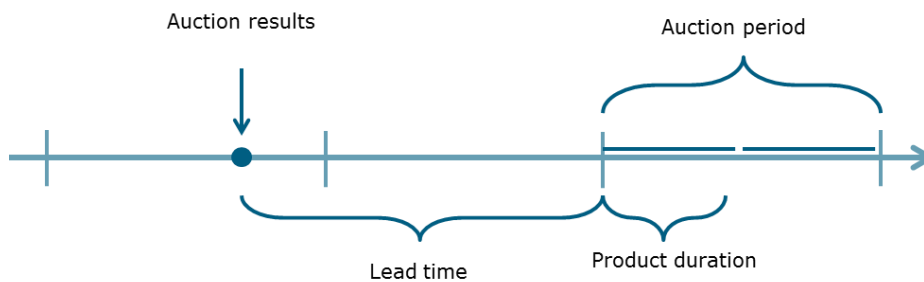


Figure 7: General concept: Main parameters of the market design

The current market for FCR within the co-operation is based on weekly procurement with both auction period and product duration of one week (Monday to Sunday = 168h). Gate opening is usually<sup>6</sup> Friday (D-10 at 12:00) i.e. two weeks before the auction period, while gate closure is usually<sup>6</sup> Tuesday the week before the auction period (D-6 at 15:00).

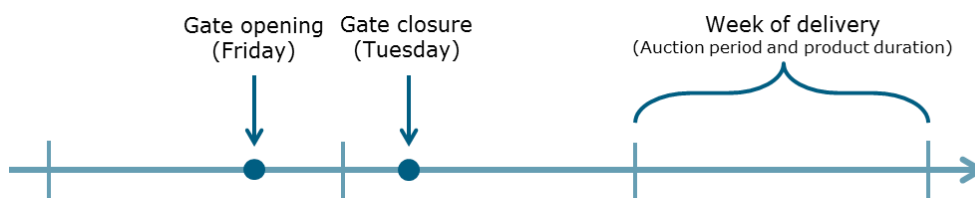


Figure 8: Currently applied FCR procurement cycle

<sup>6</sup> Auction calendar is defined year ahead and takes into account bank holidays



## 2.2 Auction frequency and timing

### 2.2.1 Introduction

Auction frequency refers to how often the auction is carried out while auction timing refers to the lead time and thereby the time for gate closure (GCT). The two parameters are interlinked, since increased auction frequency often leads to GCT closer to the time of delivery i.e. shorter lead time.

### 2.2.2 Options description

Option 1: weekly (status quo)

Option 2: daily on all days

Option 3: daily on working days only

Different sub options, with regard to exact gate opening time (GOT) and gate closing time (GCT), exist. For each option, GCT and GOT have to be defined.

### 2.2.3 Analysis

Low frequency of auctions and following long lead times make it difficult for BSPs to manage assets whose FCR capacity is highly dependent on external factors (wind, water, spot prices), because it is hard to accurately forecast those external factors e.g. a whole week ahead. This circumstance may induce that those BSPs have to include a premium in their bid prices. In case of high volatility, premium level may de facto exclude those flexibilities from the market.

High frequency of auctions and shorter lead times on the other hand only secure payment for shorter periods at a time. Additionally, it may increase staff requirement for some BSPs in certain cases (tenders taking place during the weekend). Higher frequencies and shorter lead time may also increase price volatility: prices could be higher for week-end periods and lower for working days.

Since for most BSPs there is a link between FCR delivery and energy delivery, the auction frequency should by preference be aligned with a liquid energy market in order to limit the risks for hedging purposes of BSPs – otherwise an additional price risk premium could be included in the bid prices.

In case of daily auctions, running the FCR market before the spot market allows BSPs to optimise their bidding strategy across all markets. On the other hand, running the FCR market after spot, allows BSPs to take the planned operation of their assets into account when creating their bidding strategy.

Regarding the relative order of the different balancing capacity markets, it is often considered that

(i) markets should not be simultaneous, and that sufficient time between auctions is given to BSPs to take into account the results of the previous market in the bidding of the next market and

(ii) the order of the balancing markets should be:

- the capacity procurement of FCR
- then capacity procurement of aFRR
- then capacity procurement of mFRR
- then capacity procurement of RR and
- then spot market

(in case of interdependencies, markets with highest value should take place first).

TSO considerations when considering lead time are the following:

- In case of capacity scarcity or failure of the auctioning process the TSOs need a time buffer in order to activate their emergency process for FCR procurement
- Procuring FCR after other large, important markets may imply a risk of insufficient FCR volumes if already allocated for other market purposes.

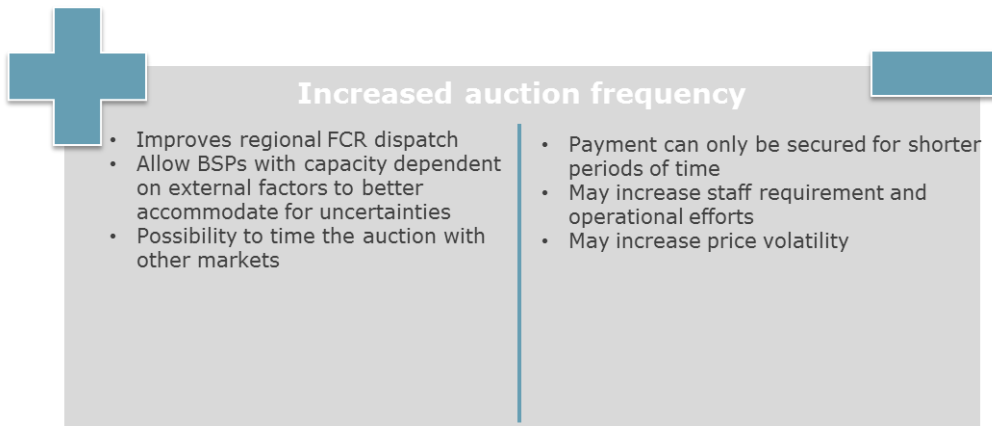


Figure 9: Examples for pros and cons of introducing increased auction frequency

### 2.2.4 Example of how a market design with increased auction frequency could look like

In this example the auction frequency is timed with the spot market, hence, the auction is performed on a daily basis. The lead time may not necessarily be timed with the lead time for the spotmarket, but may be either shorter or longer.

For the sake of the example, the gate closure is chosen to be before the spot-market at D-2 15:00. The market will thereby have the characteristics as depicted in the figure below.

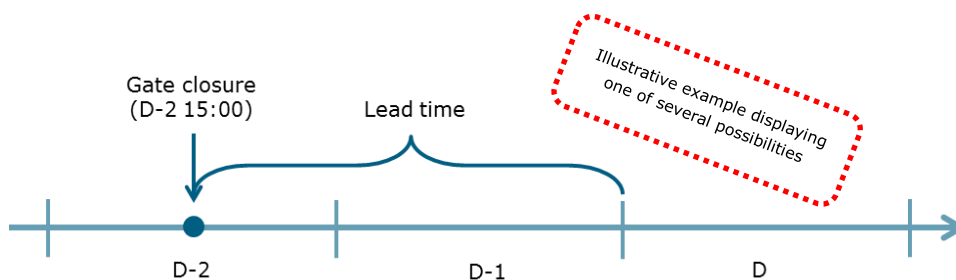


Figure 10: Example of increased auction frequency

### 2.2.5 Questions to stakeholders

Questions to stakeholders regarding auction frequency and timing

4. Do you prefer changing the auction frequency or keeping the weekly auction? – Please explain your answer

5. If you prefer to increase the auction frequency, what frequency would you prefer: daily all days, daily working days only, other...? – Please explain your answer
6. Do you prefer a short lead time (GCT D-1 or D-2) or a long lead time (GCT D-3 up to D-6)? – Please explain your answer
7. In which case would there be benefits of having a relative long period between the GOT and the GCT? – Please detail your answer
8. What are the relevant interdependencies with other markets? What would be the correct sequence according to you? – Please explain your answer

## 2.3 Product duration

### 2.3.1 Introduction

Product duration is closely linked to auction frequency. Increased auction frequency naturally leads to shorter product duration, since the product duration can not be longer than the auction period and thereby the time between two auctions. However, the product duration may be shorter than the auction period, and the auction period thereby be a multiple of the product duration. This is also illustrated in Figure 7.

The current market design has consistency between product duration and auction frequency – weekly auctions and 168h product duration.

### 2.3.2 Options description

The following options could be considered :

- week (168h product) (status quo)
- week peak / offpeak product
- day product (24h)
- 4h product
- 1h product
- other duration

Suboptions exist especially regarding the possibility to link bids in time.

For example, when considering the implementation of week peak and offpeak products there are two sub-options:

- Implementation without links in time:  
two independent auctions:
  - one auction for peak products
  - one auction for offpeak products
- Implementation with links in time:  
one single joint auction with three kind of products:
  - peak
  - off-peak
  - base

Remark: Linking of bids could be made explicit – by creating a separate product duration option (eg. a base product in addition to peak and offpeak products) with the possibility to declare bids mutually exclusive – or implicit, by giving the option to the BSPs to link certain offers together to create a longer product du-

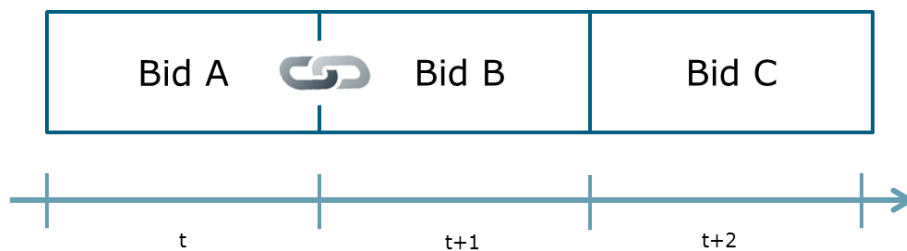
ration (eg. peak and offpeak offers can be offered separately or linked such as either both offers are accepted or none).

It should be clear that the different options depend on the auction frequency since for example hourly products make little sense in weekly auctions.

### 2.3.3 Analysis

Long product durations minimize occurrence of switching of obligation for delivery between different providers (potential operational risk) while at the same time allowing BSPs to secure payment for a longer period of time. On the other hand shorter product durations allow for better alignment with operation due to other markets and guaranteeing capacity for a shorter period of time carries less risk for the BSP. Long products facilitate participation of base assets, while short products facilitate participation of peak or variable assets.

If shorter product duration is implemented, the question of linked bids becomes relevant. By linked bids is meant a situation where a BSP provides two bids that are valid for different points in time, but where the bids are interdependent, so that either both or none of the bids can be selected. This could for example be relevant if peak and off peak products are introduced, since it will allow BSPs to link bids into a base product. This is illustrated in the figure below:



*Figure 11: Example of linked bids. By linking Bid A and Bid B in time, the BSP ensures that either none or both of the bids are accepted. Bid C is independent of Bid A and B.*

Linking bids in time raises the question of bid acceptance criteria and transparency of the algorithm function. This is further discussed in chapter 4.

TSO considerations when discussing shorter product duration are the following:

- Timing of changeover compared with changeover in other markets. TSOs have concerns that some shifts of schedules between BSPs might create or increase deterministic frequency deviations (DFDs)<sup>7</sup>. A stepwise approach may be recommended in case of implementation.

<sup>7</sup> <https://www.entsoe.eu/news-events/announcements/announcements-archive/Pages/News/the-report-on-deterministic-frequency-deviations-root-causes-and-proposals-for-potential-solutions.aspx>

### Shorter product duration

- Allow for better alignment with scheduled operation of the units
- Less risk when guaranteeing capacity over a shorter time period
- Integration of RES and decentralized sources that can not guarantee capacity for long periods of time
- Payment can only be secured for shorter periods of time
- Number of change overs increase
- May increase complexity in bidding strategy and auction algorithm if linked bids are implemented

Figure 12: Example of pros and cons by introducing shorter product duration

#### 2.3.4 Example of how a market design with shorter product duration could look like

This example is based on a market design with daily auctions as described in the example in Figure 10 i.e. daily auctions with gate closure D-2 15:00.

For the sake of the example, the product duration is set to 4 hours, with the possibility to link bids in time. The market will thereby have the characteristics as depicted in the figure below.

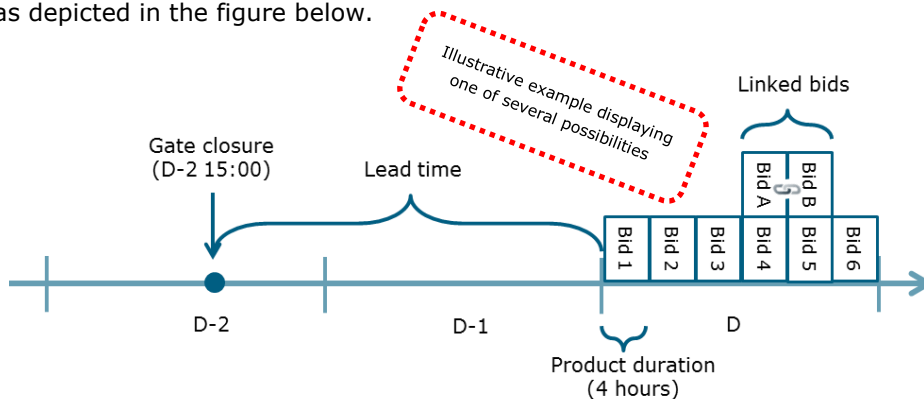


Figure 13: Example of market with linked bids

#### 2.3.5 Questions to stakeholders

Questions to stakeholders regarding product duration

9. What product duration do you prefer: weekly, weekly peak-offpeak, day (24h), 4 hours, 1 hour, other? - Please explain your answer
10. If a shorter product duration would be implemented, would linking of bids in time or having multiple products be an important feature or do you consider that only independent auctions should be implemented? For which product duration does the introduction of linked bids in time make sense to you? - Please explain your answer

### 3. Bid design possibilities

#### 3.1 Introduction

The term *bid design possibilities* refers to the different options BSPs have to design their bid. This market consultation covers the following topics within bid design possibilities:

- Indivisible and divisible bids
- Exclusive offers (conditional bids)
- Symmetric and asymmetric bids
- Bid size

There are generally two approaches to bid design possibilities. One is to limit the number of design possibilities thereby keeping bid structure simple and the auction algorithm and auction results easily understandable. The other is to allow a vast number of design possibilities in order to create flexibility for the BSPs. The flexibility inevitably leads to a more complicated auction algorithm, which often influences the transparency of the auction results. The TSOs encourage the BSPs to have this relation in mind, when answering the questions related to bid design possibilities. The functioning of the auction allocation algorithm is further discussed in section **Fehler! Verweisquelle konnte nicht gefunden werden.**

The current market design has some inconsistencies in bid design possibilities among the countries. This was accepted between TSOs & NRAs to start the common market, but should in the long term be avoided since it leads to unequal conditions and market inefficiency. The inconsistencies are described in the relevant sections below.

#### 3.2 Indivisible/divisible bids

##### 3.2.1 Introduction

Currently there is a difference between the countries of the FCR cooperation with regard to divisible and indivisible bids. Swiss BSPs are allowed to provide indivisible bids, while BSPs in other countries are not. This difference, along with differences in the German and Swiss regulatory frameworks may lead to a decoupling of the FCR cooperation. In case of decoupling, the FCR cooperation is split in 2 separate areas, one with Switzerland and one with Germany. This solution induces a loss of social welfare, but was a way to respect both regulatory frameworks. Decoupling has happened only a few times since April 2015.

One possible outcome of this public consultation could be a proposal for harmonization of rules regarding the divisibility of bids that would effectively solve the decoupling cases. Independent of this consultation, the TSOs are working on measures to avoid decouplings.

##### 3.2.2 Options description

- Option 1: do not allow indivisible bids in the whole cooperation
- Option 2: allow indivisible bids in the whole cooperation, along with divisible bids

In option 2 the maximum allowed volume of an indivisible bid should be defined.

##### 3.2.3 Analysis

The design choice of introducing divisible or indivisible bids is closely linked to BSPs possibilities to ensure cost recovery. With only divisible bids, BSPs need to take the risk of delivering a lower volume into account, when pricing their bid.

This may cause BSPs to add a risk premium to their bid or entirely exclude units that are subject to “must-run-costs” or units with FCR on/off settings only, if they have no alternative way to adjust their position after the auction. Indivisible bids also facilitate the participation of small BSPs, as large BSPs can benefit from portfolio pooling.

On the other hand, not allowing indivisible bids allows keeping the auction algorithm simple and the auction results transparent, since all bids below the marginal bid are accepted either fully or partially.

If indivisible bids are introduced a maximum cap has to be implemented. The GL SO stipulates that not more than 150 MW can be delivered from one unit. This would therefore be the regulatory maximum, but a lower maximum may be introduced. A low maximum value could reduce the occurrence of unforeseen (paradoxically) rejected offers (see chapter 4) and could reduce the risk of possible market distortions but on the other hand reduce the usefulness of introducing indivisible bids. The current maximum allowed volume in Switzerland is 25 MW.

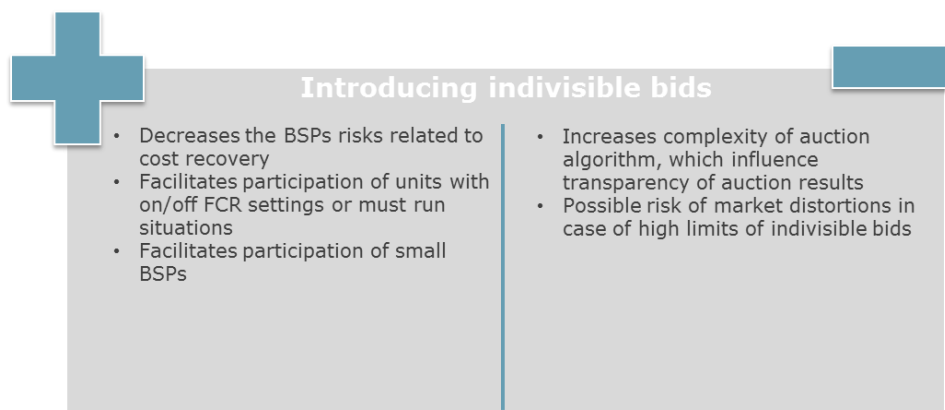


Figure 14: Example of pros and cons by introducing indivisible bids

### 3.2.4 Questions to stakeholders

Questions to stakeholders regarding indivisible/divisible bids:

11. Do you prefer divisible bids only or divisible and indivisible bids? – Please explain your answer
12. In case indivisible bids are introduced, what should be the maximum bid size? - Please explain your answer

## 3.3 Exclusive offers

### 3.3.1 Introduction

Mutually exclusive offers satisfy the following condition: only one (or none) of the exclusive offers can be selected; hence, the selection of a sub-offer belonging to an exclusive offer excludes the activation of the other sub-offers belonging to the same exclusive offer. The exclusive offers can either be

divisible or indivisible. An example of exclusive offers is illustrated in Figure 15. It presents four exclusive sub-offers with (quantities/prices):  $(Q_1/ P_1)$ ,  $(Q_2/ P_2)$ ,  $(Q_3/ P_3)$  and  $(Q_4/ P_4)$ , respectively with the same delivery period. Only one of these offers can be accepted by the algorithm.

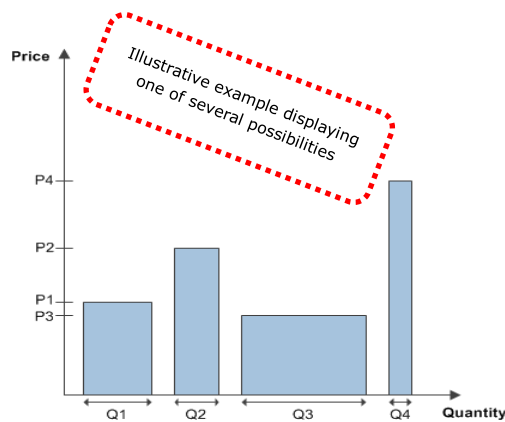


Figure 15: Example of an exclusive offer with 4 sub-offers

### 3.3.2 Options description

Option 1: do not allow exclusive bids in the whole cooperation

Option 2: allow exclusive bids in the whole cooperation

### 3.3.3 Analysis

Exclusive offers provide greater flexibility to BSPs to represent their technical constraints and synergies. On the other hand exclusive offers increase complexity and decrease transparency in the selection of bids.

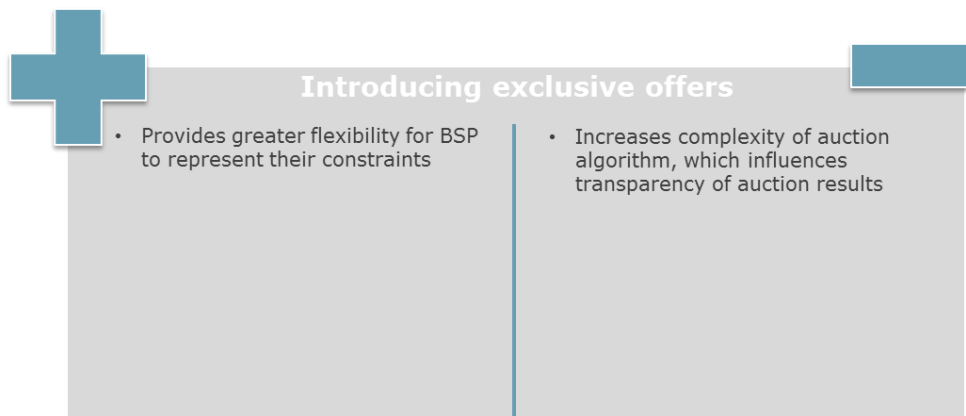


Figure 16: Example for pros and cons of introducing exclusive offers

### 3.3.4 Questions to stakeholders

Questions to stakeholders regarding Exclusive Offers:

13. Should exclusive offers be allowed or not allowed in the whole cooperation?  
 – Please explain your answer



### 3.4 Symmetric and asymmetric bids

#### 3.4.1 Introduction

The current market design only allows symmetric bids, where both upward and downward FCR is procured as one product. Another possibility is to allow asymmetric bids, where upward and downward FCR are procured as separate products.

#### 3.4.2 Options description

Option 1: keep a single auction with only symmetric products (status quo)

Option 2: introduce asymmetric bids in two separate auctions, while not allowing symmetric bids

Option 3: keep a single auction introducing asymmetric bids, while continuing to allow symmetric bids

#### 3.4.3 Analysis

Procuring FCR as a symmetric product allows BSPs to manage the balance of their portfolio over time. Technologies with limited energy reservoir, e.g. batteries, will not only be discharging, but also charging during the time of delivering FCR, thus facilitating their participation in the market. Other technologies, such as electric boilers, RES and demand, benefit from asymmetric products.

If asymmetric bids are not allowed in the auction, BSPs with asymmetric flexibilities have to use pooling or secondary market to create symmetric bids. This is sometimes regarded as a barrier to such developments towards greater flexibility.

Having asymmetric bids raises the question of FCR energy remuneration and BRP imbalance adjustment. When introducing asymmetric bids, without explicit energy remuneration and BRP imbalance adjustment, BSPs would need to take into account in their FCR capacity price the expected activation consequences.

In case asymmetric bids are introduced, the procurement could be carried out in a joint auction or in separate auctions. Separate auctions tend to facilitate the participation of asymmetric flexibilities, while a single auction tends to lead in theory to lower procurement costs.

TSO considerations when considering implementation of symmetric and asymmetric bids are the following:

- TSOs have to take into account asymmetric FCR values per country in their Load Frequency Controllers<sup>8</sup> or do not allow that a different volume of upward and downward FCR is procured in each country.
- The impact on the flows in the grid has to be analysed if a large share of the downwards FCR is placed geographically far away from the upwards FCR

<sup>8</sup> i.e. implementing asymmetric K-factors in secondary controllers. The K-Factor is an essential parameter for every LF controller and reflects the expected activation of FCR, thus any change of FCR capacity leads to a change in the K-Factor (up to now only symmetrical K-factors have been applied)

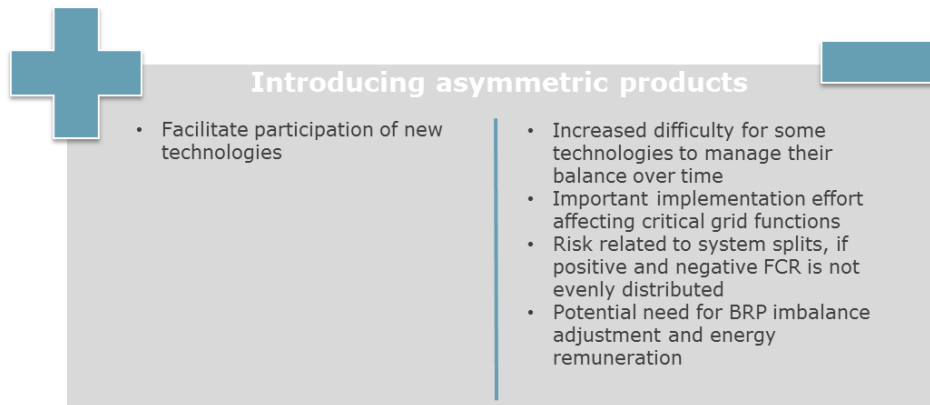


Figure 17: Example for pros and cons of introducing asymmetric bids

### 3.4.4 Example of how a market design with asymmetric bids could look like

In this example, symmetric and asymmetric products are not mutually exclusive. Asymmetric bids could be introduced either by having one auction for upward FCR and one auction for downward FCR, or by having a joint auction with upward, downward and symmetric FCR bids. This is illustrated in the figure below. In this case, the asymmetric bid from BSP B will be matched with the asymmetric bid from BSP C and bids from all three BSPs can be accepted by the algorithm.

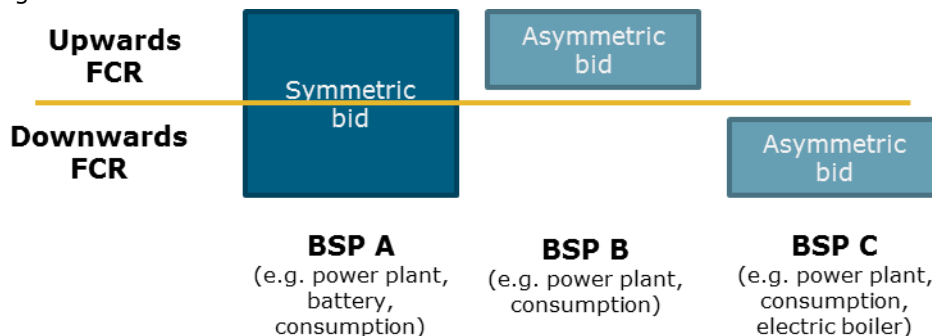


Figure 18: Example of market with both symmetric and asymmetric bids

### 3.4.5 Questions to stakeholders

- Questions to stakeholders regarding symmetric and asymmetric bids
- Do you prefer symmetric bids, asymmetric bids or the possibility for having both? – Please explain your answer
  - If asymmetric bids are preferred, should these be procured in separate auctions for upward and downward FCR or in one auction for both upward- and downward FCR, possibly together with symmetric products?
  - In case of separate auctions - which auction should be carried out first? Or should both auctions take place simultaneously?
  - If asymmetric bids are introduced, would the introduction of energy remuneration and/or BRP imbalance adjustment be necessary?

### 3.5 Minimum bid size and bid resolution

The current minimum bid size is 1 MW and pooling is allowed within all control areas to reach this minimum volume. The resolution for bid acceptance is 1 MW. Currently, the pooling rules differ among the countries. Some countries allow pooling without any limitations, in other countries pooling is limited with certain conditions such as not being allowed to pool consumption and generation. Stakeholders are invited to comment pooling under section 7 of this public consultation.

TSOs would like to stress that cross border pooling cannot be implemented, since it is not compliant with import/export limits set by SO GL.

One could consider reducing minimum bid size and bid resolution. Lower bid size facilitates the participation of smaller BSPs with only one or few assets and no opportunity to pool.

TSO considerations when considering implementation of decreased minimum bid size and resolution are the following:

- Possible difficulty to monitor activation of offers with less than 1 MW

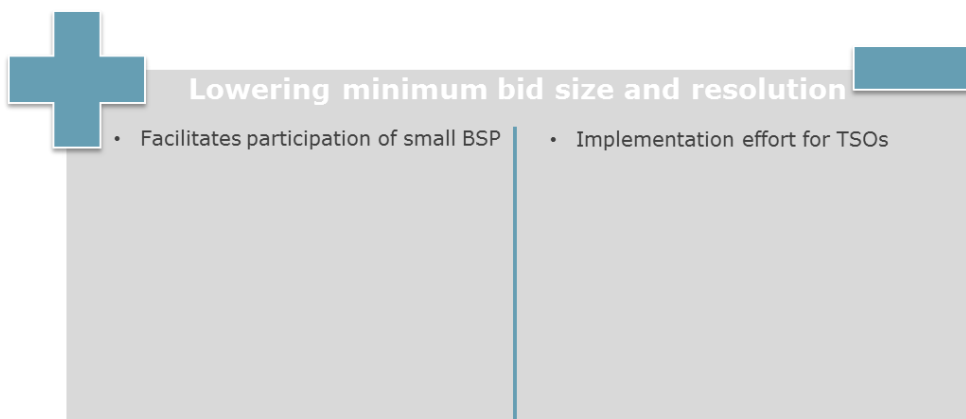


Figure 19: Example for pros and cons of lowering minimum bid size and resolution

Question to stakeholders regarding bid size and pooling

18. Is 1 MW minimum bid size sufficient or would a lower bid size facilitate your participation?

### 3.6 Stakeholders relative preference regarding bid design

Questions to stakeholders regarding bid design:

19. If only one of the following three options would be possible – indivisible bids combined with divisible bids, symmetric bids combined with asymmetric bids, and linking bids in time – what would be most important?

## 4. Auction allocation algorithm

This section will first only focus on indivisible bids handling in volume. The reasoning can then be extended to other bid linking such as bids linked in time and symmetric bids in case of asymmetric products.

### 4.1 Context

The existence of indivisible bids causes that the clearing model differs from a common merit order list. That is, a bid with a lower price can be rejected while an indivisible bid with a higher price is accepted if this results in an overall cost minimisation. An unforeseen rejected bid is a bid which is not (fully) awarded although its price is lower than the marginal price.

#### Basic example of bid selection with indivisible bids:

*TSO demand: 10 MW*

*Bid 1: 7 MW @ 9 €/MW indivisible*

*Bid 2: 1 MW @ 10 €/MW divisible*

*Bid 3: 3 MW @ 11 €/MW indivisible*

*Bid 4: 9 MW @ 12 €/MW divisible*

#### Solution A:

*Bid 1: 7 MW @ 9 €/MW indivisible → fully accepted*

*Bid 2: 1 MW @ 10 €/MW divisible → (unforeseen) rejected*

*Bid 3: 3 MW @ 11 €/MW indivisible → fully accepted*

*Bid 4: 9 MW @ 12 €/MW divisible → rejected*

*Marginal price: 11 €/MW*

*Total procurement cost: 96 €*

#### Solution B:

*Bid 1: 7 MW @ 9 €/MW indivisible → fully accepted*

*Bid 2: 1 MW @ 10 €/MW divisible → accepted*

*Bid 3: 3 MW @ 11 €/MW indivisible → (unforeseen) rejected*

*Bid 4: 9 MW @ 12 €/MW divisible → partially accepted (2 MW)*

*Marginal price: 12 €/MW*

*Total procurement cost: 97 €*

Figure 20: Examples of unforeseen rejected offers handling

If no indivisible (or conditional, linked) bids are allowed, simple price ranking mechanism is sufficient.

### 4.2 Options description

- Option 1: do not allow all kind of indivisible/linked bids and use basic price ranking
- Option 2: allow some indivisible/linked bids, allow both unforeseen rejected divisible bids and unforeseen rejected indivisible bids (solution A in the example above)
- Option 3: allow some indivisible/linked bids, do not allow unforeseen rejected divisible bids and allow unforeseen rejected indivisible bids (solution B in the example above)

Option 2 is basic procurement cost minimisation

Option 3 is in place in EU day-ahead market coupling algorithm

### 4.3 Analysis

#### Option 1:

Option 1 is simple and extremely transparent, but does not allow any kind of indivisible/linked bids.

#### Option 2:

This option maximises short term social welfare (i.e., minimum procurement cost of reserves). Additional transparency is often necessary with this option in order to facilitate the understanding and the anticipation of paradoxical rejection cases. In practice, bidders will be incentivised to offer in smaller steps, in order to avoid being rejected from total cost optimization perspective or from import/export limits perspective.

#### Option 3:

Compared to option 2, option 3 has lower short term social welfare. However option 3, contrary to option 2, guarantees that divisible bids below the marginal price will always be awarded. Therefore it puts more emphasis on the relevance of the marginal price signal and focuses more on long term optimisation. Compared to option 2, option 3 provides greater incentives for BSP not to place indivisible bids if they are able to avoid it, as only indivisible bids can be unforeseen rejected. In addition, option 3 ensures consistency with treatment of indivisible bids in previous timeframes (day ahead market coupling allocation).

### 4.4 Questions to stakeholders

Question to stakeholders regarding algorithm auction allocation algorithm

20. How do you see the possibility to create different bid structure compared to the need for easily understandable results?

21. Please rank the three options in decreasing preference order – Please explain your order preference.

## 5. Cross border transfer of capacity obligation

### 5.1 Introduction

Cross border transfer of capacity obligation means the possibility for a BSP to transfer its obligations contracted after the auction to a BSP in another country. Transfer of capacity is also referred to as *secondary market*. It allows BSPs to either manage unexpected situations, adjust their position or exchange products with different duration that TSOs procure in the primary market.

National transfer of balancing capacity is currently allowed in Belgium, the Netherlands and France. Introducing cross border transfer would imply introducing national transfer in those countries currently not allowing national transfer today.

The latest version of EB GL (article 34) contains provision applying to the transfer of balancing capacity: TSOs should allow cross border transfer of balancing capacity up to at least 24 hours before the delivery day.

Transfer of capacity obligation differs from pooling:

- (i) transfer can be done between different BSPs and
- (ii) transfer has to be explicitly notified and accepted by the TSO before delivery.

### 5.2 Constraints to be considered

In all cases, cross border transfer must respect the FCR import/export limit per country defined in SO GL. For example if Switzerland is already exporting 100 MW FCR (which is the maximum FCR export value for Switzerland), a Dutch BSP cannot transfer its obligation to a BSP in Switzerland. It means that an allocation process of these FCR import/export limits has to be set up. One could think of "first come first serve" allocation as a starting point as it is the most simple process to set up.

If a BSP transfers its FCR obligation to a BSP in another country, the TSOs will have to coordinate and adjust their Load Frequency controller settings<sup>9</sup>. TSOs need a sufficient lead time to perform this coordinated adjustment. The gate closure for cross border transfer of capacity obligation will therefore be governed by the required leadtime (which should be defined).

In case of cross border transfer, the respective liabilities between BSPs and TSOs<sup>10</sup> have to be defined, taking into account that there are no cross-border BSP-TSO contracts. It should be underlined that as a consequence, countries having a penalty regime based on bid prices may have to adapt their penalty regimes.

### 5.3 Options description

- Option 1: do not allow cross border transfer of capacity obligation (status quo)
- Option 2: allow cross border transfer of capacity obligation

In case of option 2 there exist different implementation sub-options. The main sub-option concerns the allocation process needed to respect the import/export constraints per country.

<sup>9</sup> Changing the K-factors in load frequency controllers

<sup>10</sup> (BSP-BSP liabilities, BSP-TSO liabilities, TSO-TSO liabilities)

## 5.4 Analysis

Cross border transfer of balancing capacity could improve regional FCR dispatch, improve the management of outages and allow BSPs to exchange complex bids while keeping the auction simple. It can be expected that the closer the auction is to real time and the shorter the products, the lower would be the expected benefits of allowing cross border transfer of balancing capacity.

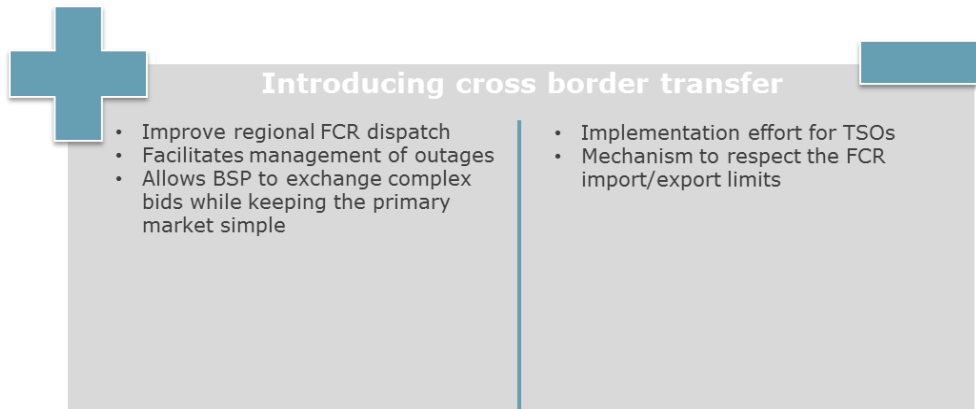


Figure 21: Example for pros and cons of introducing cross border transfer of capacity obligation

### 5.4.1 Example of how a market design for cross border transfer of capacity obligation could look like

This example described below is based on a decentralized secondary market which is based on a first come first serve allocation mechanism with the following characteristics:

- BSPs declare their bilateral deals (volume, period<sup>11</sup>, counterpart) to the TSOs (but not the price)
- BSPs settle their deals through OTC contracts. TSOs only match volumes; TSOs don't act as financial counterparts
- GOT for deal notification to the TSOs is the GCT of the auction
- GCT for deal notification to the TSOs is D-1 16:00
- At D-1 6:00 all notifications posted to the TSOs since the notification transfer GOT are processed, earlier notification are treated first
- There is a continuous period of matching in D-1 between 6:00 and 16:00, where TSOs accept notifications as long as the notifications match, the BSPs have a contract with each TSO with sufficient capacity and the import/export limits are respected for the concerned period
- Some additional rules could be introduced to prevent abusive preemptive reservation of import/export limits
- At 16:00 notifications of transfers are closed and TSOs adapt their aFRR controller settings for the next operation day

<sup>11</sup> With 1h resolution

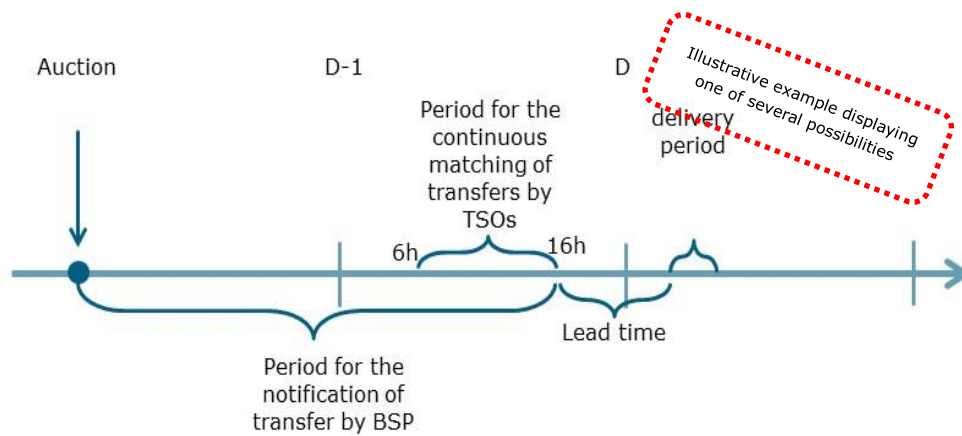


Figure 22: Process example for cross border transfer of FCR obligations

### 5.5 Questions to stakeholders

Questions to stakeholders regarding cross border transfer of capacity obligation

22. Is cross border transfer of capacity obligation an important feature? – Please explain your answer
23. In case you think XB transfer of capacity obligation is an important feature, do you think its relevance decreases when auction frequency increases and when product duration decreases? Is there a specific breakpoint in terms of auction frequency or product duration where it would not be that important anymore? – Please explain your answer
24. In case of implementation would you support a simple mechanism such as first come first served? – Please explain your answer
25. In case of implementation could you please comment on the example proposal made?



## 6. TSO-BSP settlement

### 6.1 Context

The current TSO-BSP settlement is pay-as-bid.

The TSO-BSP settlement could be changed to marginal pricing: the BSP would be paid the marginal price of its country. As for market coupling, the marginal prices for all countries are equal as long as no import/export limits are hit.

### 6.2 Options description

- Option 1: pay-as-bid (status quo)
- Option 2: marginal pricing

### 6.3 Analysis

Under marginal pricing, under the assumption of perfect competition, BSPs optimal strategy is to bid their marginal costs. Under pay-as-bid, BSPs optimal strategy is to bid just below the expected marginal price. Under marginal pricing regime as the BSPs actually bid their marginal costs, FCR procurement cost minimization will yield the most optimal FCR dispatch. However in case of pay-as-bid, when BSPs not perfectly anticipate the marginal price, the awarded bids may not always be the most optimal in terms of FCR dispatch.

It can be observed that BSPs in the FCR cooperation are currently able to anticipate the marginal price with great accuracy.

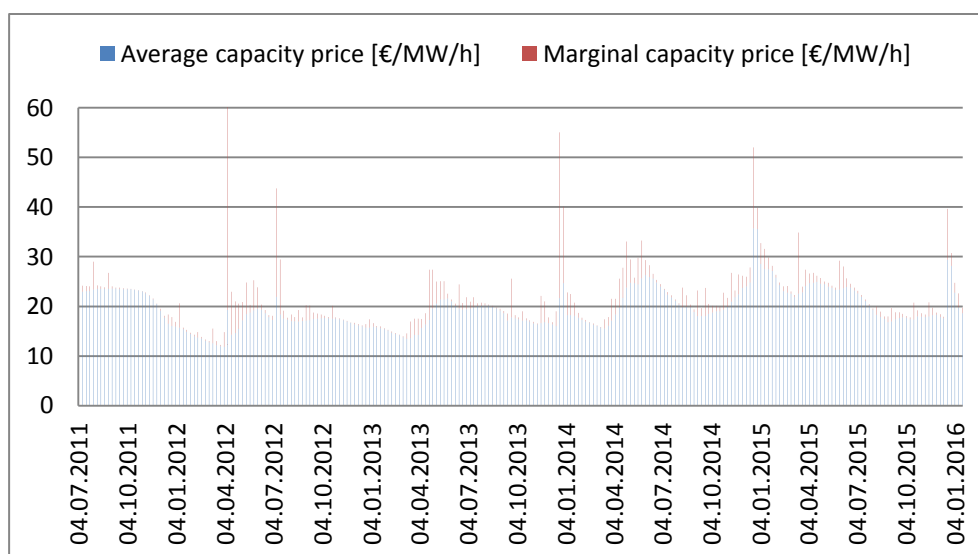


Figure 23: FCR capacity price in Germany

BSPs seem to be already capturing the infra marginal rent in the FCR cooperation. The risk of higher costs<sup>12</sup> of switching to marginal pricing thus appeared to be quite limited.

It could be expected that switching to marginal pricing will reduce the overall procurement costs, as BSPs would be incentivised to reveal their marginal costs. In this case it would induce a monetary transfer of value from BSPs to cost recovery actors.

In order to anticipate the auction marginal pricing under pay-as-bid regime, each BSP has to develop and maintain some forecast skills whereas under mar-

<sup>12</sup> in most countries the grid users are bearing FCR procurement costs

ginal pricing regime each BSP only has to bid its marginal cost. As such marginal pricing would make easier the participation of new entrants and reduce the operating costs of small BSPs.

Marginal pricing could also reduce the operational efforts for small BSPs to place bids during the non working days in case of daily auctions.

Marginal pricing also facilitates market surveillance for NRAs as BSPs should bid their costs.

Marginal pricing remuneration often increases marginal price volatility and the consequences of price spikes are more important for cost recovery actors than pay-as-bid. It is often considered that marginal pricing can only be introduced in liquid and mature markets.



Figure 24: Example of pros & cons by introducing marginal pricing

#### 6.4 Questions to stakeholders

Question to stakeholders regarding TSO-BSP settlement

26. Do you prefer pay-as-bid or marginal pricing? – Please explain your answer.

## 7. Market rules harmonization

### 7.1 Context

The introduction and the well functioning of the FCR common market has become one of the major focus of the TSOs in the development of the balancing markets in Europe. As a central issue, the TSOs strive at enabling a level playing field by strengthening the level of harmonisation within the existing and extending cooperation for FCR of the national FCR market rules.

Since full harmonization is relatively costly to achieve, TSOs would like to focus on the most important topics for the time being. Therefore BSPs are invited to point out the most critical differences that might interfere with the goal of a fair competition amongst the BSPs within the FCR cooperation.

### 7.2 Identified differences

The current FCR Cooperation is working well. Nevertheless there are some remaining differences in the national market frameworks.

TSOs provide hereunder a brief overview of the main identified differences, with brief explanations.

#### URL for FCR market and prequalification rules (Remark: some rules may not be translated in English)

<b>AT</b>	<a href="https://www.apg.at/en/market/balancing/primary-control/tenders">https://www.apg.at/en/market/balancing/primary-control/tenders</a>
<b>BE</b>	<a href="http://www.elia.be/en/users-group/Working-Group_Balancing/Projects-and-Publications/R1-FCR">http://www.elia.be/en/users-group/Working-Group_Balancing/Projects-and-Publications/R1-FCR</a>
<b>CH</b>	<a href="https://www.swissgrid.ch/swissgrid/en/home/experts/topics/ancillary_services/prequalification.html">https://www.swissgrid.ch/swissgrid/en/home/experts/topics/ancillary_services/prequalification.html</a>
<b>DE</b>	<a href="https://www.regelleistung.net/ext/static/prl?lang=en">https://www.regelleistung.net/ext/static/prl?lang=en</a>
<b>DK</b>	At the moment no information published on the webpage
<b>FR</b>	<a href="http://clients.rte-france.com/lang/fr/clients_traders_fournisseurs/services_clients/regle_ssy_pop.jsp">http://clients.rte-france.com/lang/fr/clients_traders_fournisseurs/services_clients/regle_ssy_pop.jsp</a>
<b>NL</b>	<a href="http://www.tennet.org/english/operational_management/system_data_preparation/primary_reserve.aspx">http://www.tennet.org/english/operational_management/system_data_preparation/primary_reserve.aspx</a>

#### Prequalification criteria

Prequalification criteria contain the tests that the BSP have to pass and the success criteria to be met, in order to obtain prequalification. Besides the +200 and -200 mHz offline tests, in some countries there are additional tests such as offline tests with limited frequency deviations, or 8 hours online tests with actual grid frequency.

#### Prequalification procedures

The documents to be provided by the BSP to obtain the prequalification are different. Furthermore the delays for obtaining prequalification, once the tests have been passed and the request contains all necessary documents are different. In some countries the TSO has a limited period of time to analyse the documents provided by the BSP, once all the documents have been provided.

#### IT requirements

What is required from the BSP for its own IT infrastructure? In some countries there are some explicit provisions while in some others there is no provision on the BSP internal IT infrastructure.

### **Real time measurement requirements**

Are real time measurements mandatory for all units, and what are measurement resolutions? Real time measurement is required in all countries. However the resolution range is from 1s to 10s.

### **Frequency measurement requirements**

Is there a precision requirement, and is centralized frequency measurement allowed? What is critical to avoid single points of failure, and to maintain functioning in case of a system split? Central frequency measurement is allowed in some countries for pooling of small units whereas it is forbidden in other countries.

### **Security level of BSP-TSO communication**

Are there special provisions regarding security level of BSP-TSO communication? In some countries there are specific requirements, while in some countries there are none.

### **Scheduling requirements**

Should the BSP nominate its FCR schedules before delivery? Is there a lead time? In some countries it is mandatory to provide FCR schedules before delivery, while in some countries it is not required. In some countries FCR schedules cannot be changed by the BSP within a given lead time before real time.

### **Control/monitoring criteria and procedures leading to penalties**

Is there both an availability check and a delivery check? Are controls systematic or occasional? What are the criteria for both checks? In some countries there are two separate checks: one for availability, and one for delivery, while in other countries only delivery check is performed. With regard to the delivery check, in some countries these are systematic while in others they are only done occasionally. The technical criteria for both families of checks are different in each country.

### **Penalty regimes**

Penalties in case of non availability, penalties in case of non delivery, period during which there is a penalty exemption. In some countries there are different penalty regimes for non-availability and non-delivery. The penalty regimes are different between countries; they are either based on bid price, spot price or clean spark spread. In some countries there is a period for penalty exemption after outage.

### **Backup rules**

Should the BSP have a backup in its portfolio or is the backup centrally managed by the TSO? In some countries the BSP is responsible to hold a backup in its portfolio and activate it in case of outage, while in other countries the backup is centrally managed by the TSO in the balancing timeframe while costs are forwarded to the defaulting BSP.

### **FCR energy remuneration**

Is there an explicit FCR energy remuneration, or is it implicit through imbalance settlement price? In some countries FCR energy remuneration is explicit at spot price (with a BRP imbalance adjustment), while in other countries FCR energy remuneration is implicit through imbalance settlement price (and in this case

there is no BRP imbalance adjustment).

### **Independent BSP**

Is it mandatory for the BSP to have the agreement of the BRP of the unit/site in order to deliver FCR? In some countries BSPs are allowed to provide FCR with a unit without the agreement of the BRP of the unit, while in some countries an agreement between the BSP and the BRP of the unit is mandatory. In some countries the situation is different between generation and consumption sites.

### **National transfer of FCR between BSPs**

Are BSPs allowed to transfer FCR between themselves in the country? In some countries the transfer of FCR obligation between BSPs is allowed, while in other countries it is forbidden. When the transfer of FCR obligation is allowed there is a different lead time for transfer in intraday.

### **Energy availability requirements**

What are the energy availability requirements for units with limited reservoir such as run-of-river or batteries? The requirements in terms of energy availability is defined with regard the duration of delivery at -200 or +200 mHz. The duration is between 15 and 30 minutes in the different countries of the cooperation. Some countries have different energy availability requirements depending on the system state (normal, alert).

### **Pooling rules**

Is there any restriction for pooling within the country? Pooling being understood as aggregating several units/sites to provide the expected FCR response, which alone would not be able to. In some countries each unit should be able to deliver FCR on its own. In some countries pooling between generation and consumption is not allowed. In some countries there are geographical limitations to pooling, etc.

## **7.3 Questions to stakeholders**

Questions to stakeholders regarding the level playing field and the level of harmonisation of the national market rules:

27. Are you satisfied with the degree of harmonisation of the common FCR market (satisfied, mixed, not satisfied)? - Please explain your answer.
28. Do you consider any of the existing differences as critical concerning level playing field? If yes, please list the most critical differences from your point of view and give an explanation why this is relevant concerning level playing field.
29. Please list and sort the 3 most important harmonization priorities for your company

## 8. Final questions

The 30<sup>th</sup> question of this public consultation should give some insights regarding the relative important of the different topics addressed in this document. It will allow TSOs to make implementation proposals taking into account stakeholders priority expectations.

30. Could you list and sort the 3 most important topics that should be addressed for your company

31. Do you have any other comments regarding FCR?