

DISCLAIMER: The memo is solely intended to clarify and explain topics and processes within and related to the Nordic Balancing Model Program, and may be updated during the program execution period. The content is based on current knowledge and maturity of the program and may not be accurate in every circumstance. The content does not constitute or propose to constitute legal advice or positions, and is not intended to be binding, in any manner.

## Memo - Process for activating products – update June 2020

This memo gives an outlook for the product development and how the energy activation markets are an integrated part of the system operation. This is an updated, second version of the memo that was published in 2019. Since the publication of the first version, further work has been done within the Nordic Balancing Model program for the planning of the development of the mFRR products and the different steps towards the final target with full integration of the European mFRR energy activation market. This update includes further details to that matter. Still, it is foreseen that this memo will be updated taking into account new information, gathered experience in the development process and from the stakeholder dialog.

### Introduction

The Nordic region has had a common regulating power market (RPM) since 2002. Simplified, RPM can be described as the mFRR energy activation market of today. Many changes are necessary before we have an automated mFRR activation market that meets all EBGL requirements. These are both changes in internal TSO processes, product definitions and development of terms and conditions for market participation. Changes in internal TSO processes are not only necessary for legal compliance and European market integration, but are also driven by the need for automation in order to be able to operate the future green power system in a secure and efficient manner.

Efficient and well-functioning activation markets are integral tools in the TSO operational processes and critical for a secure and efficient operation of the power system. TSOs have to be confident that the activation market design fulfils the operational needs and continues to work well while changing the balancing process and markets. This includes reliable fall-back

arrangements and any interim solutions. The coming years imply a sequence of complex changes in core operational processes. These changes must be deployed in a continuously operating environment and carried out in a way that the impact from each change is thoroughly understood and that all relevant risks are appropriately mitigated. To secure a safe transition, the TSOs will need to apply an adaptive approach to the implementation which implies that adjustments to the solutions are continuously considered and incorporated when new learnings from both TSO and stakeholder processes unfolds.

### **Brief description of some features of today's Nordic balancing**

## Balancing process today

Today, the Nordic balancing is frequency-based. Frequency deviations are caused by imbalances in the whole Nordic synchronous area, including 4 countries and 11 bidding zones.

Balancing and congestion management is currently performed in one integrated process. The operator can select regulating power bids for activation either because of imbalances or in order to relieve overload. When activating bids for balancing the operator can choose to deviate from the price order to avoid creating or worsen an overload.

The requested volumes and geographical restrictions of activations are defined by the TSOs' control room operators. Regulating power bids, provided by balancing service providers (BSPs) in all Nordic countries, are visualised in a common merit order list (CMOL) from which the operators choose the cheapest available bids that will not create or worsen overload.

Operators of the Nordic TSOs continuously co-ordinate in the above described process with Svenska Kraftnät and Statnett sharing the co-ordination lead.

In addition to the activation process described above, the operators perform planning and preparation activities, such as changes in production schedules and grid re-configuration. This is done both before the operational day, but also close to real-time and is linked to the manual congestion management process.

## TSO-BSP process

After the TSO operator has chosen a bid, the BSP is contacted, either by phone or electronically. The BSP confirms that the bid will be activated, and the exact timing of the activation is agreed on between the TSO and the BSP.

## Products

Today, the bids in the RPM are directly activated<sup>1</sup>. The formal full activation time (FAT) is 15 minutes, but it is often agreed as part of the TSO-BSP process to activate quicker than 15 min. Also, bids with longer FAT than 15 minutes may be accepted in some countries. The bids are used for both congestion management and balancing. Gate closure time is 45 min before the start of the operational hour, and the validity period is one hour.

A bid stays activated for the validity period (hour) or until it is deactivated. The current practice varies between the TSOs. In Norway a manually activated bid is activated until it is deactivated (for more than one delivery period), while electronically activated bids in Norway and all bids in Sweden and Denmark have to be re-activated for a new hour.

## Transition until Nordics join MARI

Before the Nordic countries connect to the European mFRR energy activation market, MARI, there are many changes needed in both internal TSO processes and attributes related to the mFRR product. These changes will be developed, tested and implemented in this period. From a planning and change implementation perspective, the period until the Nordics join MARI can be divided into three sub periods:

1. Preparation and stepwise implementation before parallel operation
2. Parallel operation
3. Period between 15 min ISP and joining MARI

These periods are shortly described below.

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<sup>1</sup> Directly activated bids can be activated continuously, while scheduled bids can only be activated at defined scheduled times. Hourly scheduled activation is used in DK2 already today.

## **Preparation and stepwise implementation before parallel operation**

This period last until the start of the parallel operation in Q2 2022. To be able to initiate the parallel operation, the process for activating products needs to be prepared for automation, including IT and process development. It is important to emphasise that many changes are therefore required in the relatively near future. To some extent these changes will also require changes in the BSP processes.

Some of the most important changes in this period include:

- New bid attributes
- New tools to handle structural imbalances or measures to reduce them
- The new CIM bid format

## **Parallel operation**

Parallel operation is planned between Q2 2022 and Q2 2023. In this period the new processes and product attributes will be used in the real time system operation. The most important purpose of the parallel operation period is to gather operational experience on the automated processes required to be able to implement 15 min ISP. After 15 min ISP is introduced manual balancing is not considered to be viable, so confidence must be built in the new processes before this 'point of no return' is passed.

If new automated processes during parallel operation for some reason are not available or cannot provide a safe operation, a switch back to the more manual processes similar to those that are in operation today can be done. Thus, an important purpose of this period is also to gather experience on the necessary fallback processes.

## **Period between 15 min ISP and joining MARI**

This period will take place from the implementation of 15 min ISP until the Nordic countries connect to the common European mFRR platform, MARI. Some of the market design aspects that have been decided for the European standard product and processes for activating mFRR will be implemented in the Nordic countries during this period.

The European standard product shall be fully implemented before the Nordic countries join MARI.

## Important process and product changes

In this section, some specific topics with related changes are described in more detail as well as when the changes are expected to be implemented.

### Bid attributes

	<b>Bid attribute</b>	<b>Description</b>	<b>Implemented by</b>
<b>Common for all Nordic countries</b>	Minimum offered volume	This is in order to set a minimum volume to be activated even though the bid is divisible. For example bid of 50 MW but minimum volume to be activated is 10 MW.	Parallel operation (Q2-2022)
	Indivisible Bids	Bids that have to be activated in its entirety. For example the AOF can't activate 10 of 20 MW in the offered bid, only 20 MW.	Parallel operation (Q2-2022)
	Exclusive Bids	It will only be possible to activate one of the amounted volumes with its corresponding cost. For example start-up costs dictate that the first MW will cost 101 EUR (100 start-up, 1 variable cost). 2 MW will cost 51 EUR (100/2 + 1), 4 MW cost 26 (100/4 +1) etc.	Parallel operation (Q2-2022)
	Multipart (Parent/child) *	Gives an opportunity to notify when the bid is subject to an increasing cost curve. For example, an indivisible parent bid of 100 EUR/ 10 MW, and divisible child bid 1: 20 MW 110 EUR, divisible child bid 2: 30 MW 120 EUR etc.	Parallel operation (Q2-2022)
	Conditional Bids	If the bid is activated during the latest quarter, it's available/not available in the next. Used to automatically adjust bids in QH1 and/or QH2 as a result of the outcome of the clearing during QH0, even though GCT for QH1 or QH2 already have passed.	Parallel operation (Q2-2022)
	Technical Linked Bids	For Direct Activation: If bids are directly activated in Q0, it can't be activated in Q1. Ramping and Scheduled activation: If the same resource has been activated for	Parallel operation (Q2-2022)

		an upwards bid in Q0, it can't be activated downwards in Q1.	
	Direct activation type	If bid is eligible for scheduled activation only or for both scheduled activation and direct activation.	Parallel operation (Q2-2022)
<b>National bid characteristics</b>	Minimum duration	BSPs include information on the technical limitations regarding how short a bid can be activated. Minimum duration longer than 15 minutes is not compatible with the standard product and cannot be activated by the AOF.	National decision if and when to be implemented.
	Maximum duration	BSPs include information on the technical limitations regarding how long a bid can be activated. This attribute is necessary to allow BSP to send in bids in advance so that they do not need to update bid if they are activated.	National decision if and when to be implemented.
	Resting time	Closely linked to maximum duration. How long resting time does the BSP need between each activation? Very relevant for demand side BSPs	National decision if and when to be implemented.
	Inclusive bids	If one bid is activated, another bid (f.ex a resource downstream) also needs to be activated.	National decision if and when to be implemented.
	Locational information on bids	More detailed location on where the resources in the bid are situated	National decision if and when to be implemented.
<b>Possible national specific products</b>	Period shift product	Bids are activated for a shorter period than the whole Market Time Unit around period shift in order to resolve structural imbalances.	National decision if and when to be implemented.
	Bottleneck product/pre real time process	Product/Information that handles bottlenecks before the balancing process begins. Process will probably run (manually or automatic) between 40 and 120 minutes before period shift	National decision if and when to be implemented.
	Faster or slower activation time products	Products that have a FAT that's either faster or slower than 12,5 minutes	National decision if and when to be implemented.

\* Within the MARI project there has been a discussion on the “Advanced Parent Child” attribute, which is a different version of

exclusive bids. Here, the start-up cost is given as well as the variable cost. The algorithm activates the desired amount up to a given amount. The parent reflects the full start-up cost, the child the decreasing costs. Currently this attribute is put on hold in MARI.

## **Period shift product**

Around the start of a given Market Time Unit (MTU), big imbalances can occur due to the difference between the gradual changes in consumption and HVDC ramping as compared to the often very fast changes of production - referred to as “structural imbalances”. To avoid this the Nordic TSOs currently utilize different tools to “smooth out” the planned production changes. These tools can be divided into two categories.

- The BRPs are imposed to smooth out their production change when their scheduled production change exceeds a certain threshold. In that sense, the BRP is responsible for the action; or
- The TSO operators take actions to contact the market parties and agree on shifting the planned change, to either before or after the period shift – up to 15 min either way.

This section focuses on the second category, which is currently used by Svenska kraftnät (“Kvartsaffärer”) and Statnett (“Produksjonsflytting”). These tools are here referred to as period shift products.

The introduction of 15 min MTU should in theory reduce the structural imbalances because the necessary production changes can be spread out over all quarter shifts and not only the hour shift. This will reduce the need for period shift products, all else equal. Some Nordic TSOs however, expect that there will be a need to have tools available to smooth out production changes also after the introduction of 15 min ISP. There is some uncertainty about the time it will take before the market behaviour has fully adapted to the higher time resolution. Also, depending on the future system dynamics of production (and consumption), the structural imbalances around a single period shift may still require some smoothing in order for not to exceed the available balancing volumes.

Furthermore, it is not certain if the introduction of single pricing can affect the structural imbalances or when 15 minute MTU is introduced in the Day-ahead market. In summary, there are

uncertainties on when the structural imbalances will be reduced and to what extent.

The currently used period shift products require manual actions by the operator. As communicated earlier by the NBM program, these kinds of manual procedures are not feasible in the future 15 minute resolution and these processes will need to be automated. Therefore, some of the Nordic TSOs investigate new, automated tools and products.

One option that will be further analysed and discussed with Nordic stakeholders is to utilise an mFRR product, e.g. by introducing a separate bid attribute that make it possible for the BSP to voluntarily offer their bids for a period shift. An mFRR bid activated for period shift would only be activated in the start or end of the 15 minute period. A part of the further analysis will be how to establish sufficient incentives for such an option.

In parallel, the Nordic TSOs will analyse possible measures to reduce the structural imbalances, and thus the need for period shift products. Such measures can include BRP ramping around period shifts.

## **Non-standard products**

The Nordic TSOs will strive to use the standard products and processes as much as possible, but there can be cases where we need to deviate from the standard processes. All these exceptions will be introduced in a transparent way, and after discussions with market players and regulators. Some of these might require the definition of a specific product as described in the EBGL.

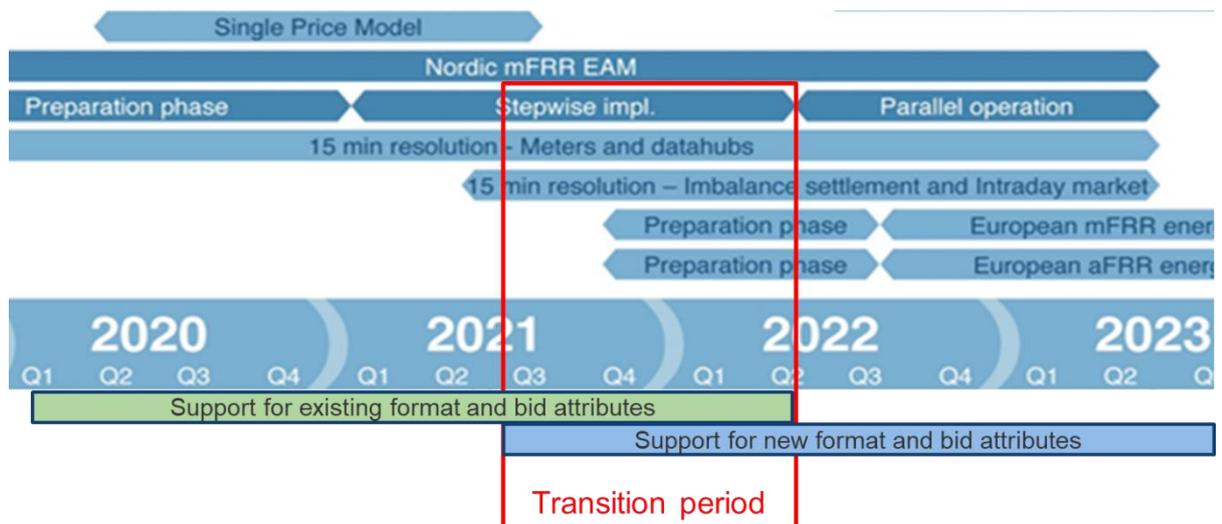
- **To handle structural imbalances around period shifts** as described above
- **To activate bids faster than 12,5 minutes** after a large incident. Many BSPs in the Nordics can make activations significantly faster than 12,5 minutes, and the TSOs will assess if a process for faster activation is required.
- **To activate bids that are not able to fulfil the requirements in the standard product.** Some resources can have restrictions on ramping speed, minimum activation time or other that is not in line with the standard product. These resources might still be needed in scarcity situations or in case activation is needed

at a certain location in the grid. This will be further assessed.

- **To perform some early activations.** If large imbalances or bottleneck problems can be identified ahead of time, it might be beneficial to sort out these issues before the regular balancing process that is performed every 15 minutes. If, when and how this can be done must be further investigated.

## The new CIM bid format

The introduction of new bid attributes, as described earlier in this memo, will require the shift from the current bid format to the CIM format. The Nordic TSOs foresee that there will be a gradual shift, including a transitional period where the BSPs can use both the current format and the new CIM format. This period is currently planned from earliest Q3 2021 until start of parallel operation period.



## Other relevant market design features

The table below gives an overview of the stepwise implementation of the different product attributes.

	Today	Parallel operation (Q2 2022-Q2 2023)	After 15 min ISP but before connection to MARI	When connecting to MARI
Full Activation Time, FAT (minutes)	15	To be determined <sup>1</sup>	To be determined <sup>1</sup>	12,5
Maximum/minimum price (EUR/MWh)	5000/no minimum price	To be determined <sup>1</sup>	To be determined <sup>1</sup>	99 999/- 99 999 <sup>1</sup>
Minimum bid size (MW)	5 or 10 <sup>2</sup>	1, 5 or 10	1, 5 or 10	1
BSP bid time resolution for price and volume (minutes).	60	60 and 15 <sup>3</sup>	15	15
Marginal price resolution (minutes)	60	60	15	15
Bid activation	Electronic and manual	Electronic	Electronic	Electronic
Gate closure time	H-45 min <sup>4</sup>	H-45 min	Q-45 min	Q-25 min

<sup>1</sup> The exact time for introducing standard product features for Full Activation Time (12,5 min) and maximum/minimum price (99 999/- 99 999 EUR/MWh) price is not yet decided

<sup>2</sup> The minimum bid size differs today depending on the bidding zone.

<sup>3</sup> How and when 15 minute bid resolution will be introduced is not yet decided. In the parallel operation period it could be possible to allow 15 minute resolution on the bid volume and/or the bid price but the consequence of allowing this must be further analysed.

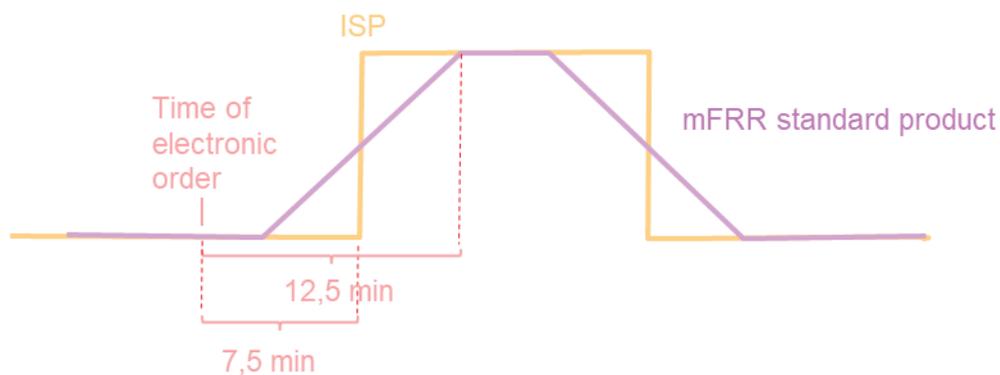
<sup>4</sup>H and Q marks the start of the MTU, 60 min and 15 min respectively.

## BSP activation response

In the new 15-minute based process the activation profile of the bids will be more important. The mFRR standard product

describes a full activation time of 12,5 minutes, divided in 2,5 minutes preparation time and 10 minute ramping time. The TSOs might propose additional requirements in the local terms and conditions according to EBGL article 18.

The figure below shows the process for activation of the standard product with 12,5 minute FAT. Before the full introduction of the standard product and the new FAT, the process can look different. The details about how the activation process will be in the intermediate steps is not yet decided.



The activation of bids will be requested in a fixed rhythm, and the activation requests using electronic ordering will come every 15 minutes. When the standard product is fully implemented the electronic order will come exactly 7,5 minutes before the start of the quarter hour, but this can be different in the intermediate steps.

In the new process where everyone receives synchronized activations it is more important than before to get a predictable response. Reasons for this:

- There will be exchange of mFRR between the Nordic synchronous system and DK1. After MARI, also to the rest of Europe. This exchange over HVDC will follow the standard product. If the BSP activation deviates from this product this will lead to imbalances in the activation area and frequency deviations in the Nordic synchronous area
- Changes in the merit order list or the available transmission capacity can mean that there are bids ramping up and other bids ramping down at the same quarter hour shift. If the response is not predictable, this will lead to system imbalances

From a TSO perspective the desired response is that the BSP follows the standard product precisely, but we understand that

this is not practically feasible for all BSPs due to the nature of their production/consumption unit. It can however be assumed that one of the principles for a desired BSP response will be predictability around the period shift.

The Nordic TSOs see the possible benefit of developing harmonised rules for the BSP response. These discussions will be initiated and stakeholder input will be an important part of the work.

In parallel operation the TSO will follow the new process as much as possible. The new process includes an optimization and activation every 15 minute, and hence the need for a predictable BSP response is present already in parallel operation. However, we must further analyse and discuss with stakeholders how introduction of requirements for BSP response shall be coordinated with the introduction of the new FAT of 12,5 minutes.