

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 December 2020

This memo gives an outlook for product development and how the mFRR energy activation market is an integrated part of the system operation. This is an updated, third version of the memo that was originally published in 2019. Substantial updates as compared to the last version of the memo are coloured in grey. Further versions will be published when new information is available, and experience is gathered in the development process and from the stakeholder dialog. Contact information for each TSO can be found on the NBM website: [Automated Nordic mFRR energy activation market – nordicbalancingmodel](https://nordicbalancingmodel.net/automated-nordic-mfrr-energy-activation-market).

### 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 energy 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, and processes on the market participant side. 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 meets the needs for operation and an efficient market and that the market will continue to function well while balancing process and market is

undergoing changes. 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 such a way that the impact of 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.

## Balancing process today

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

Balancing and congestion management are 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 worsening 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 minutes. 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 joins 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 Automated operation pre 15 min ISP<sup>2</sup>
2. Automated operation pre 15 minute ISP
3. Period between 15 min ISP and joining MARI

The two first periods focus mainly on preparing the IT- and operational systems and processes, both from a TSO and BSP

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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.

<sup>2</sup> This period was previously called "Parallel operation"

point of view. Larger changes in market design are planned from 15 min ISP. When both operational and market changes are implemented the Nordics will be better prepared for joining the European mFRR platform MARI. These periods are further described in the next sections.

The new mFRR balancing process will be based on the model described in the European regulations<sup>3</sup>. This means calculation of the balancing need in each bidding zone, and a common regional optimization every 15 minutes.

The TSOs must decide the mFRR need per area before every 15 minute period based on an imbalance prognosis. Together with the available bids and the available transmission capacity this makes it possible to find the optimal bids to activate. Since the bid selection process is done per 15 minutes, also the standard mFRR product is defined for a 15-minute period.

The bid selection is done for 15 minutes at the time, and each bid selection is independent of the previous period.<sup>4</sup>

## **Preparation and stepwise implementation before Automated operation pre 15 minute ISP**

This period lasts until the start of the Automated operation pre 15 minute ISP in Q4 2022. To be able to initiate the Automated operation pre 15 minute ISP, 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 balancing service provider (BSP) processes. Some of the most important changes in this period include:

- The new CIM bid format
- Possibility to use a selection of new bid attributes in some countries
- New tools for TSOs to handle structural imbalances or measures to reduce them (described later in the memo).

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<sup>3</sup> The European regulations shaping the model for the balancing process are primarily EBGL and SOGL.

<sup>4</sup> The BSP can indicate some dependencies between 15 min periods through linking bid attributes, see Table 1 regarding technical and conditional linking.

## Automated operation pre 15 minute ISP

Automated operation pre 15 minute ISP is the start of the new Nordic mFRR energy activation market. That means new bid characteristics, attributes and formats, bid selection, and TSO automation will be put into operation. This period is planned between Q4 2022 and Q2 2023. The most important purpose of the Automated operation pre 15 minute ISP 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 Automated operation pre 15 minute ISP for some reason are not available or cannot provide a safe operation, a switch back to the more manual processes 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 for this period.

The European standard product will 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

Bid attributes in this section are divided into New bid attributes, common for all Nordic countries and National bid attributes.

Table 1 includes the *New bid attributes*, which are the European standard product bid attributes and will be supported by the Nordic mFRR energy activation market

platform and ultimately by MARI. Thus, such bid attributes will be sent to and considered in bid selection. In Automated operation pre 15 minute ISP all new bid attributes are supported for the 15-minute bids, while support of bid attributes for 60- minute bids will be limited and differ between TSOs. Implementation guide includes detailed information on the support of bid attributes for 60-minute bids.

Table 1.

New bid attributes, common for all Nordic countries		
Valid from Automated operation pre 15 minute ISP Q4-2022		
Type	Bid attribute	Description
<b>Simple bids</b> One bid, one price	Minimum offered volume	Can be applied to set a minimum volume to be activated even though the bid is divisible.
	Indivisible Bids	A standard mFRR balancing energy product bid, which cannot be activated partially. Therefore, the volume of an indivisible bid is always activated altogether
<b>Complex bids</b> Combination of simple bids	Exclusive Group Order	The exclusive bid is a group of bids where solely one of the bids can be activated; hence, the activation of a bid belonging to an exclusive bid excludes the activation of the other bids belonging to the same group
	Multipart (Parent/child) <sup>5</sup>	A multipart bid consists of two or more simple bids within the same quarter hour. The bids must have different prices but may have the same or different volumes. A component of an upward multipart bid cannot be activated unless all other components with a lower price have been activated up to their entire offered volumes. A component of a downward multipart bid cannot be activated unless all other components with a higher price have been activated up to their entire offered volumes.
<b>Bids linked in time</b> Between consecutive quarter hours	Conditional bids	Conditional linking is the linking of bids (only simple) in two or three subsequent quarter hours. Conditional linking is used to adjust the availability of a bid in QHo (available/non-available) based on the activation outcome of linked bids in previous quarter hours QH-1 and/or QH-2.
	Technical linked bids	Technical linking is the linking of two bids (simple or complex) in two subsequent quarter hours. Technical linking ensures that a bid in QHo is not available for clearing if the bid in the previous quarter hour was activated in direct activation (DA). This is important in order not to activate the same balancing resource twice.
<b>Activation type</b>	Direct	A standard mFRR balancing energy product bid that can be activated at any point of time following the point of scheduled activation of the quarter hour for which the bid is submitted and until the point of scheduled activation of the subsequent quarter hour. Every direct activatable bid is scheduled activatable bid as well.

<sup>5</sup> 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 not foreseen in MARI.

All the new bid attributes are relevant only for the CIM format bids.

In Table 2 below additional national bid attributes are described. These attributes will be handled locally by the TSO. More information on the attributes supported in different countries can be found in the Implementation Guide.

Table 2

National bid attributes	
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.
Resting time	The BSP can add information on the required minimum duration between the end of deactivation and the following activation.
Inclusive bids	If one bid is activated, another bid (e.g. a resource downstream) must also be activated.
Locational information on bids	More detailed location on where the resources in the bid are situated, than bidding zone.

## Non-standard products

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 and, in that case, how the process should be designed.
- To activate bids that are not able to fulfil the requirements for the standard product. Some resources can have restrictions on ramping speed, minimum activation time or others that are 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.

Table 3

Possible national tools / specific products	
National decision if and when to be implemented	
Period shift tools	Bids are used to shift activation for a shorter period than the entire Market Time Unit around period shift to resolve structural imbalances.
Faster activation time products	Products that can be activated with a FAT which is faster than 12,5 minutes.
Non-standard product bids	Bids that have a FAT that is slower than 12.5 minutes and/or has a minimum duration of activation that is longer than the activation in the standard product

## Period shift

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”.

Today the Nordic TSOs currently utilize different tools and requirements to address this

- Production changes must be shifted 15 minutes if the planned change is larger than 200 MW
- Production changes can be shifted 15 minutes on request from the TSO in the planning phase ("Produksjonsglatting")
- The TSO operators request to move production changes in the operational phase. Shifting the production 5 to 15 minutes in either direction. ("Kvartsaffär", "Produksjonsflytting")

The introduction of 15 minutes MTU is expected to reduce the need for period shift tools, 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, and therefore - Statnett and Svk - investigate new, automated tools.

A proposal that will be further analysed and discussed with Nordic stakeholders is to utilise information provided together

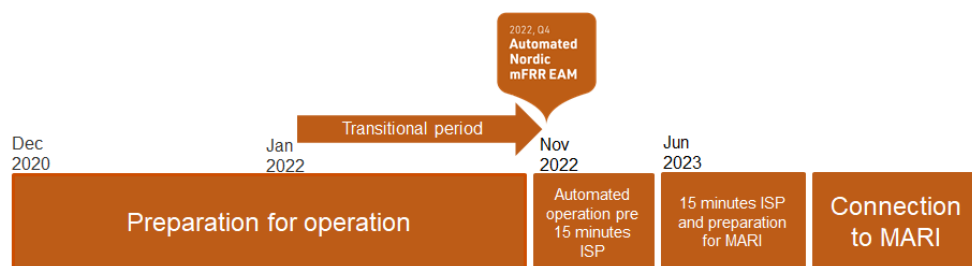


with the mFRR bids, e.g. by introducing a separate bid attribute that makes it possible for the BSP to indicate that they can be used for period shift handling. A BSP bid that is used for period shift handling would be activated in a similar way to an mFRR bid, but only at the start or end of the 15-minute period.

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

## The new CIM bid format

The introduction of new bid attributes will require the shift from the current bid format to the CIM format. 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 gradual shift is currently planned from earliest **Q1 2022** until start of Automated operation pre 15 minute ISP period. **Thus, the BSPs must implement and test the new CIM format before the start of Automated operation pre 15 minute ISP as only this format will be accepted in Automated operation pre 15 minute ISP<sup>6</sup>. For more details, see the Implementation Guide.**



<sup>6</sup> Fingrid will allow 60 minute bids in current format for transitional period during Parallel operation

## Other relevant market design features

Table 4 gives an overview of the stepwise implementation of the different product attributes. Some details differ among the TSOs. Please see the Implementation guide for the details of each TSO.

Table 4

	Today	Automated operation pre 15 minute ISP (Q4 2022-Q2 2023)	After 15 min ISP but before connection to MARI	When connecting to MARI
Full Activation Time, FAT (minutes)	15	15	12.5	12.5
Maximum/minimum price (EUR/MWh)	5000/no min. price	5000/no min. price	5000/no min. price	99 999/-99 999
Price granularity (EUR/MW)	0.01 or 0.5 <sup>1</sup>	0.01 or 0.5 <sup>1</sup>	0.01	0.01
Minimum bid size (MW)	5 or 10 <sup>2</sup>	1 or 10 <sup>3</sup>	1	1
BSP bid time resolution for price and volume (minutes).	60 <sup>4</sup>	60 and 15 <sup>5</sup>	15	15
Marginal price resolution (minutes)	60	60	15	15
Bid activation	Electronic and manual	Electronic	Electronic	Electronic
BSP Gate closure time	H-45 min <sup>6</sup>	H-45 min	Q-25 min <sup>7</sup>	Q-25 min

<sup>1</sup> Statnett will continue the current practice with 0.5 EUR price granularity from the start of Automated operation pre 15 minute ISP but foresees to remove this constraint no later than at the introduction of 15 min ISP.

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

<sup>3</sup> Statnett will continue with a minimum bid volume of 10MW in Automated operation pre 15 minute ISP. Exceptions may apply in some bidding zones or for pilot projects.

<sup>4</sup>In Norway volume resolution is 15 minutes

<sup>5</sup>How and when 15 minute bid resolution will be fully introduced is not yet decided among all TSOs. In the Automated operation pre 15 minute ISP period there will be support for 15 minute resolution on the bid volume and/or the bid price. The dynamics and activation examples for 60 min bids during

Automated operation pre 15 minute ISP is further described in Implementation guide.

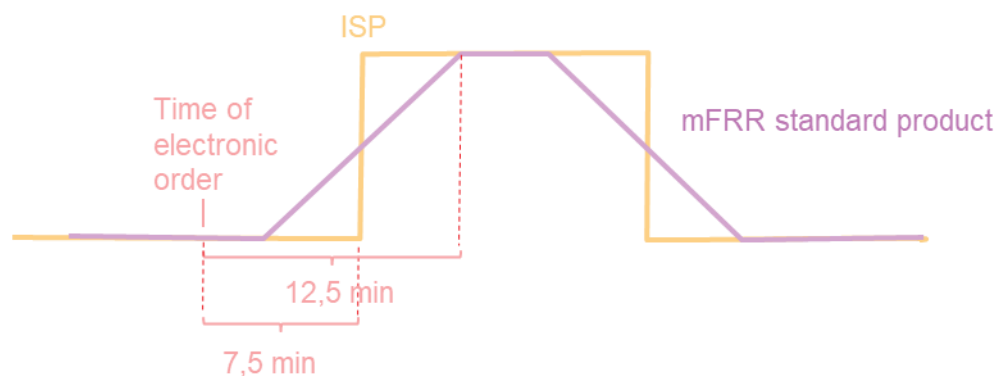
<sup>6</sup>H and Q marks the start of the MTU, 60 minutes and 15 minutes respectively. This means that in Automated operation pre 15 minute ISP bids will be submitted for all four quarters at 45 min prior to the start of the hour.

<sup>7</sup> Earlier introduction of BSP GCT at Q-25 as compared to what has been previously communicated.

## BSP activation response

The mFRR standard product describes a full activation time of 12.5 minutes, divided in 2.5 minutes preparation time and 10 minutes ramping time. It also includes the minimum duration of full amount of offered power of 5 minutes. However, if a bid is activated for several consecutive quarter hours the full activated power can be extended. The TSOs might propose additional requirements for the activation response 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. The new FAT requirement will come into effect after Automated operation pre 15 minute ISP, meaning that 15 minute FAT will be allowed during Automated operation pre 15 minute ISP. This means that the BSP can use the time from receiving the activation order (Q-7.5) until the midpoint of the delivery period for ramping, and that down ramping (if not re-activated) should start immediately after reaching full activation. Delivery according to the 12,5 minute profile is also allowed in Automated operation pre 15 minute ISP.



The activation of bids (electronic ordering) will be requested in a fixed rhythm every 15 minutes. The electronic order will be sent exactly 7.5 minutes before the start of the quarter hour (Q-7.5).

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 Automated operation pre 15 minute ISP the TSO will follow the new process as much as possible. The new process includes optimization and activation every 15 minutes, and hence the need for a predictable BSP response is present already in Automated operation pre 15 minute ISP. However, we must further analyse and discuss with stakeholders how the introduction of requirements for BSP response shall be coordinated with the introduction of the new FAT of 12.5 minutes.

**During Automated operation pre 15 minute ISP phase the imbalance adjustment for the BSPs will be done the same way**

as today with a "block volume". From the start of 15 minute ISP the imbalance adjustment will be calculated according to the ramped profile, meaning that not following the ramping profile could lead to imbalances.