Consultation Report
"FCR Cooperation"

31 May 2017

List of figures and tables

1. Executive summary

With the ongoing changes in the technology mix, e.g. increased share of renewables, demand side response, and storage technologies, TSOs and NRAs decided to assess current status of the cooperation and study 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 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 extend possible. The objectives must be met under consideration of secure grid operation and security of supply.

Assessing current status and studying possible market design evolutions, a public consultation was held from 9 January to 10 February 2017. The consultation report on hand presents results of the public consultation together with TSO analysis and subsequent TSO conclusions for six main topics. Foreseen market design evolution is summarized below. Detail information is provided in the dedicated chapters.

TSOs conclusions regarding the evolution of FCR cooperation market design are the following:

- change the auction frequency from weekly auctions to daily all days auctions
- subject to technical feasibility and time restrictions the proposal for GOT and GCT is:
    - GCT at 08:00 in D-1
    - Publication time at 08:30 in D-1
    - Gate Opening Time in D-5.
- change the product duration from weekly to 4h products
- neither to implement linked bids nor multiple products
- not to introduce a cross border transfer of obligations
- not to introduce asymmetric products
- to allow indivisible bids, with a restriction that no divisible bid can be paradoxically rejected. This will be avoided by allowing overprocurement.
- Maximum bid size of an indivisible bid will be limited to 25 MW
- not to introduce exclusive bids
- to keep the current minimum bid size of 1 MW
- introduce Marginal Pricing as the TSO-BSP Settlement scheme
- to investigate and to come up with a joint solution for harmonisation on these topics:
    - Rules for aggregation & Centralized frequency measurement
    - Monitoring & Penalties
    - Backup requirements (n-1)

These are joint TSO conclusions as compromises from discussions and investigations within FCR cooperation. They may not be the best solution for each country but they are considered to be the best option for the whole region.

FCR Cooperation NRAs informed the FCR Cooperation TSOs that the approval process will be done on the legal basis of the *Guideline on Electricity Balancing* (GLEB). Public consultation on the detailed design proposal respecting the GLEB process will be carried out in September 2017, based on the conclusions listed in this report. After the public consultation TSOs intend to submit their proposal to NRAs shortly after the entry into force of the GLEB. NRAs should then issue their approval within 6 months of receiving TSOs proposal. These next steps are presented in chapter 7.

An exemplary implementation planning for the market design evaluation is drafted in the chapter 8 and compliancy of the current conclusion with the recently voted GLEB and the *Guideline on Electricity Transmission System Operation* (SOGL) is assessed in chapter 9.

2. Introduction

2.1 Description of the FCR cooperation

To support the implementation of the GLEB, 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[1]. Extension towards France has been realised in mid January 2017 and extension towards Denmark is currently foreseen.

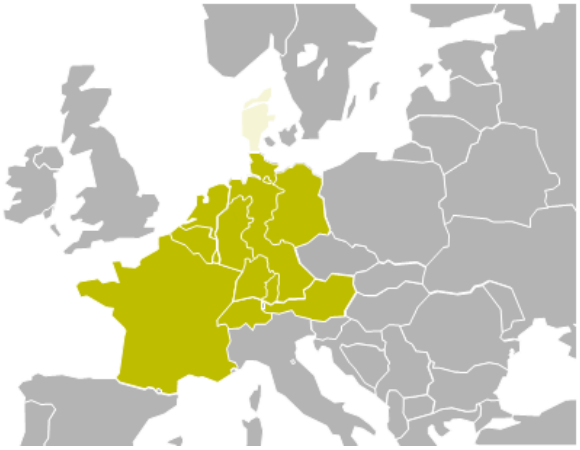

Figure 1: FCR Cooperation map

The FCR cooperation works currently with weekly auctions with one weekly symmetric product. The auction takes place on Tuesday afternoon and applies for the next delivery week.
The cooperation is organised with a TSO-TSO-model[2], where the FCR is procured through a common merit order list where all TSOs pool the offers they received. The interaction with Balancing Service Providers (BSPs) and the contracts between the TSOs and BSPs are handled on a national basis.

2.2 Description of the public consultation

With the ongoing changes in the technology mix, e.g. increased share of renewables, 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. The TSOs and NRAs are specifically interested in stakeholder's input on six main topics that together constitute the market design.
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 the perimeter of the consultation to the stakeholders and gather initial feeback. These feedbacks have been integrated in the actual consultation document[3].

[1] 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.

[2] See " Guideline on Electricity Balancing"
https://ec.europa.eu/energy/en/topics/wholesale-market/electricity-network-codes

[3] See "Consultation document"
https://www.entsoe.eu/news-events/announcements/announcements-archive/Pages/News/public-consultation-for-the-design-of-the-fcr-cooperation.aspx

After the public consultation, TSOs prepared a joint conclusion and an implementation roadmap proposal to the NRAs, which is this very document. NRAs will then jointly assess TSOs proposal. In the below Figure 2 and Figure 3 the general statistics from the consultation are shown.

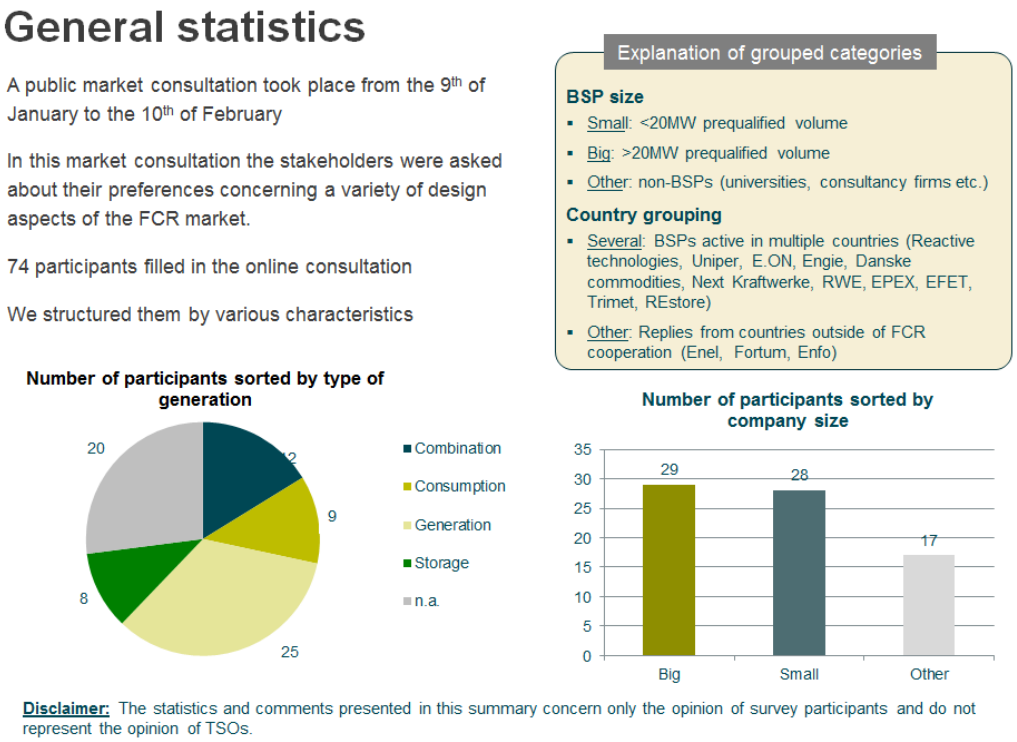

Figure 2: Explanations and general statistics from the consultation

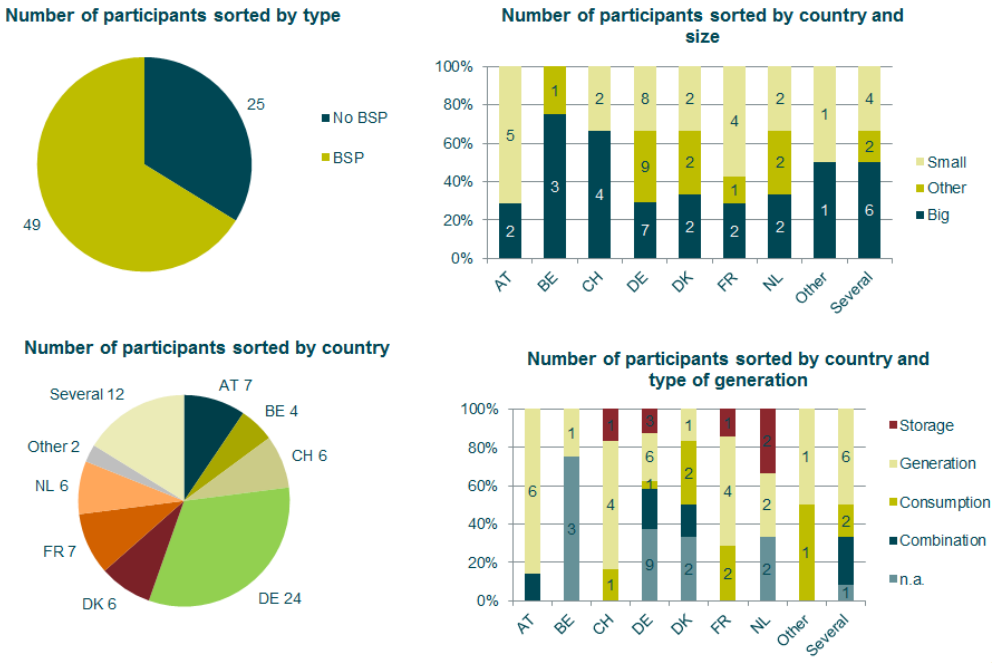

Figure 3: General statistics from the consultation

3. Auction frequency, product duration and secondary market

3.1 Introduction

Auction frequency, product duration and secondary market constitute the main framework of a common market. These topics are of prime importance and their interaction is vital for a well functioning market. As the topics are interlinked a common analysis is indispensable. For transparency reasons and information purposes we first show the results of each topic seperately, including a first analysis and a conclusion, but refer to an interlinked analysis which can be found in chapter 3.5 *Consistent package analysis &* .

3.2 Auction frequency and timing

3.2.1 Introduction

At the beginning, the stakeholders were asked whether they are satisfied with the current auction frequency or if they would like to change it. The answers received are almost divided in the middle which at first sight does not show an aligned preference. One very visible trend that can be extracted from Figure 4 is the fact that BSPs with consumption resources would like to move towards shorter auctioning periods.

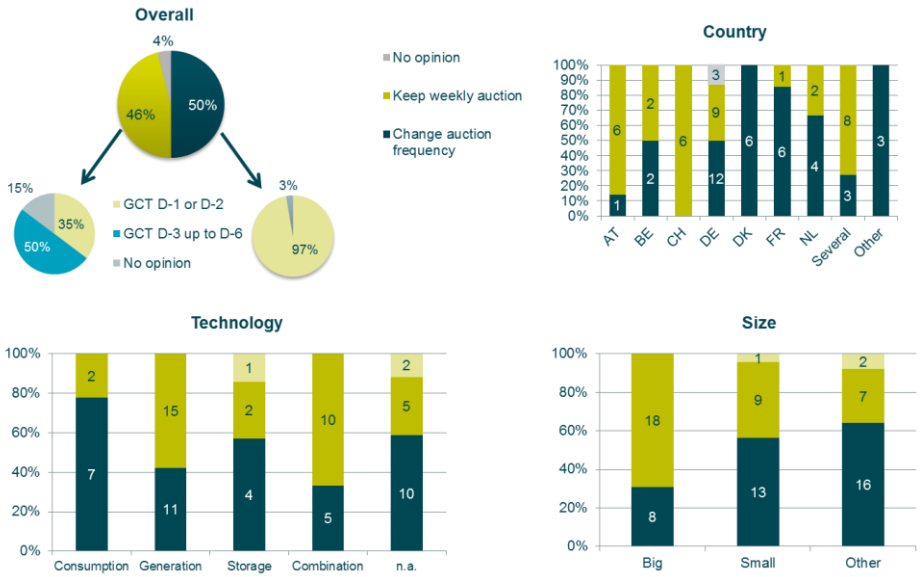

Figure 4: Stakeholder opinion on change of auction frequency

However, when the stakeholders were asked to prioritize the changes they would like to see in the regional FCR market, increasing the auction frequency was ranked very high as it can be seen from Figure 15. TSOs are taking this request very seriously into account as it will help stakeholders with alternative sources of flexibility to enter the FCR market with as equal terms as possible. The arguments related to different options of auction frequency given by the stakeholders are listed in Table 1.

Closely linked to this question, is the question on the lead time i.e. the duration between the Gate Closing Time (GCT) of the auctions and the actual time of delivery. In order to get a better view of the stakeholders' opinions on the GCT, the answers are grouped according to the preferences on auction frequency as shown in Figure 4 on the top left charts.

The next question raised was about whether stakeholders would prefer to have auctions every day or only on working days in case the auction frequency is decided to increase. *Figure 5* shows the

preference of stakeholders in a scenario with increased auction frequency. Answers marked as "other" include the stakeholders that answered that they would prefer to stick to weekly auctions independently of the formulation of the question.

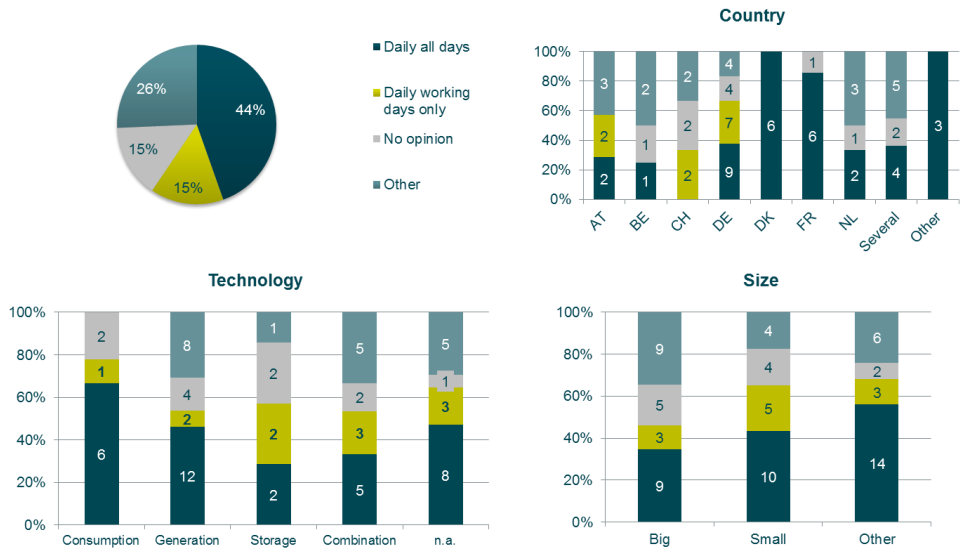

Figure 5: Auction frequency in case of increase

Finally, in Table 1 a more detailed analysis of the question regarding the lead time is given also mentioned in Figure 6.

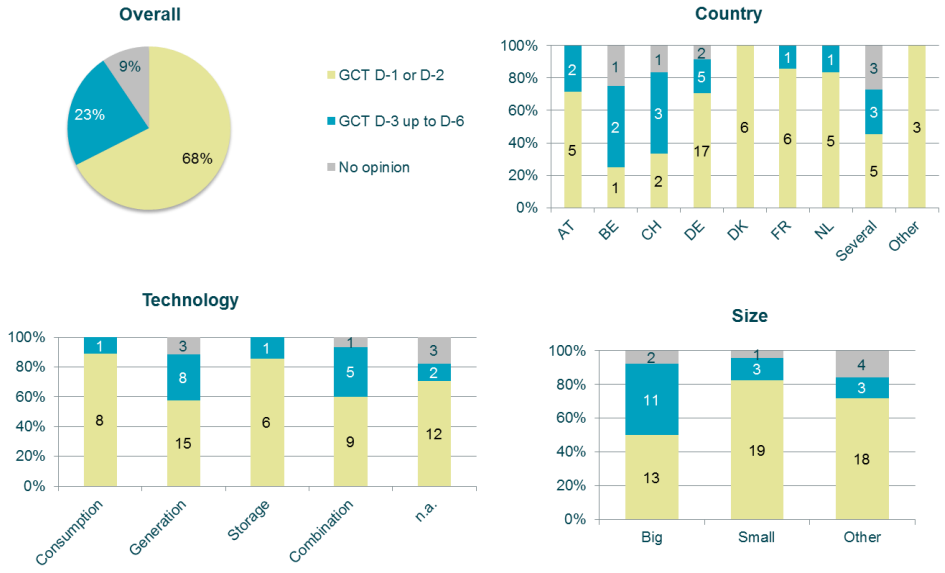

Figure 6: Preference for short or long lead time

The arguments providing by the stakeholders to support the different opinions are summarized in Table 1.

Table 1: Summary of stakeholders' arguments for different auction and lead times.

Arguments for keeping weekly auctions	• A daily auction will lead to "cherry picking" of beneficial days and a significant shortness and increasing market prices at weekend days and public holidays. • To lower the administrative costs, especially for smaller BSPs. • Longer contracts will increase bankability of storage. • Daily auctions will increase price volatility. • Possibility to optimize bidding with the spot market. • Power plant operation becomes easier.
Arguments for changing auction frequency	• Flexibility from resources like EVs, RES, load, and run of river hydros depends a lot on external factors that are not easy to forecast one week in advance. • Better for CCGTs as the optimisation is happening D-1 and small changes in the market can change the whole schedule of the CCGT. Increased prices will be seen if the frequency of the auctions is long. • Shorter auctions will reduce opportunity loss premium.
Arguments for short lead time	• The question is strongly linked with the one of auction frequency. The argument regarding ability to forecast prevails for GCT D-1 or D-2. • If we go for shorter auctions, a long lead time does not make sense.
Arguments for long lead time	• This will allow time for a secondary market. • A short lead time combined with daily auctions, will allow the market stakeholders to know the DA market results and the power schedules of their units. • It allows more time for portfolio optimisation.

The participants of the public consultation also gave their opinion regarding the time delay between Gate Opening and Closing Times. 64% of them believe that it would be beneficial for smaller BSPs with low staff to have a long time delay as they will be able to bid long in advance e.g. in case of weekends or bank holidays. Another argument for this delay was the fact that it will provide enough time for the balance responsible parties (BRPs)/BSPs to bid in different markets. Moreover, an argument from BSPs with large portfolio was that it will help them with portfolio optimization but there was no strong position expressed.

The final question regarding the auction frequency was about the sequence of different markets. In that case, most of the participants mentioned that they would prefer to have the FCR auctions before the Day Ahead market as shown in Figure 7.

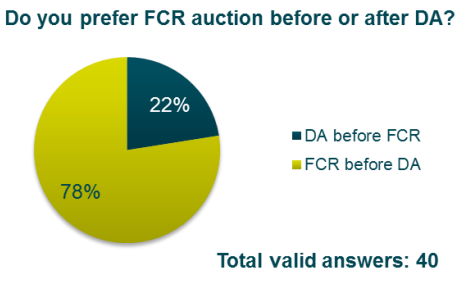

Figure 7: Feedback on timing of the auction

3.2.2 TSO analysis

Adapting the auction frequency is an important decision that strongly affects the market design of the FCR market. Many countries have moved from long term contracts for FCR towards weekly procurement in order to increase the liquidity of the market and reduce prices.
Following this path, it is believed that an even higher auction frequency will be helpful especially for alternative flexibility resources like RES, electric vehicles or demand response. These resources are not easily forecasted and an operation closer to real time will help them to offer a service which is very demanding with respect to availability like FCR. Although this may require some additional operational effort from the BSPs and TSOs, it is considered crucial for increasing the volumes that these resources can offer in a reliable way.
As far as the technologies that have been traditionally offering FCR are concerned, they are not expected to be significantly affected by such an evolution. Moving towards daily auctions will not increase much the operational costs as these units are already participating in different markets requiring daily operations.
The lead times and the sequence of the different markets of energy and ancillary services strongly depend on the choices on the auction frequency and on technical constraints.

Gate Opening Time (GOT) and Gate Closing Time (GCT)
The TSOs understand the need of the alternative sources of flexibility like renewables, demand response etc. and would like to move the FCR auctions closer to real time. This will help BSPs account for forecast uncertainties and possibly increase the available FCR volume while improving the reliability of service. Together with moving towards daily auctions, the TSOs believe that the GCT should also be as close to real time as possible. Starting with the case of having the GCT in D-1, the following guidelines should be taken into account when evaluating the viability and technical specificities of this option:

- According to the opinion of the stakeholders (Figure 7), the FCR market should be closed before the DA market. This means that GCT and the publication of the auction results should be before 12:00 of the previous day
- Stakeholders also mentioned (Figure 6) that GCT should be in D-1 or D-2.
- Enough time should be foreseen between GCT and the closing of DA in order for the traders to consider the FCR results in their bidding strategy for DA.
- Alignment of FCR market timing with aFRR. Some countries (e.g. Germany) are planning to move towards daily auctions for aFRR and this should be taken into account.
- The TSO auction and validation process will be partly automatized. Although reading of the results and changes in the k-factor can be done automatically, backup processes for emergency cases may still include human intervention that could set limits in the timing of the auctions.
- Enough time should be allowed to perform a fallback auction in case of a technical failure or in case the auction fails to provide enough volumes.
- If a regional solution is foreseen for the fall back case, a second run of the algorithm should be foreseen in case of a technical failure. This run should take place before the closing of DA market which leads to having the GCT early in the morning of D-1 (e.g. at 08:00) to ensure enough time for the back up auction.
- In case of lack of volume, a second auction could take place even after the DA market hoping that providing more time will increase the available volume. This does not affect the GCT.

3.2.3 TSO conclusion

Auction frequency

TSOs conlude the auction frequency should be changed from weekly auctions to daily all days auctions.

Further information on how we arrived at this result can be found in chapter 3.5 "Consistent package analysis & ".

Gate Opening Time (GOT) and Gate Closing Time (GCT)

Subject to technical feasibility and time restrictions the conclusion for GOT and GCT is:

- **GCT at 08:00 in D-1**
- **Publication time at 08:30 in D-1**
- **Gate Opening Time in D-5. This way the small BSPs that are short in staff could place their orders well in advance in case of holidays or weekends.**

In case the aforementioned option is not considered technically plausible due to time restrictions, the TSOs conclude to move the GCT to D-2 at 15:00. This timing is selected because it falls within working hours and still leaves enough time for activating a fallback solution.
Regarding the GOT, it should provide enough time for the smaller BSP that do not have staff working all days to place their bids before weekends or bank holidays. For this reason, a worst case of 4 consecutive days (a weekend followed by two bank holidays) is considered.
A more detailed design for the GOT and GCT might be drafted if the daily auctions with 4 hour products are validated.

3.3 Product duration

3.3.1 Introduction

As a second topic stakeholders were asked about their preferences concerning product duration. In Figure 8 you see their answers shown from different perspectives.

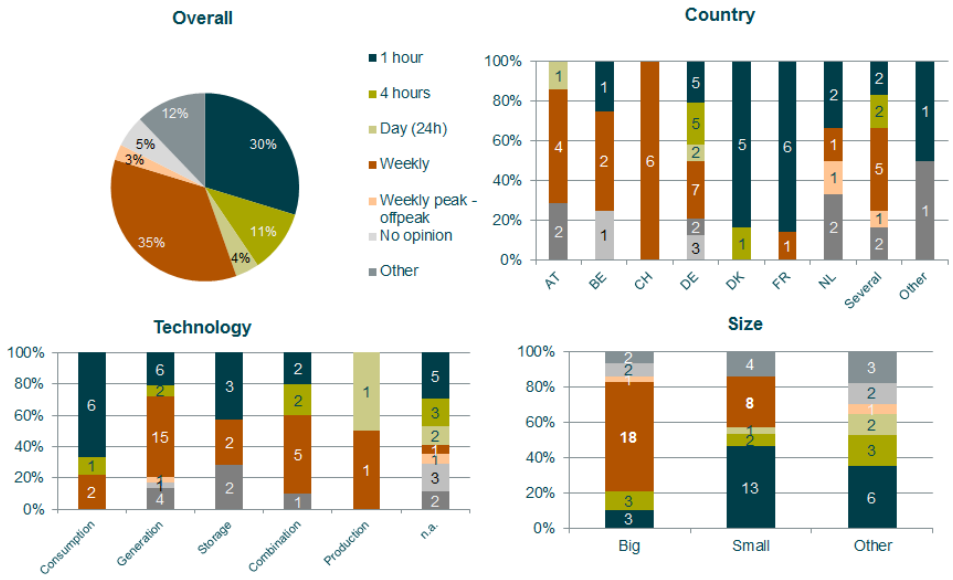

Figure 8: Feedback on product duration

About one third of the stakeholders is in favour of weekly auctions. The majority is in favour of having smaller product durations. The majority of market participants in Austria and Switzerland are in favour of weekly products, a majority in Denmark and France is in favour of hourly products.

Opinions of market participants of other countries are mixed. In contrast to big BSPs which tend to favour weekly auctions, small BSPs favour smaller product durations instead.
The arguments and other product duration proposals of the stakeholders can be summarised with the following table.

Table 2: Pros and cons of different product durations

	pros	cons
Weekly	• Planning reliability for TSOs • Easy plant operation • Gives knowledge on how much capacity & energy can subsequently be offered in other markets • Stable investment conditions	• Some technologies cannot guarantee capacity for this period • Lower flexibility for some technologies
Weekly peak off-peak	• Spot price can fluctuate between peak & off-peak • Good compromise between weekly and shorter product durations	• Some technologies cannot guarantee capacity for this period • Short product duration increase operational costs for pricing & bidding • Demand may not be met for all products
Daily	• Good compromise between long and short • Makes a secondary market less important	• Some technologies cannot guarantee capacity for this period • Short product duration increase operational costs for pricing & bidding • Neither suits renewables nor power stations • Demand may not be met for all products
4 hours	• Good compromise between long and short • In line with aFRR and mFRR for some countries • Makes a secondary market obsolete	• Increase operational costs for pricing & bidding • Auction result could be less transparent • Demand may not be met for all products • Risk of Deterministic Frequency Deviations (DFDs)
1 hour	• Ideal for EV fleets • Very flexible • Makes a secondary market obsolete	• High operational costs for pricing & bidding • Auction result is less transparent • System risk / stability • Demand may not be met for all products • Risk of DFDs
Other	• 15‘ products provide flexibility • Combination of weekly and daily • Weekly from Saturday to Friday → better planning! • Monthly • 5 years (bankable business case) • 2 step auction (one long & one short)	

In the next question stakeholders were asked about the implication of the introduction of a shorter product duration.

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

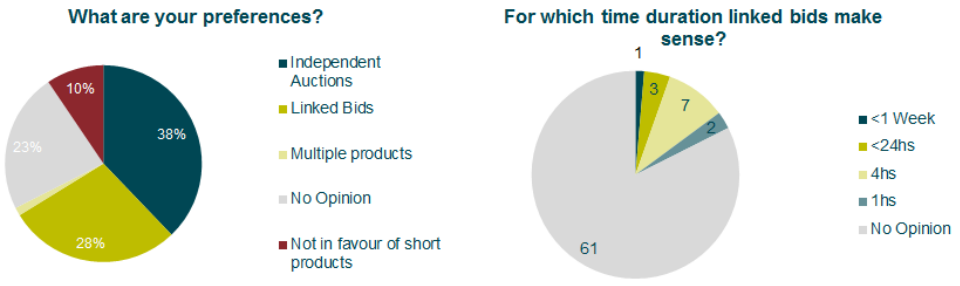

Figure 9: Multiple products and adequate duration for linked bids

As the first graph indicates, preferences are quite versatile. The biggest group is in favour of having independent auctions. Asking the participants which product duration represents for them the threshold where they would appreciate having the possibility of linked bids, the great majority has no preference. Among the participants that gave an answer the majority was of the opinion that the limit should be 4 hours.

3.3.2 TSO analysis

The answers given by stakeholders concerning product duration are quite heterogeneous. In order to better understand the needs of the BSPs, TSO include in their analysis the list of preferences and most urgent topics that BSPs were asked to fill in in the end of the consultation.
Linked bids and multiple products are two different way to implement a feature that gives similar pros and cons. The table below lists the provided arguments in favour and against linked bids and multiple products*.

Table 3: Pros and cons of linked bids and multiple products

	pros	cons
linked bids and multiple products	• Flexibility • Help to handle ramp-up costs • Positive especially during summer time • Makes sense especially if product duration is less than 4hs	• Complexity • Increased costs to prepare bids • Less Transparency • More effort • Little practicality

*Definition: Possibility to offer products with different product durations, e.g. weekly product and daily product or daily products and 4hs products at the same auction.

3.3.3 TSO conclusion

Product duration

TSOs conclude to change the product duration from weekly to 4h products.

This measure is seen as one of the best ways to augment liquidity and bring new companies to the market. Further reasons and details on the decision making process can be found in 3.5 Consistent package analysis & . It is suggested to allow that mitigation measures are applied in case increased deterministic frequency deviations (DfDs), linked to the 4 hour product duration, are observed or are expected.

Linked bids & multiple products

TSOs conclude neither to implement linked bids nor multiple products.

The TSOs understand the opinion expressed by a large number of BSPs to implement a simple algorithm with high transparency, low complexity and easily understandable auction results. In addition to that stakeholders did not show great interest in the introduction of either linked bids or multiple products.
Nevertheless TSOs might reconsider the possibility of introducing these products in the future if market participants express their interest in it after the implementation of the new market design.

3.4 Cross border transfer of capacity obligation

3.4.1 Introduction

Stakeholders' answers to the possibility to allow cross border transfer of capacity obligation are the following:

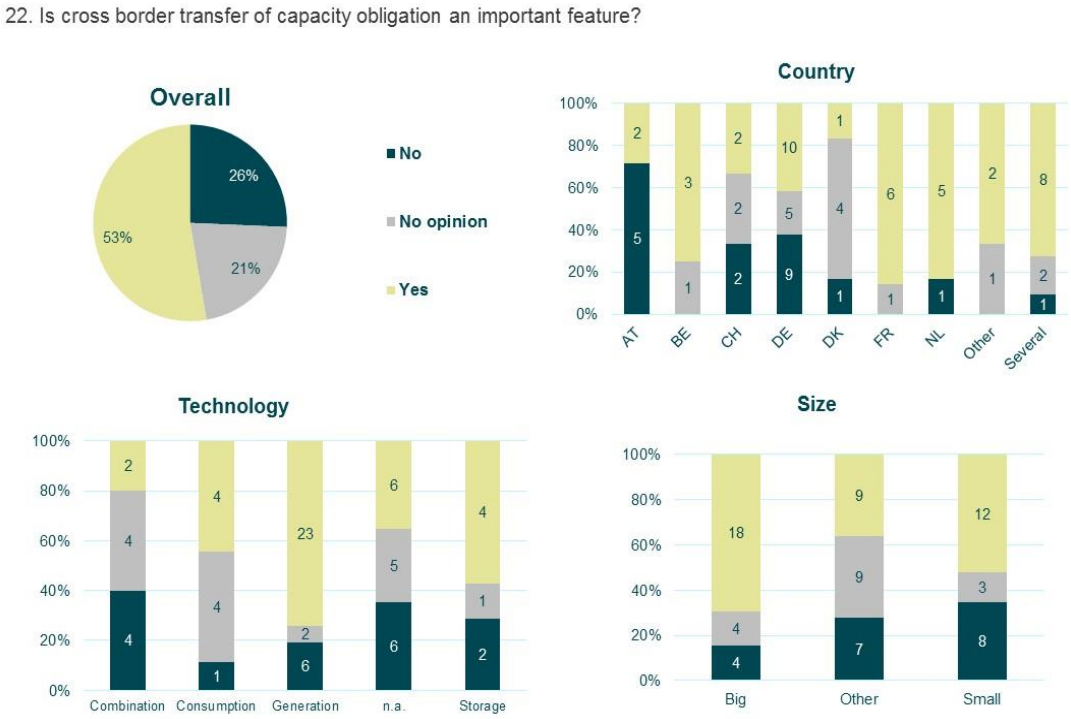

Figure 10: Interest for cross border transfer of obligation

Stakeholders were twice as much in favour of than against allowing cross border transfer of obligation. The arguments provided by the stakeholders can be summarised with the following table:

Table 3: Stakeholders arguments with regard to cross border transfer

Arguments against cross border transfer	Arguments in favour of cross border transfer
• Implementation effort for TSO • Fear of market speculation • Reduces the need to go for shorter products • Against cross border trading • Unclear benefits • Favours cross border pooling • No interest due to backup rules • Reduces cross zonal capacities	• Higher social welfare • Reduces entry barrier • Improves efficiency of backup • Increases trading opportunities • Improves uncertainty management • A way to do cross border pooling

Concerning the stakeholder comments TSOs would like to underline that the cross border transfer of FCR has no impact on cross zonal capacities and that cross-border pooling is not compliant with System Operation Guideline (SO GL). Stakeholders point of views regarding the relevance of a cross border secondary market in case of increased auction frequency are the following:

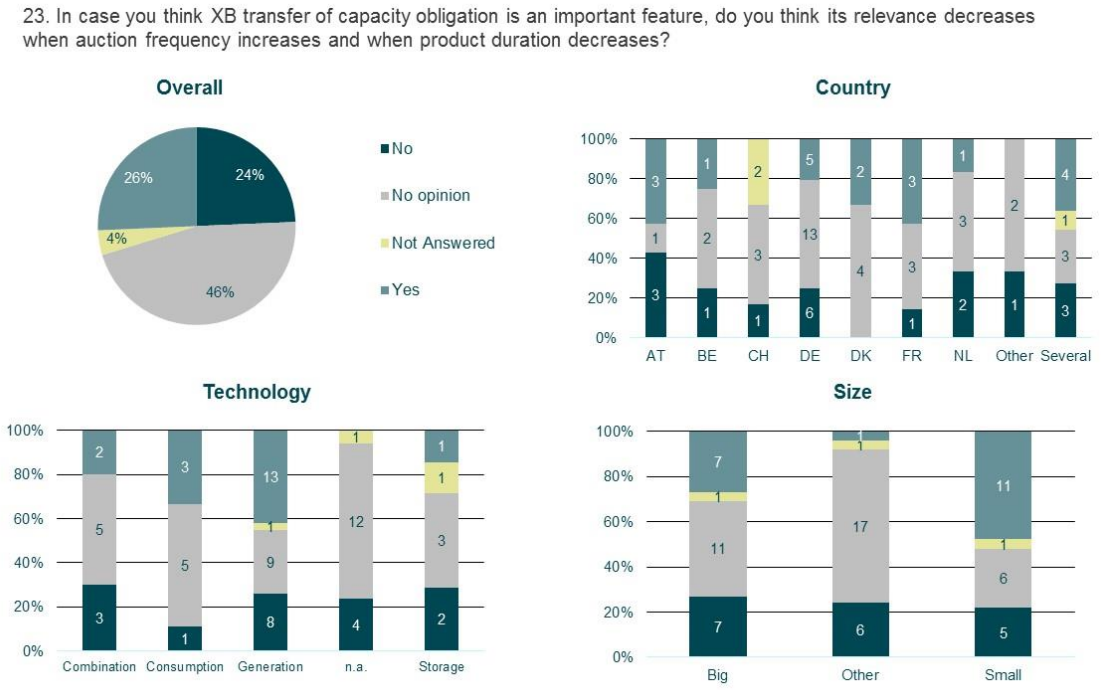

Figure 11: Cross border transfer with regard to increased auction frequency

Stakeholders answers are evenly divided on this question, but the main answer is the absence of opinion.
In case a cross border transfer of capacity obligation would be implemented stakeholders favour a simple mechanism such as first come first served as described in the consultation document:

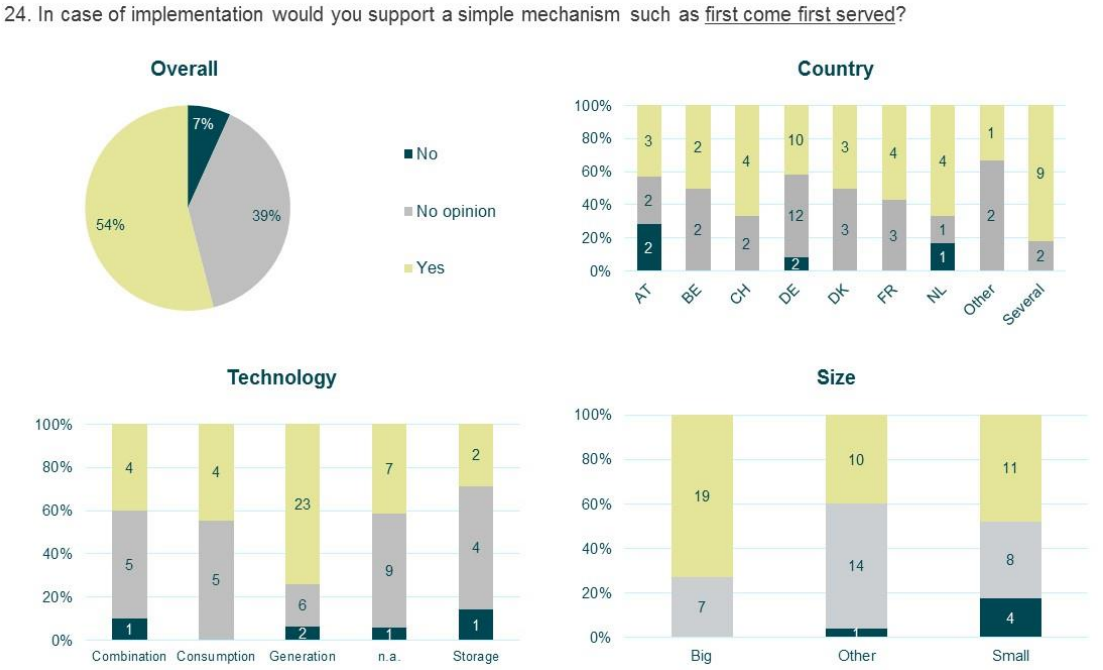

Figure 12: Views on detailed implementation of cross border transfer

The mechanism proposal was assessed as pragmatic and efficient by most of the stakeholders, however some stakeholders required additional information, and others expressed their wish for allowing cross border transfer of obligation closer to real time.

3.4.2 TSO analysis

TSOs analyse that cross border secondary market would mainly serve two different purposes:

- Improve FCR dispatch in the FCR cooperation countries
- Facilitate backup management by BSPs

Both would in theory contribute to social welfare increase.
The first purpose can also be reached when introducing shorter products and increasing the auction frequency.
The second purpose is limited by two factors: increased auction frequency and not allowing intra-day transfer.
For TSOs, allowing intraday transfers would be challenging as it would require the update of the secondary controller settings with a limited lead time.
Even if not in force yet, the EBGL provides that cross border transfer of obligation has to be allowed in case the procurement period is greater than or equal to a week.

In case a cross border transfer is introduced, TSOs would invite NRAs to extend their market surveillance on this market in order to guarantee proper functioning.
If weekly auctions are maintained, TSOs propose to introduce a cross border transfer of obligations as described in the consultation document.

3.4.3 TSO conclusion

As daily auctions are introduced, TSOs pragmatically conclude not to introduce a cross border transfer of obligations, and to focus efforts on the introduction of other measures.
The opportunity to introduce cross border transfer in intraday timeframe might then be reassessed in the future if market participants still show interest.
Further information on the decision making process can be found in the following chapter 3.5.

3.5 Consistent package analysis & conclusion

As already explained in the introduction, the topics auction frequency, product duration and secondary market are linked to each other. Therefore it only makes sense to analyse and consider them together. In order to fulfil this requirement, TSOs use the concept of decision trees. A decision tree is used to determine all possible options and then after analysing the larger correlations and conducting a deeper analysis it allows you to narrow down the possibilities to a few options. In the first step, a decision tree is determined. Figure 13 is the visual representation of the first decision tree, which illustrates all possible options that make sense.

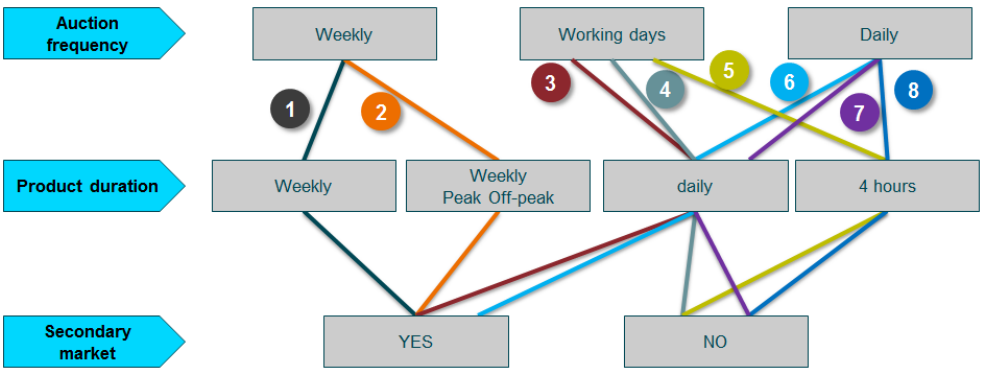

Figure 13: Decision Tree No. 1 showing all possible options

Explanation: 1 hour products have been disregarded as being not pragmatic for a first change. Therefore we did not illustrate them.

In principle eight combinations could be feasible. In the second step, a first evaluation is conducted. During this process some options were excluded and TSOs came up with a decimated decision tree which contains three options (see Figure 14).

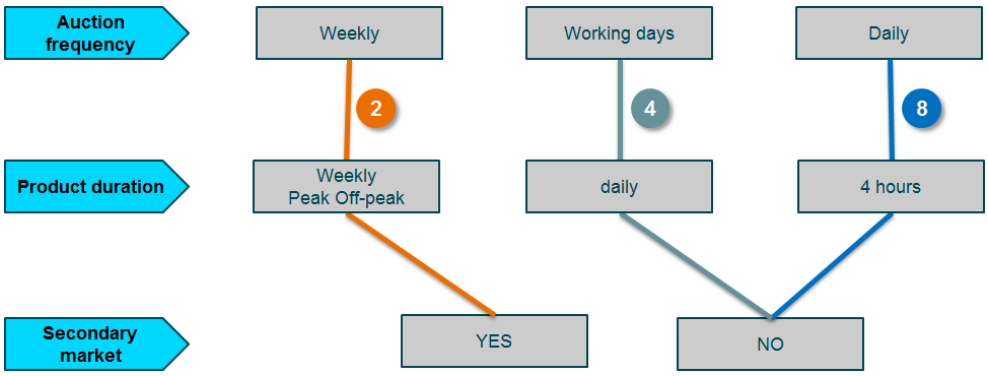

Figure 14: Decimated decision tree with three options

The three options all combine the strongest preferences of the market participants in consistent, but different ways. All the options have advantages and disadvantages, but they all have in common that the implementation effort and the expected benefits are balanced. The main arguments in favour and against Option 2, 4 and 8 are listed below in Table 4.

Table 4: Pros and cons of the three remaining options

Option No	pros	cons
2	•Flexibility through secondary market •Little administrative efforts	•Implementation effort for secondary market •Less flexibility than for 4h blocks
4	•Good compromise between Weekly and Daily all days •No implementation effort for a secondary market •More flexibility than weekly products •Does not require non working days operation	•Prevents BSP with variable FCR delivery over the day to participate – limited benefit of the shorter product duration •No secondary market •Requires all working days operation
8	•No implementation effort for a secondary market •Allows BSP with variable FCR delivery over the day to participate •Good compromise between 1h, 4h, daily products (linking in time less necessary, several hours for cost recovery, but still flexible)	•4h products require mitigation measures by some TSOs (problem of DfDs) •Greater administrative efforts for TSOs & BSPs than the other options •No secondary market •Requires all days operation

The idea behind the third step is to detect one option with the best cost benefit ratio. In order to arrive at one option that reflects stakeholders preferences best, the priorities of the stakeholders are also taken into account. Figure 15 shows the weighted priorities of the stakeholders. The following points are relevant to consider when reading Figure 15:

- First priorities have a weight of 3, second priorities of 2 and third priority a weight of 1
- Only the priorities with a score higher or equal to 6 are shown
- No opinion bar has been removed
- Green and red bars are opposing. Grey bar indicate that there are different meanings included for each respondent.

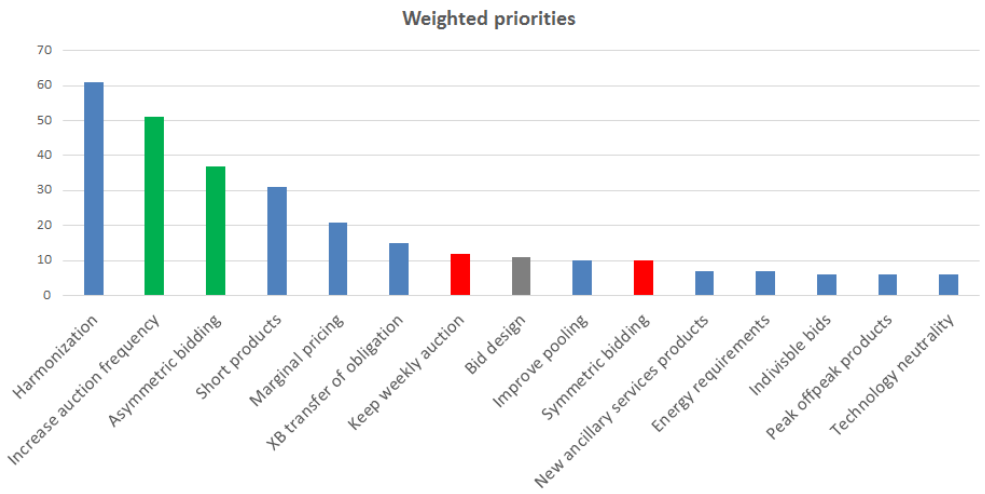

Figure 15: Weighted priorities of the stakeholders

As we can see in Figure 15, an increase of the auction frequency (No. 2) and short products (No. 4) are among the highest priorities of stakeholders. This led TSOs to the conclusion that Option 8 would be the most suitable for a majority of BSPs. Furthermore it is a balanced choice between implementation costs and effort and expected benefits. Therefore TSOs prepare to implement option 8.

4. Bid design possibilities

4.1 Asymmetric bids

4.1.1 Introduction

The topic on introduction of asymmetric bids consisted of several questions for stakeholders. First, stakeholders were asked to provide their preference for either symmetric products, asymmetric products or a combination of both. In case asymmetric products were preferred, stakeholders were asked about the procurement procedure. The procurement procedure could either be separate auctions for upwards and downwards FCR, one common auction or an auction combined with symmetric products. In case of separate auctions, there was also a question on the timing of the two auctions. The final question was related to induced effects by the introduction of asymmetric products e.g. the need for introduction of energy remuneration or imbalance adjustment for the BRP.

The stakeholders had diverging opinions on the introduction of asymmetric bids and while almost 50% preferred the option of having both symmetric and asymmetric products, a bit more than 50% preferred to only have either symmetric or asymmetric products. Austrian stakeholders unaminously prefered only symmetric products and the far largest part of French and Dutch stakeholders preferred the option of having both. For other countries the picture is more mixed. Stakeholders answers to the question can be seen in the graphs below.

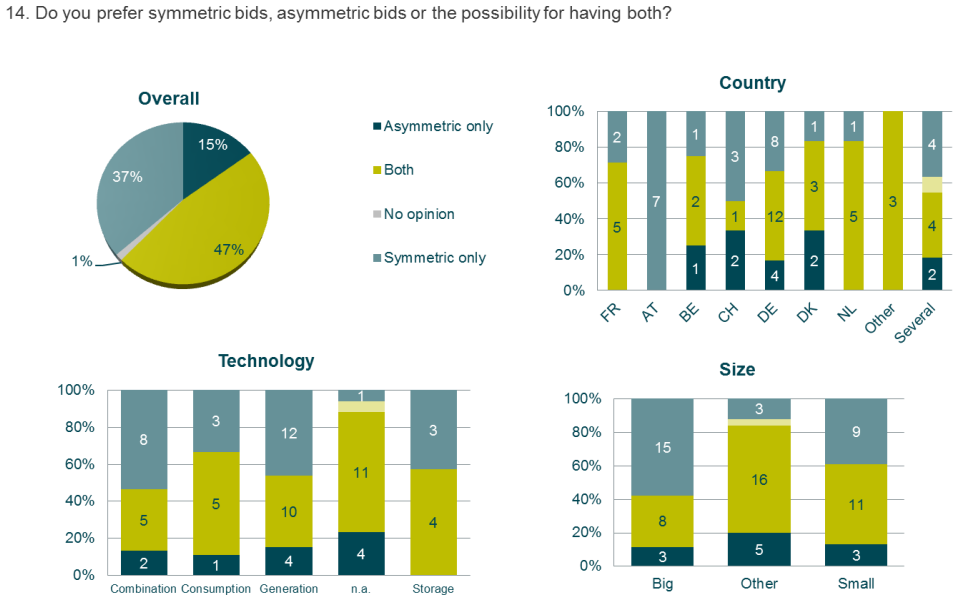

Figure 16: Preference for symmetric / asymmetric bids

The arguments stakeholders provided for either symmetric or asymmetric products covered a wide range of topics. Some of the main arguments for keeping only symmetric products are that introducing asymmetric products is a large change to the current market design that already allows BSPs only able to deliver asymmetric products to pool and thereby create a symmetric product. On the other hand, stakeholders main arguments for introducing asymmetric products are that more technologies can participate and provide more capacity to the market, without forcing BSPs to engage in individual aggregations, since this can be left for the market functioning. A summary of the main stakeholder comments are provided in the tables below.

Table 5: Summary of pros and cons for symmetric / asymmetric bids as given by BSPs

Why symmetric?	Why introduce asymmetric or both?
•Concern for lack of positive FCR or large price differences between up- and downwards FCR. •Asymmetric bids is a substantial change in market design and requires other considerations e.g. energy measurement and monitoring, and energy remuneration •Asymmetric bids will increase administrative costs and decrease transparency. •Pooling is already allowed (up- and downwards) and can be used to create symmetric bids •Concern on grid stability and effect on grid functions.	• Capacity could increase if asymmetric products are introduced. • In line with procurement of FRR and likely to be required in the EU Clean Energy Package. • Optimise and maximize capacity offered to the market since bidding strategy can be optimized to fit all technical constraints (hydro, thermal, demand side, renewables etc.). • Allows broader range of market participants to participate and avoid forcing actors to engage in aggregations, instead optimisation is secured across all offers in the market. • The value of each direction could be determined by the market

Some stakeholders suggest introducing the possibility of having both symmetric and asymmetric product, by allowing asymmetric products and provide the possibility to link two asymmetric products. The difference in this approach compared to allowing both symmetric and asymmetric products is that the upwards and downwards direction can be priced differently. For a symmetric product both directions have the same price, wheras a linked asymmetric product allows the stakeholder to price each direction differently according to underlying costs.

4.1.2 TSO analysis

The TSOs recognize that 62% of stakeholders prefer the option of having either only asymmetric products or both symmetric and asymmetric products. Introducing asymmetric products is likely to allow more technologies to participate and thereby more capacity to the market. The argument that asymmetric products are not needed since pooling can be used to create symmetric products is considered by TSOs to favour BSPs with a large, internal pool, compared to smaller BSPs that have to establish partnerships. Also, the concern of some stakeholders on the expected price difference between upwards and downwards FCR is not a main concern of the TSOs since this is considered to be a price signal to the market.

However, the TSOs also recognize stakeholders' concern on such a large change to the existing market design especially with regard to imbalance adjustment and/or energy remuneration. Introducing energy remuneration will not just affect the money flows, but potentially also the auction results depending if only the capacity price or both the capacity price and energy price should be considered in the auction. This topic will require further investigation including if energy remuneration, imbalance adjustment or combination of both is the best solution.

4.1.3 TSO conclusion

The TSOs believe that introducing asymmetric products could be a positive development of the current market design, but compared to other changes it has a lower priority. This is particular due to the implications on energy remuneration and imbalance adjustment.

The TSOs therefore conclude not to implement asymmetric bids.

After the first step in the market development has been in operation for e.g. a year and both market participants and TSOs have gained some experience, the option of asymmetric products might be investigated again. The investigation can include multiple options for the implementation of asymmetric products, where the suggestion from stakeholders mentioned in section 4.1.1 is only one possible option.

4.2 Indivisible bids and auction allocation algorithm

4.2.1 Introduction

Majority of the stakeholders are of the opinion that only divisible bids should be allowed. At the same time it is observed that for Belgian and Swiss stakeholders there is a strong preference for having indivisible bids. It should be mentioned that in the latter countries indivisible bids are allowed today and are important to cover the need for FCR.

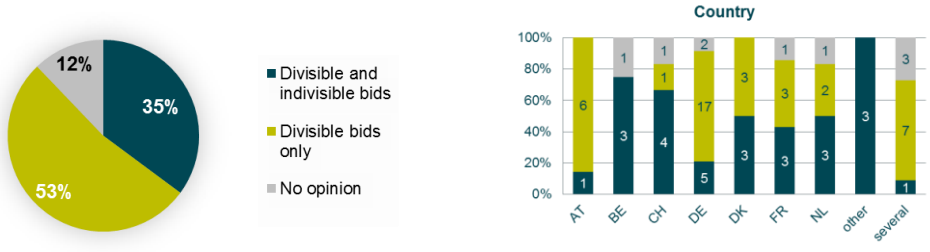

Figure 17: Divisible / Indivisible bids

4.2.2 TSO analysis

The TSOs are of the opinion that the reasons for acceptance of indivisible bids are more important than reasons for rejection.

Table 6: Arguments with regard to indivisible bids

	pros	cons
Introducing indivisible bids	• Decreases the BSPs risks related to cost recovery • Facilitates participation of units with on/off FCR settings or must run situations • Facilitates participation of small BSPs	• Increases complexity of auction algorithm, which influences transparency of auction results • Possible risk of market distortions in case of high limits of indivisible bids

Therefore indivisible bids should be allowed besides the divisible bids. However they are only acceptable in combination with changes in the market coupling algorithm, which protects divisible bids from being paradoxically rejected.
When using indivisible bids it can happen that such a bid is the marginal bid and that selecting it would mean that more than the overall demand would be procured. Depending on the question if we do accept this "over-procurement" or not, two different options for the solution can be constructed.

4.2.3 TSO conclusion

Indivisible bids should be allowed, with a restriction that no divisible bid can be paradoxically rejected (no rejection under the marginal price for divisible bids).

Maximum bid size of an indivisible bid will be limited to 25 MW (as currently defined in Switzerland).

Indivisible bids can be rejected below marginal price, but they can also be accepted on the marginal price if it reduces the overall procurement cost. This is a cost optimisation where it is possible that more than the total demand is procured in case this results in overall lower costs. If overprocurement is not possible then indivisible bids would be rejected even if it imply higher overall costs.

4.3 Exclusive bids

4.3.1 Introduction

An example of exclusive offers is illustrated in Figure 18.

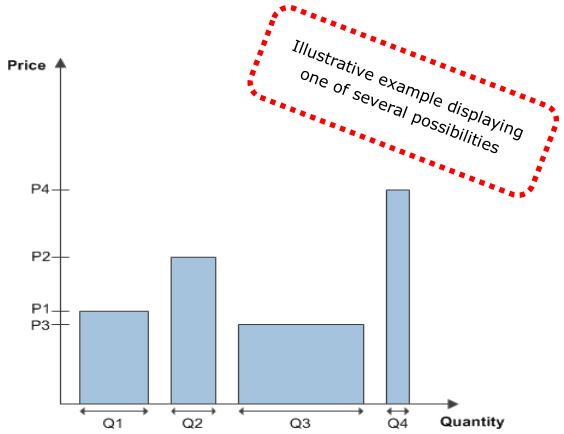

Figure 18: Example of an exclusive offer with 4 sub-offers

It presents four exclusive sub-offers with (quantities/prices): (Q1/ P1), (Q2/ P2), (Q3/ P3) and (Q4/ P4), respectively with the same delivery period. Only one of these offers can be accepted by the algorithm.
Here is the overview of the stakeholders opinions to the exclusive bids:

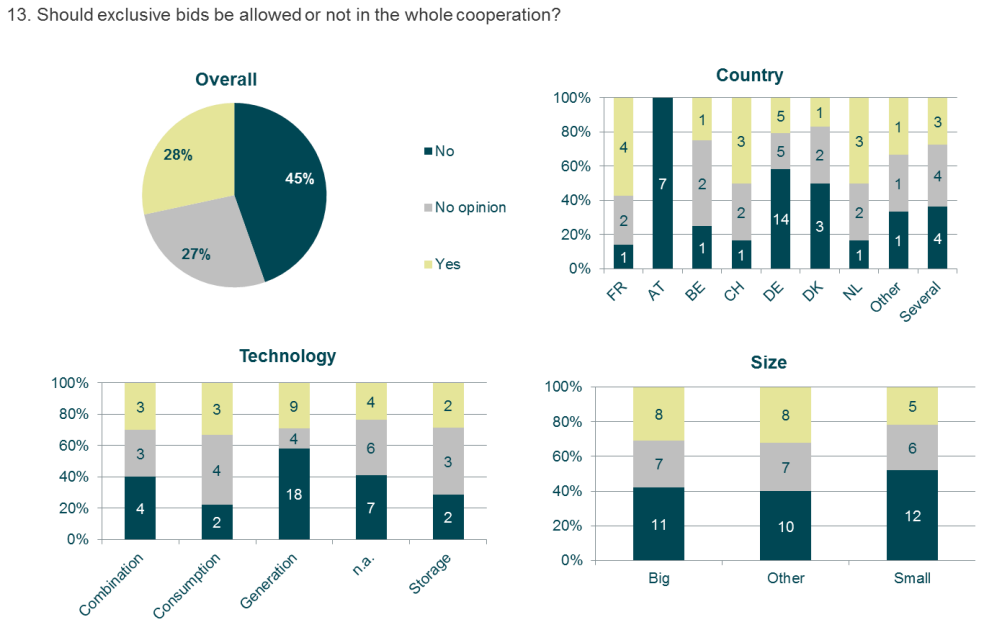

Figure 19: Exclusive bids

4.3.2 TSO analysis

Allowing exclusive bids to be submitted is supported by little over a quarter of consultation respondents. TSOs acknowledge that allowing exclusive bids offers some advantages towards maximization and optimization of the offered capacity. Exclusive offers provide more flexibility to BSPs to represent their technical constraints and synergies. Downsides of exclusive bids are that they

have an impact on market transparency. This can be mitigated by publishing the awarded bids. Additionally they have a significant impact on the capacity allocation algorithm and the bidding platforms, making them more complex, which also has an impact to the transparency. Furthermore, in current situation exclusive bids are only allowed in Switzerland and implemented only in the allocation algorithm of the current Central Clearing System (CCS).

4.3.3 TSO conclusion

TSOs therefore conclude to implement other measures first.

TSOs might raise the question of exclusive bids again, if after the implementation of the other changes it still can be considered as harmful for the level playing field and market participants show great interest in their implementation.

4.4 Minimum bid size

4.4.1 Introduction

It is only allowed to offer bids which are equal to or higher than the minimum bid size. Moreover it is only allowed to offer bids which are equal to or a multiple of the minimum bid size. Currently a minimum bid size of 1 MW is used in the cooperation. In Denmark, which will soon join the cooperation, the minimum bid size is lower (0.3 MW).
These are the results from the stakeholder feedback:

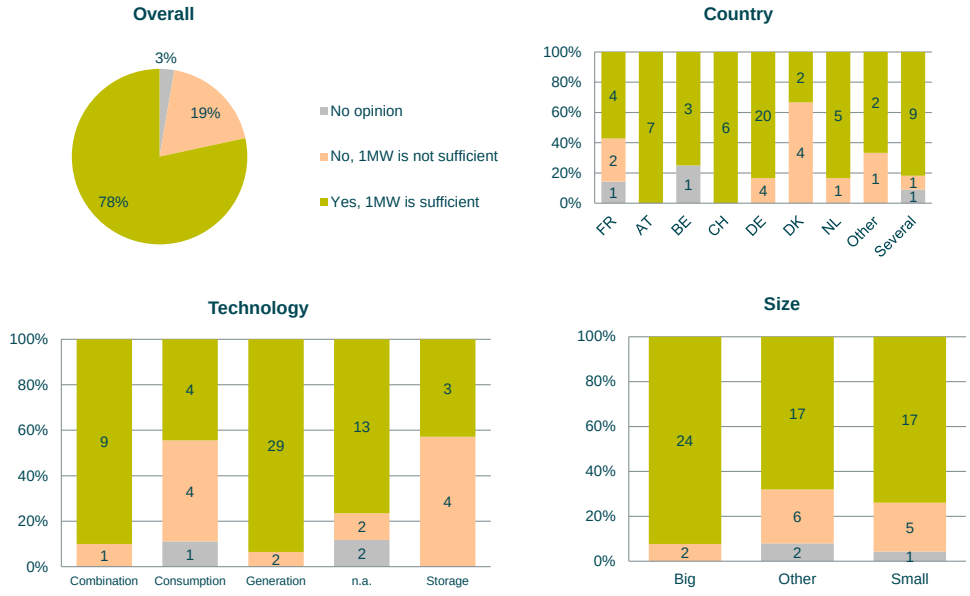

Figure 20: Minimum bid size

4.4.2 TSO analysis

Most stakeholders are of the opinion that a minimum bid size of 1 MW is sufficient, since pooling allows to reach this size easily. Moreover their argumentation is that below 1 MW there is no business case.
Exemptions are stakeholders from Denmark, since they already have a lower minimum bid size there. Moreover the stakeholders representing the technologies consumption and storage are in favour of a bid size smaller than 1 MW as well. The argumentation is that a lower minimum bid size would increase liquidity and allow the entrance of new technologies (e.g. electric vehicles).

TSOs think that lowering the minimum bid size would have very minor impact on liquidity, since pooling is already allowed to introduce small units and moreover there is hardly a business case below 1 MW.
Furthermore TSOs see the risk that lowering the minimum bid size could cause costs/effort (metering devices, administration,…) and the risk that stakeholder will require to lower the requirements (e.g. IT) in order to increase their economic efficiency.

4.4.3 TSO conclusion

TSOs conclude to keep the current minimum bid size of 1 MW.

Nevertheless since some stakeholders were in favour of lowering the minimum bid size this might be reevaluated in the future if stakeholders ask for it.

5. TSO-BSP settlement

5.1 Introduction

TSO-BSP settlement is a crucial feature for the BSPs in the FCR Cooperation. On the one hand it determines their revenues and on the other hand it is a source of market information. Further in the context of this consultation the TSO-BSP settlement is independent of the other consultation topics like product duration and could therefore have their own implementation path which means that TSOs e.g. do not have to change things as a prerequisite for a certain pricing scheme.

In the current FCR Cooperation a pay-as-bid TSO-BSP settlement scheme is implemented. That means that every selected bid gets the demanded price paid.

In the public consultation the stakeholders were asked if this TSO-BSP settlement scheme is appropriate or if they would prefer to switch to marginal pricing (MP), were the last awarded bid (with the highest price) sets the price for all awarded bids.
The FCR public consultation results are shown in Figure 21.

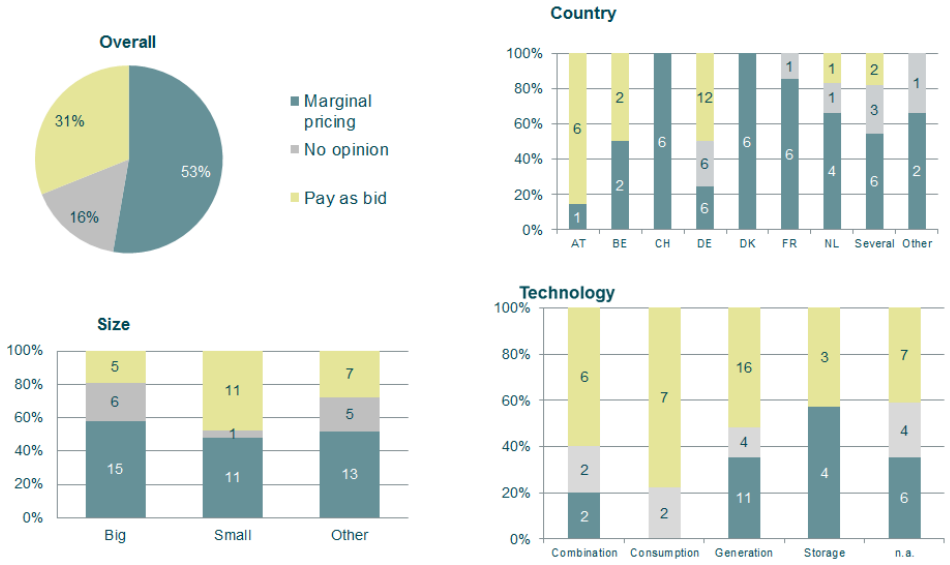

Figure 21: TSO-BSP settlement

5.2 TSO analysis

53% of all stakeholders are in favour of Marginal Pricing (MP), while 31% are in favour of pay-as-bid. Big BSPs are over proportional in favour of MP, whereas small BSPs have no preference. Regarding the technology classes it can be said that Generation, Combination and Consumption are in favour of MP, Associations (i.e. ”n.a.”) and Storage did not show a clear preference.
The main argument from the stakeholders for MP is that it provides an easier market entry for new participants in the FCR market. It is just needed to bid its own marginal or variable costs, which at least will be covered if they are selected. There will be a markup (producer/BSP rent) if the bidded cost were below the resulting marginal price. Bidding is therefore much easier and reduces risks. It is not necessary to analyse past auction for optimal bidding strategies and overall it reduces gaming (bet the marginal price).
Further MP fosters economic efficiency since it is closer to actual costs. In opposition to that it is argued that in the current FCR market not every assumption for optimal economic efficiency of MP

is given (perfect competition). But from TSO perspective it is not clear why pay-as-bid pricing should lead to a better resource alloction than MP.
Moreover it is stated that MP could lead to price peaks and probably higher costs. Which is probably true but it has to be acknowledged that this price peaks are the relevant price signals to expose scarcity and give better investment signals.

Since we are facing at least two limitations in the current FCR market (core shares (also called import limits) mandatory from SOGL; maximum transfer of capacities (also called export limits) mandatory from SOGL and the ENTSO-E Operation Handbook Policy 1) the major features of a marginal pricing scheme should be clear. They will be outlined as follows:

- Determination of marginal price for each country
  If the import or the export limit of a country is hit, then the marginal price of this country is the maximum price of the accepted offers of this country.
  For all the countries where the import and export limits are not hit, the marginal prices of all these countries are equal. The marginal price of all these countries is the maximum price of the accepted offers over all these countries where no limitation applies.

- BSP remuneration
  Each awarded offer is remunerated by its connecting TSO at the marginal price of its country.

- TSO-TSO cost distribution
  TSOs have to perform a cost distribution between countries.

5.3 TSO conclusion

TSO conclusion is to introduce Marginal Pricing as the TSO-BSP Settlement scheme.

6. Market rules harmonisation

6.1 Introduction

The current FCR Cooperation is working well. Nevertheless there are some remaining differences in the national market frameworks.
The TSOs strive at enabling a level playing field by strengthening the level of harmonisation of the national FCR market rules within the existing and extending cooperation for FCR.
Since full harmonisation is relatively costly to achieve, TSOs would like to focus on the most important topics for the time being. Therefore BSPs were 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.

6.2 TSO analysis

Figure 22 shows an overview of the stakeholders opinions on the market rules harmonisation:

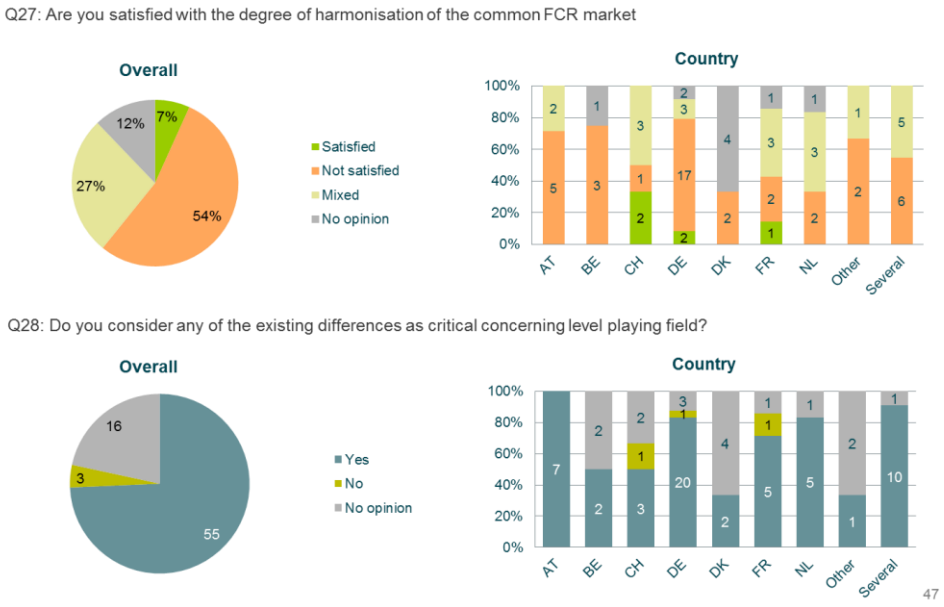

Figure 22: Market rules harmonisation

It is clear that most stakeholders are not satisfied with the level of harmonisation of market rules, in fact only 7% of the respondents state that they are satisfied. Furthermore the differences are observed as being critical to the level playing field.
In Figure 23 an overview is given from the most critical topics that need harmonisation from a stakeholder point of view.

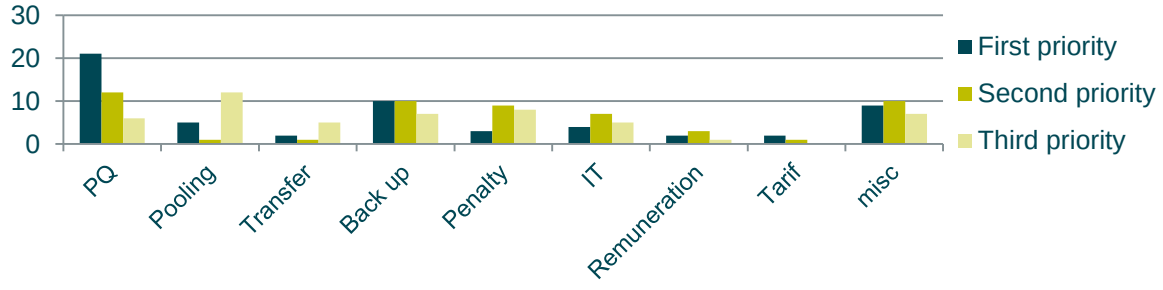

Figure 23: Most critical topics to be harmonised

As the BSPs expressed also their wish to have the prequalification criteria further harmonised (see Figure 23), TSOs started a detailed analysis. After this evaluation TSOs found out that the existing differences in prequalification cannot be considered as severely disruptive for a level-playing field and are therefore not treated as highest priority. However rules for aggregation and centralised frequency measurement will be studied. Energy availability requirements (duration either 15 or 30 minutes) are considered as the only remaining critical point, as this point is currently treated on ENTSO-E level, discussion does not belong to this cooperation.

6.3 TSO conclusion

TSOs understand that harmonization of national FCR rules is an important topic for BSPs and will therefore continue to work on harmonizing these rules further, using the experiences gained over the last two years of FCR cooperation.

In order not to address all topics at once, TSOs will pragmatically first focus their efforts on the following topics:

- **Rules for aggregation & Centralized frequency measurement**
- **Monitoring & Penalties**
- **Backup requirements (n-1)**

TSOs commit to investigate and to come up with a joint solution for harmonisation on these topics.

TSOs have chosen these topics because they are considered as important for achieving a level playing field. The solution will respect the balancing strategies of the FCR cooperation countries.
Implementation of the solution will be carried out after NRA approval of those measures.
This process might be further repeated in the future in case of successful results and in case harmonization of national rules still remains being important for BSPs.

7. Approval process

FCR Cooperation NRAs informed the FCR Cooperation TSOs that the approval process will be done on the legal basis of GLEB. According to NRAs this process will be faster than following the current national approval processes. The relevant GLEB articles for this process are the following:

- Article 33.1: TSOs have to develop a proposal for the establishment of common and harmonised rules and processes for the exchange and procurement of FCR within the FCR cooperation.
- Article 65: This proposal shall be submitted to NRAs at the entry into force of GLEB.
- Article 10.4: This proposal shall be subject to regional consultation.
- Article 5.3.b: The proposal is subject to approval by all concerned NRAs.
- Article 5.6: NRAs have 6 months to reach a common decision to approve or not to approve the proposal.

Public consultation on the detailed proposal will therefore be carried out in September 2017, based on the conclusions listed in this report. This proposal will also contain the current functioning of the FCR cooperation. Despite GLEB will not be into force in September 2017, this second public consultation will be announced as part of the GLEB implementation.

After taking into account the results of the public consultation TSOs intend to submit their proposal to NRAs shortly after the entry into force of the GLEB. NRAs should then issue their approval within 6 months of TSOs proposal.

The following planning represents the whole process taking into account an expected entry into force of GLEB on 1st January 2018. In case the entry into force is postponed, the proposal submission and the NRAs approval will automatically be postponed as well.

Figure 24: Public consultations and approval process

8. Implementation roadmap

Mentioned conclusions could be implemented in 3 independent consistent packages. This split has been estimated more preferable than implementing all changes at once:

- Package A consists in introducing indivisible bids in all countries, removing exclusive bids in Switzerland and changing the TSO-BSP settlement to marginal pricing. Package A could be implemented 9 months after NRA approval at the latest. This package has high priority for TSOs as it would solve the current decoupling issues[4], and the implementation effort for TSOs remains limited.
- Package B consists in implementing daily auction with 4h products. Package B could be implemented by TSOs 18 months after NRA approval at the latest. The implementation of this package is more challenging for TSOs as it requires consequent automation of TSO processes.
- Package C consists in implementing a first step of further harmonization of FCR market rules. TSOs will make a joint plan for further harmonization to NRAs on 22nd December 2018 at the latest. Implementation timing will then be detailed at this time, taking into account NRA approval time.

The 9 months (for package A) and 18 months (for package B) implementation periods include the needed time to adapt the national contracts and rules, in cooperation with NRAs, where applicable.

TSOs suggest to implement above mentioned packages first and than raise the question of asymmetric bids, exclusive bids, linked bids in time, cross border secondary market and minimum bid size again, when TSOs and BSPs have gained some experience with the implemented changes.

[4] In case of pardoxically rejected divisible bids, because of indivisible bid in Switzerland, the market will be decoupled as followed: AT & CH in one market and other countries in second market. From July 2017 AT will be coupled with the bigger market region.

9. ANNEX 1

Together with the analysis of the consulstation results, the TSOs made a quick analysis in order to assess the compliancy of the currently planned changes with the recently voted guideline on electricity balancing (EBGL) and guideline on electricity transmission system operation (SOGL). It need to be noted that this was not an analytical investigation but only the articles that are directly related to the envisaged changes were assessed. Below, there is a list of the topics that were compared to the two guidelines:

- The introduction of daily auctions and not implement a transfer of obligation. The latter is in line with EBGL article 34 allowing not to implement a transfer of obligation in case the auctions are more frequent than weekly.
- The implementation of an algorithm for the capacity procurement optimisation function where overprocurement is allowed (may happen due to introduction of indivisible bids) in order to minimize the total procurement costs. This is requested by EGBL article 58 (3) where a cost minimization is required. [5]
- TSO plan not to implement energy remuneration for FCR in all FCR cooperation countries. It is not considered mandatory for the time being since asymmetric products will not be implemented. Article 46 of GLEB provides that settlement of activated volume of balancing energy for the frequency containment reserve is optional.
- Import / export limitations addressed in annex VI of SOGL will be taken into account by the allocation algorithm when the regulation enters into force.

[5] Non-rejection of divisible bids may lead to higher costs but:
- the effect is minimal
- this specific feature intends to provide cost minimisation on the long run by giving appropriate price signal and incentives.