

# *Nordic Balancing Model*

## *Consultation report*

*May 29 2019*

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## **1 Introduction**

This document describes an updated roadmap proposal for the Nordic Balancing Model (NBM). The NBM roadmap now includes the implementation of Single price model and 15 min time resolution, consisting of 15 minutes Imbalance Settlement Period (ISP) and 15 minutes Market Time Unit (MTU).

Implementation of the Nordic Balancing Model is organized in two phases, where this document explains the roadmap for the 1<sup>st</sup> generation of NBM.

Plans for the 2<sup>nd</sup> generation NBM and implementation of the European platforms (MARI and PICASSO) are described briefly, but not at the same detailed level as the 1<sup>st</sup> generation NBM.

This document, including the proposed updated roadmap, will be subject to public consultation, where after the input will be taken into account and the NBM roadmap for 1<sup>st</sup> generation of NBM finalized

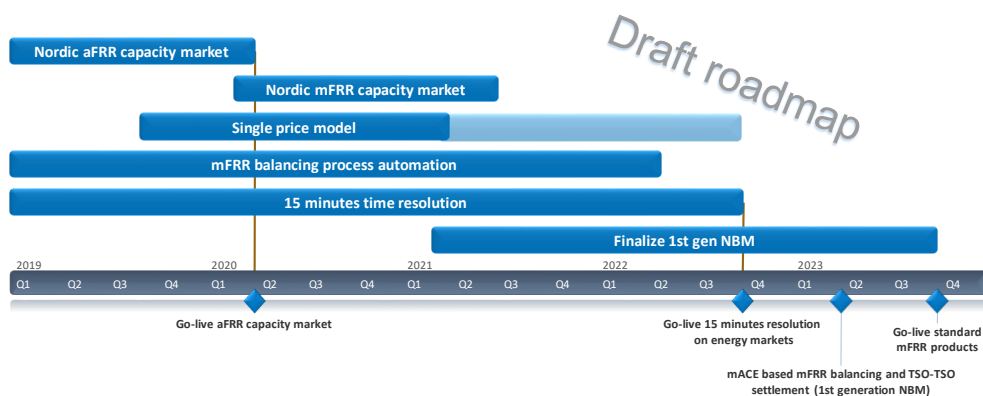
The Nordic TSOs strongly value stakeholder contributions and feedback.

## **2 Executive summary**

We are moving towards a green, integrated and harmonized European power market. This calls for a new model for balancing of the Nordic power system, to ensure an efficient security of supply and to secure a balancing scheme compliant with the European network codes. To achieve this, the NBM Cooperation agreement was signed by the Nordic TSOs in March 2018.

From signing the NBM cooperation agreement in March 2018, up until now, the TSOs have gained experience on the governing of NBM, approval processes for common Nordic services and IT development of the first common Nordic service, aFRR Capacity Market. These experiences, and the inclusion of 15 min time resolution to the NBM scope, has led to increased insight of requirements to be compliant with EBGL while implementing new IT systems that automates the balancing processes. The Nordic TSOs therefore propose an updated roadmap for the NBM.

Below is a description of the roadmap for 1<sup>st</sup> generation NBM. The roadmap activities are organized with respect to resource allocation at TSO's, necessary regulatory approval processes, and mitigation of timeline risk.



The 1<sup>st</sup> generation NBM contains:

- Nordic aFRR capacity market
- Nordic mFRR capacity market
- Single price model
- 15 minutes time resolution
- mFRR balancing process automation (including changes to the mFRR energy activation market)
- Data & transparency

The features of the European mFRR standard product will be introduced stepwise, starting in NBM 1<sup>st</sup> generation. Before the Nordic TSOs join the European platforms the remaining features of the standard product shall be implemented.

The 2<sup>nd</sup> generation NBM contains:

- European mFRR Standard product
- aFRR energy activation market with European standard product
- Full mACE model implementation

The most important milestones and dates of the 1<sup>st</sup> generation NBM are listed in the following table.

Milestone	Date (draft)	Comment
Go-live Single price model	TBD	
Go-live aFRR capacity market	March 2020	
Go-live mFRR capacity market	Q3/2021	

Milestone	Date (draft)	Comment
Go-live 15 minutes time resolution (mFRR energy- and Intraday markets)	Q4/2022	Initial date. Will be updated after consultation process.
Go-live mACE based mFRR balancing (1 <sup>st</sup> gen NBM)	2023	Includes further automation of balancing process and TSO-TSO settlement of exchanged mFRR
Go-live standard mFRR products	2023	

The proposed roadmap is based on today's knowledge and high level design and aims to be both realistic and ambitious.

15 minutes time resolution has a significant impact on the TSO balancing processes and is thus an integrated part of the development of a new NBM. Today the balancing of Nordic power system is mainly based on manual processes done by control room operators of the TSOs. When market time unit is shortened, the planning and operation horizons also become shorter, and the manual processes as of today are not possible anymore. The needed automation of the TSO balancing processes is complex and a great challenge. Even though the road map is considered realistic it comes with a level of uncertainty. The need for additional contingency (risk reserve) in the roadmap will be assessed throughout the consultation process period and will be reflected in the finalized roadmap report.

TSOs are accustomed to successfully carrying out large infrastructure projects. The Nordic Balancing Model is, however, not about infrastructure, but contains highly complex IT automations that will revolutionize the Nordic balancing operation. The IT discipline has not historically been considered core TSO competence, but the Nordic TSOs now strengthen the companionship in new ways and are dedicated to place massive effort into succeeding with the transformation to 15 minutes time resolution and automation of the Nordic balancing.

The roadmap for 1<sup>st</sup> generation NBM will be finalized after the public consultation is completed. This does not end the stakeholder dialogue, which continues with stakeholder representatives in the Nordic Reference group, seminars and webinars.

More information regarding consultation period and NBM can be found at [NBM webpage](#).

### **3 Nordic changes**

The Nordic Balancing Model is the Nordic TSOs response to implementing more renewable energy, while maintaining security of supply in the most cost-effective manner.

The NBM Cooperation agreement was signed in March 2018, and NBM has now matured into a competent and effective framework for implementing extensive Nordic changes. The increased commitment and possibility to align Nordic business and IT competence, has led to insight on what needs to be done, to be compliant with EBGL and at the same time handle security of supply – while making a safe transition to 15 minutes time resolution.

Based on this knowledge, the Nordic TSOs now releases a revised roadmap for the NBM program, containing several market reforms:

- Nordic aFRR Capacity Market
- Nordic mFRR Capacity Market
- Single price model
- 15 minutes time resolution
- mFRR balancing process automation (including changes to the mFRR energy activation market)
- Data & transparency
- aFRR energy activation market

It is important to address that the implementation of 15 minutes imbalance settlement period brings along a comprehensive change of systems, operational procedures and legal regulations for the TSOs. 15 minutes time resolution for electricity markets has a critical impact on the TSO balancing processes which needs to be highly automated, and has become a fully integrated part of the development of the revised roadmap for NBM. Today the balancing of the Nordic power system is mainly a manual process done by control room operators of the TSOs. This has been possible when market time unit has been one hour. When market time unit is shortened to 15 minutes, planning and operation horizon becomes shorter so manual processes are not possible anymore.

The transition to 15 minutes time resolution also implies significant changes for all parties. A successful and robust implementation depends upon thorough preparations from all parties, and close cooperation and mutual involvement between the TSOs and affected stakeholders.

Bidding zone DK1 needs special attention. It has initially been expected that DK1 will be included for initial go-live of the Nordic mFRR capacity market, the Nordic mFRR energy activation market and the Nordic aFRR energy activation market. Now it is foreseen that, DK1 will not be part of the Nordic aFRR capacity market at initial go-live, but is expected to be included at the same time as mACE is introduced in the Nordics. The revised NBM roadmap will affect the planning on the inclusion of DK1 into the Nordic markets,

but this is something that will be evaluated when the program goes forwards.

### **3.1 Nordic aFRR capacity market**

The Nordic TSOs are currently preparing to establish a Nordic cross-border aFRR capacity market. The market design proposal was subject for public consultation during the autumn and has now been submitted to the Nordic NRAs to start the regulatory approval process. The proposal consists of two legal methodologies; Rules and processes for exchange and procurement and Allocation process of cross-zonal capacity. The legal proposals are associated with explanatory documentation which provides a comprehensive description of the purpose, legal prerequisites, market design and market operation. The final planning of the go-live date is dependent on the ongoing regulatory process, but the Nordic TSOs currently hope to be able to start the operation of the market in Q1 2020.

The TSOs foresee an increased need for automation of all parts of the balancing process and an increased volume of aFRR capacity play a vital role in the updated balancing process. A regional and well-functioning capacity market for aFRR is therefore considered as an important foundation in the Nordic Balancing Model.

Reservation of cross-border capacity for reserves is a pre-requisite for having an effective regional aFRR capacity market, which would bring significant socio-economic benefits for the Nordic market.

### **3.2 Nordic mFRR capacity market**

The Nordic TSOs plan is to base the design of the Nordic mFRR capacity market on the same principles as the Nordic aFRR capacity market. The timeline for a common Nordic mFRR capacity market is uncertain as it depends on the ongoing regulatory process for aFRR capacity market. The mFRR capacity market doesn't have a significant impact on the development process for other important milestones in this road map. The TSOs will therefore only provide a preliminary timeline for the mFRR capacity market, which will then be updated when the result of the regulatory process for the aFRR capacity market is known.

### **3.3 Single price model**

The changing balancing market design together with the legal obligations from the EBGL requires a number of changes to the imbalance settlement model. According to the EBGL requirements, all European TSOs have submitted, in the turn of the year 2018 – 2019, a proposal to specify and harmonise imbalance settlement<sup>1</sup>.

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<sup>1</sup> [https://docstore.entsoe.eu/Documents/nc-tasks/EBGL/EBGL\\_A52.2\\_181218\\_ALL%20TSOs%20proposal\\_ISH\\_proposal\\_for%20submission.pdf?Web=0](https://docstore.entsoe.eu/Documents/nc-tasks/EBGL/EBGL_A52.2_181218_ALL%20TSOs%20proposal_ISH_proposal_for%20submission.pdf?Web=0)

After approval of all relevant regulatory authorities, it will become a binding requirement for TSOs to implement imbalance settlement according the rules set in the all TSOs proposal.

The submitted proposal does not require full harmonization among European TSOs, however certain features of the proposal will impose changes to the Nordic imbalance settlement model.

The Nordic imbalance settlement scheme currently apply dual imbalance position which translates to separated imbalance portfolios for production and consumption. The production portfolio is settled on dual pricing and the consumption portfolio is settled on single pricing.

According to EBGL and the Imbalance settlement harmonisation proposal, the imbalance settlement scheme shall be harmonised into one imbalance position and one imbalance price, which is a change in the Nordic imbalance settlement model. Apart from this change, there are many additional changes related to calculation of the allocated imbalance volume and the calculation of the imbalance price as well as publication of near real-time information.

The Nordic TSOs have actively participated in the detailing of the all TSOs harmonisation proposal and support the coming changes. At the same time, it is important to underline that these changes may impose challenges for system operation why a prudent transition plan is vital. As mentioned, EBGL and the harmonisation proposal outlines a number interrelated reforms that fundamentally change the Nordic imbalance settlement scheme. aFRR energy price shall be included as a component to imbalance pricing. Reference pricing rules may be changed and calculation of a position shall be done based on internal and external trade schedules corrected with the imbalance adjustments. The production plans that are currently used for calculating the production imbalance will not have a role in future imbalance settlement.

Some of the described changes will also necessitate a review of the BRP fees.

The required IT changes to enable the new imbalance calculation will be implemented in the eSett's systems and the same data that is currently needed, will be needed also in future. Also, the delivery of the production plans to TSO is still needed, as they serve also for other purposes than imbalance settlement.

### 3.3.1 Timeline options for Single price model

EBGL sets a deadline for the implementation of the all TSOs proposal to be 18 months after the regulatory approval. This translates to an earliest implementation deadline during the first quarter of 2021. The



proposal may be subject for an amendment process which require an additional four months prior to NRA approval.

In the EBGL there is no link between harmonizing the imbalance settlement period to 15 minutes and harmonizing other features of the imbalance settlement. This leaves the TSOs with the separate plans for implementation of 15 minutes ISP and the changes comprised in the Single price model. These plans could be either separated or aligned, both alternatives comes with a set of pros and cons.

Separation of the plans would imply a time period of approximately 18 months (Q2 2021 to Q4 2022) where imbalance settlement is based on 60 min ISP, single imbalance price and single imbalance position.

The main advantages with separation of the plans are related to the early realisation of presumed market efficiency gains, including harmonised and level playing field for BRPs (in terms of portfolio composition and geography), incentives for market participants to restore the system balance and benefit from, as well as influence the real-time value of energy. It might also reduce risk for Energinet onboarding eSett.

The main drawback is TSO operational concerns in some geographical areas and operational situations. Real-time information feedback loop on system balance state combined with single imbalance pricing may cause power oscillations in system balance, thus negatively impact on operational security on those ISPs. The power oscillation may either occur when the self-regulation response overcompensates for the system imbalance or when the imbalance price incentives are misaligned with TSO real time and geographical need of balancing energy. This could in turn trigger an opposite self-regulation response. A 60 min ISP combined with single pricing opens a relatively long time window for self-regulation actions which may strengthen these effects.

On the other hand, alignment of the plans would conversely imply that mentioned market efficiency gains are postponed one and a half year, but the TSO operational risks can be mitigated differently in a 15 min ISP context.

The different alternatives are also associated with different types of IT implementation for both stakeholders and Nordic TSOs. Separation or alignment of the plans could create different type of complexity to IT implementation. However, from the TSO and eSett point of view, the change to single position and single pricing should require only smaller changes from the market participants, as the data flow is expected to stay mainly similar.

There are also a range of solutions in-between alignment and separation of the plans, which will be further assessed. These solutions could imply in some bidding zones a gradual introduction of the market reforms included in the Single price model, including publication of real-time information and conditional use of dual pricing. These could create market benefits and at the same time solve Nordic TSOs operational concerns.

These solutions may come with additional IT implementation complexity and may be dependent on the regulatory framework.

The assessment of the solutions require further analysis and discussions with NRAs as well as other stakeholders. This will be done in parallel with the consultation process.

### **3.4 15 minutes time resolution**

The article 53.1 of the EBGL has two parts, one putting an obligation on all TSOs to implement 15 minutes ISP by 18 December 2020 and another setting a clear link between the ISP and the market time unit (MTU).

Thus, the Nordic TSOs expect that the ID-market time unit is 15 minutes at the same time as 15 minutes ISP is introduced. ACER has explicitly stated that this is the case for cross-border intraday trade. However, the new Electricity Regulation within the Clean Energy Paper requires that the NEMOs have an obligation to offer products with an MTU of 15 minutes from the day when 15 minutes ISP is introduced in the Nordics.

For the TSOs there is a limited number of new changes in tools and systems required to support 15 minutes day-ahead trade, as long as the required tools to handle 15 minutes time resolution, 15 minutes ID trade and 15 minutes balancing markets are implemented. 15 minutes time resolution may increase the maximum allowed ramping on the HVDC interconnectors out of the synchronous area, because the full hour can be used for ramping.

The NBM project have strong interdependencies between each other but also closely linked to several national changes for market parties. To implement these changes smoothly it requires industry-wide cooperation, both nationally and between the Nordic countries. This cooperation is crucial to identify and mitigate risks of the implementation and to ensure good flow of information to all stakeholders.

Several changes affect all the Nordic countries. These include changes in:

- Energy metering (DSO - TSO, DSO - grid users)

- Datahubs
- IT systems and tools (e.g. metering systems)
- Reporting and calculation of imbalances
- National regulations.

Moving to 15 minutes time resolution affects the whole chain from the meter itself to the systems reading the meters, in addition to systems processing and communicating the readings. This entails investments for the grid operators and requires resources from IT vendors. Furthermore, changes to the principles of metering and requirements set to DSOs must be passed into national legislation.

Along with the changes related to datahubs and 15 min metering, market participants need to modify their processes when 15 min ISP and market time unit are implemented, e.g. updates in , trading-, balance management and production planning systems. National remarks

### **Denmark**

The DataHub and the Engrosmodel were implemented in 2013 and 2016. The DataHub and the related processes are therefore based on an hourly resolution and will have to be updated to 15 minutes time resolution. For some DSOs, especially in Eastern Denmark, this will require an update of processes, IT systems and meters. Energinet will be responsible for coordinating the update of the DataHub and related processes towards stakeholders.

As part of the Nordic harmonization, Denmark will join the Nordic settlement company, eSett. For Danish stakeholders, this implies an additional activity besides from the activities in the NBM roadmap. The change to eSett will be aligned with stakeholders, eSett, regulators and NBM

### **Finland**

Fingrid has been working in close cooperation with its stakeholders to reach cost-effective and non-discriminatory solutions to the reforms to all market participants. This work has been carried out within the national 15 ISP implementation project by a stakeholder reference group (established early 2018) which has discussed the details of the implementation plan and effects to the markets. In addition, a broad round of interviews was done to gain understanding about the impacts to companies in different roles and to inform the stakeholder about the upcoming changes.

The preparation to the commissioning of the Finnish Datahub has been a significant undertaking for retail market participants and DSOs. It has demanded great amount of resources from the market parties and their IT vendors. Linking this to the transition to 15 ISP is possible, but market parties needs clear schedules and sufficient

transition periods. The planned Datahub go-live in Finland is in April 2021, which in the plan made during 2018 was four months after transition to 15 min ISP. With the new proposed schedule to 15 ISP, the order of these transitions change places. Adapting these two changes is challenging to the stakeholders and the risk of the order of them changing again should be mitigated by pursuing sufficient prolonging of the 15 ISP implementation. The stakeholders have expressed that predictability of the upcoming changes is the most important factor in successful implementation.

In the national 15 min ISP implementation plan prepared by Fingrid and its stakeholders, a step-wise approach was agreed to update metering in different points to 15 min. The extent of updating the meters from the beginning of 15 min ISP is a compromise between avoiding extra costs and allowing actors to participate in the 15 min markets. In the first phase of the plan, all MGA exchange points and over 1 MW production units was planned to move to 15 min metering. In the following phases consumption metering was planned to be updated starting from larger consumption points and customers participating to 15 min markets, such as balancing.

### **Norway**

As a basis, the necessary meters in the power system need to handle 15-minute values. Statnett's own meters will be upgraded during 2019, but many other companies are also affected. For relatively new meters, this mean the meter needs to be reconfigured. Older meters will have to be replaced. The scale of this task heavily depends on the national decision on what part of the value chain shall be metered – and what parts can be left for profiling. This decision will be taken by the Norwegian Regulator NVE through an update of the national regulation (Avregningsforskriften). If NVE follows the advice of their consultant<sup>2</sup>, the limit will be set to 1000V. This means about 6000 meters are affected (not all needs to be replaced).

In addition, all DSOs, BSPs and BRPs needs to update their IT systems. In total this represents about 300 companies. Both the systems for gathering meter data, and the trading systems needs to be updated.

The local implementation in Norway will to a large extent be guided through the new datahub, Elhub, which has been in full operation since February 2019. An internal IT upgrade is needed to prepare for 15 min values and there will be a major implementation project where all Elhub users are tested and approved over to the 15 minutes time resolution. This transition must be done in sequence and will require time. It is quite certain that not all Norwegian meters will be changed to 15-minute from the start, so Elhub must also develop and

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<sup>2</sup> Praktisk innføring av 15 minutters avregningsperiode i kraftmarkedet (Oslo Economics) 2018

implement a new methodology for profiling the parties remaining on 60-minute values.

The vital signal for DSOs and market participants to make investment decisions is coming from new requirements in the Avregningsföreskriften. Based on stakeholder contact and survey we estimate a time lag of at least 18 months after this milestone, before all are ready for 15-minute trading and metering.

### **Sweden**

Implementation of the Swedish data hub (elmarknadshub) will imply a change of the market model for the retail market participants and the DSOs. This means that business processes and IT-systems need to be developed in order to adapt to the new model. In addition, 15 min ISP will also require resources from market participants. To avoid the risk of these two initiatives delaying each other and give market participants sufficient time for necessary planning and preparation, 15 minutes ISP has been planned to be introduced before - and independently – of the implementation of the data hub. Hence, an intermediate solution regarding the reporting between the DSOs and eSett has been developed. An implementation date of 15 min ISP after the data hub would mean that the intermediate solution would be obsolete, since functionality to handle 15 min ISP are within the data hub scope. According to current timetable for the data hub, the go-live date is Q3 2021 but the project has indicated a revised timetable, which will be communicated in Q2 2019.

Implementation of 15 min ISP require meter values with 15 min resolution, even though some exceptions of the requirements for certain meters (e.g. households, micro production) could be made. Current national legislation states that all meters should be able to register meter values with 15 min resolution latest in the beginning of 2025. Thus, since the timetables of the regulations and implementation of 15 min ISP do not coincide, the 2<sup>nd</sup> regulation needs to be changed. Furthermore, regulations regarding reporting of meter values will also have to be changed in accordance with the requirements that come with 15 min ISP.

## **3.5 mFRR balancing process automation (including mFRR energy activation market changes<sup>3</sup>)**

The introduction of the Nordic Balancing Model and 15 minutes time resolution in all markets require improved decision support for operators and extensive automation of the mFRR balancing process in order to ensure operational security and efficiency. This is

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<sup>3</sup> All TSOs' proposal for the implementation framework for a European platform for the exchange of balancing energy from frequency restoration reserves with manual activation in accordance with Article 20 of Commission Regulation (EU) 2017/2195 establishing a guideline on electricity balancing

especially relevant for the existing mFRR energy activation market that needs to be automated.

Furthermore, the following changes to the mFRR energy market are also needed:

- 15 minutes validity period for the bids in the mFRR market. This allows for separate bid volumes and bid prices for all market time units of the energy market.
- Imbalance and mFRR prices are calculated and published per 15 minutes

Many features of the Nordic mFRR energy activation market need to be aligned with the European platform MARI. This includes new standard products and a new balancing process, which allows for integration with the European platform.

### 3.5.1 New mFRR process for TSOs

Today all balancing decisions are taken by the TSO control room operator, with limited decision support. This approach is challenging today, and it is expected that the challenges will continue to grow. Therefore, better decision support and automation are needed.

To be able to automate the balancing, the mFRR process must be re-designed and all the sub-processes must be automated.

The most important part of the new mFRR process is that the demand for mFRR is determined per bidding zone. This replaces the process today where the operator manually determines the mFRR demand for the total Nordic area, or for a smaller area if there are congestions. In the new mFRR process each TSO determines the demand for mFRR in their own bidding zone(s), based on forecasted imbalances.

When a TSO determines the mFRR demand per bidding zone (bidding zone is equal to LFC area), it allows TSOs to use a central optimization algorithm for the bid selection. The optimization algorithm takes as input the mFRR demand per bidding zone, all available bids and the available transmission capacity between the bidding zones. The optimization aims ensuring that the cheapest available bids are activated, and that all available transmission capacity is allocated effectively.

Most of the mFRR activation will be performed per each quarter, in a so-called *scheduled mFRR process*. For scheduled mFRR, the TSO request, the optimization and the BSP activation is coordinated and the BSPs are activated for a full 15-minute period. The TSOs can also order mFRR in between the scheduled activations, this is called direct activation. In the first phase only scheduled activation will be part of

a Nordic optimization. When direct activation is needed it will be manually ordered by the control room operators at each TSO.

In the new mFRR-process the activation must be fully electronic and also mostly automated. Activation every 15 minutes leaves less room for dialogue and manual routines between the TSO and the BSP, and automation is probably also needed on the BSP side.



### 3.5.2 New mFRR standard product

The European standard product for mFRR will in time be the standard product also in the Nordics. The features of the standard product will be introduced stepwise.

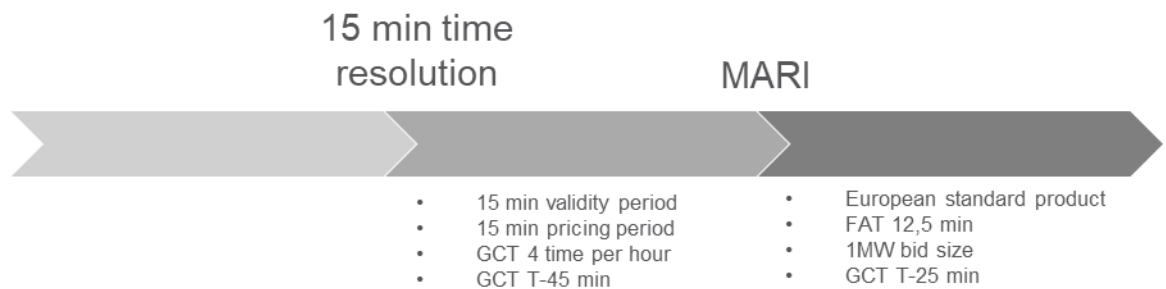
In time for the introduction of 15 minutes time resolution the following standard product features shall be introduced:

- 15 minutes validity period for mFRR bids
- 15 minutes pricing period for mFRR activation
- GCT for mFRR bids for every 15 minutes period. 4 times per hour. GCT will initially be 45 minutes before the start of the validity period, as it is today.
- Updated rules for activation process and activation profiles of the BSPs.
  - Agreed rules for ramping profile and timing, include stronger enforcement of 15 minutes FAT
  - BSP will normally not be allowed to decline an activation request

Before the Nordic TSOs join the MARI platform the remaining features of the standard product shall be implemented, including:

- FAT 12.5 minutes
- New prequalification requirements (for some TSOs)
- New format and protocol for bid interface between BSP and TSO (for some TSOs)

- GCT 25 minutes before
- 1MW minimum bid size



### 3.5.3 Congestion management

mFRR is relevant for the congestion management process in two ways: Firstly, it is important to avoid that activation of mFRR bids cause congestions. Some TSOs will do this by filtering some of the bids before bids are made available for the optimization. Secondly, some of the mFRR bids will be used to resolve congestions in the grid.

The bid filtering is a TSO process where all bids are assessed to determine if activation of this bid can lead to congestions within a bidding zone or not. If a bid will lead to a congestion it is marked as unavailable and not included in the bid selection optimization. Bid filtering is a new task and will require extensive development for TSOs with many internal bottlenecks.

The process for resolving bottlenecks will be largely unchanged from a BSP point of view, but some TSOs see a need for more automation and decision support also here. Like today, the mFRR/RPM bids will be used for both balancing and congestion management, and the pricing of system regulations is not expected to change.

The need for and extent of congestion management interventions varies a lot among the Nordic TSOs. While Statnett foresees a need for automated and effective processes for this, other TSOs expect that bid filtering and congestion management will not be part of the daily operation, and that it can be handled manually.

### 3.5.4 Nordic Balancing Platform with Activation Optimization Function (AOF)

The redesign and automation of the mFRR balancing process, including changed process for congestion management, is a major change of operation for the Nordic TSOs. The benefits of the change are that it provides the necessary automation for 15 minutes time resolution and a balancing process more suited to current and future



needs of balancing of the Nordic power system. It also supports the preparation for participation in the European mFRR platform MARI.

In order to successfully implement this transformation, a stepwise approach is chosen, where each step can be verified and adjusted accordingly. As part of the stepwise transformation, the various automated balancing process components will be piloted. A Nordic balancing platform with Activation Optimization Function (AOF), and with the possibility to adjust platform and algorithm based on observed behaviour, is a crucial part of the piloting. In addition to support the transition to a new mFRR balancing process in the Nordics, a possible outcome of piloting and go-live of the Nordic balancing platform may be that changes are needed in MARI before the Nordic countries are able to join, or that the Nordic balancing platform will be needed as a supplement to the European platform, e.g. to handle additional products or to be used for periods with certain special conditions in the Nordic power system. After joining MARI, The Nordic platform can be used as a regional fall-back solution if MARI is unavailable.

### **3.6 Data and transparency**

According to EBGL and Transparency Regulation the TSOs are obliged to publish market and balancing data to the European Transparency Platform. The Nordic TSOs acknowledge the importance of providing data to the market players and to the public, as a whole. Increased transparency and open data fosters both innovation and competition.

Although transparency is important, the main driver for addressing the 'Data & transparency' as a NBM reform, is the fact that the manual balancing and operation for the TSOs are now a subject to automation, due to the transition to 15 min time resolution. The consequence of this automation is a comprehensive change in the demand and focus on data foundations, data quality, alignment, documentation and governance that aims to keep data trustworthy. The ability to automate operational processes requires consistent delivery of reliable data. Improving data maturity and quality is crucial for succeeding with the transformation to increased automation of the balancing process.

### **3.7 aFRR energy activation market<sup>4</sup>**

The last major change in the Nordic Balancing Model is the introduction of an aFRR energy activation market. In an aFRR energy activation market aFRR is activated in merit order, based on energy bids, and the activation volume is determined by the observed

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<sup>4</sup> All TSOs' proposal for the implementation framework for a European platform for the exchange of balancing energy from frequency restoration reserves with automatic activation in accordance with Article 21 of Commission Regulation (EU) 2017/2195 establishing a guideline on electricity balancing

imbalance. This is the same model known from the mFRR activation market.

Today, and until the launch of the energy activation market, aFRR is activated pro-rata based on a Nordic need for aFRR. The aFRR demand is determined by the frequency deviation, and all BSPs are activated in parallel, making sure that there is some aFRR in all parts of the system. The maximum activation volume is equal to the amount of procured aFRR capacity.

The aFRR energy activation market will be based on mACE. Each bidding zone will have their own aFRR controller calculating the desired aFRR activation for their area. The controller takes the area ACE as input and calculates the required aFRR MW to correct the ACE.

The bid selection will be performed by a central platform based on the requests from all bidding zones, all available bids and the available transmission capacity. This will aim at finding the optimal activation, while respecting and utilizing the available transmission capacity.

BSPs will provide energy bids, and the least expensive bids will be activated first. So-called free bids will be allowed, meaning that there will be no requirement to take part in the aFRR capacity market to be allowed to provide aFRR energy bids. The bids must be in line with the aFRR standard product that will be a common standard for all of Europe. The full activation time for the aFRR standard product will be 5 minutes. Remuneration will be based on cross-border marginal price.

The aFRR energy activation market will be implemented in the Nordics in line with the proposed European development as described in the aFRR implementation framework and other related proposals. The Nordic TSOs all aim at taking part in the European platform for aFRR energy activation, PICASSO, and this implies a pan-European aFRR energy activation market.

The transition from the pro-rata aFRR market, based on frequency and with limited volumes that we have today to a fully integrated European aFRR market is significant. Which steps that are needed in this transition is not yet decided. A key decision is whether to have a temporary Nordic aFRR activation market or if it is possible to join the European aFRR platform directly.

### **3.8 Outlook for energy activation markets**

As described above the regulating power market product needs to be transformed to a standard mFRR product before joining MARI. This implies that the features of the product and the way to activate

products will be more strict than today. Today's product is used for combined activation for both congestions and balancing, slower bids are allowed to be on the bidding list, and fast bids are chosen when necessary. Hence, it may be necessary to introduce new products. This can be congestion management products and /or specific balancing products with shorter activation time. If introduction of such products is necessary it will be important to have a dialogue with the market players on how this can be introduced as efficient as possible, including the interaction with the standard products.

Standard products will as well be introduced for aFRR. A consequence is that aFRR balancing capacity and aFRR activation markets will be separate markets. It is expected that the use of aFRR as a part of the balancing process will increase both in number of hours and volumes.

According to EBGL the European platforms for mFRR and aFRR (MARI and PICASSO) shall be made operational 30 months after the approval of the implementation framework of the platforms (between Q1 2022 and Q4 2022, depending on the regulator process). TSOs can request a derogation for a maximum period of two years. Alignment of the balancing processes and products in order to be able to efficiently join the European platforms, is one of the targets for the planned changes in the new Nordic Balancing Model.

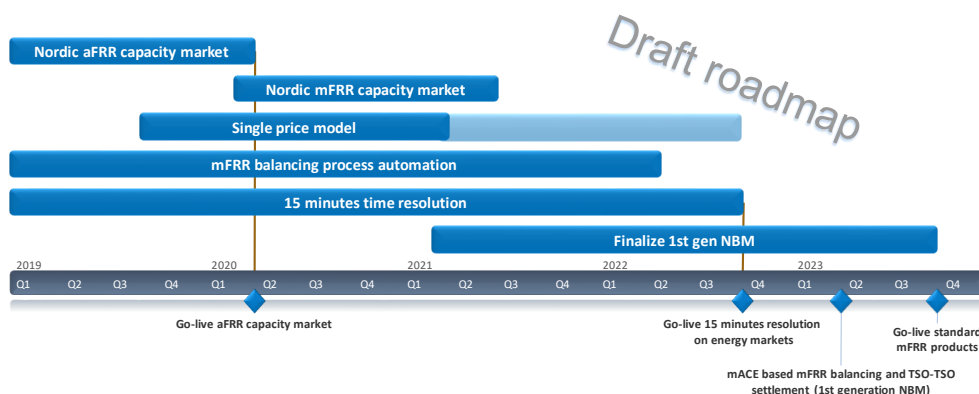
In order to join MARI, three conditions must be satisfied; MARI must be ready for onboarding of the Nordic countries, mFRR standard product must be implemented in the Nordics, and operational security and efficiency of the changed Nordic mFRR balancing process must be successfully in operation over some months. Following the roadmap milestones, the time for joining MARI will earliest be 2<sup>nd</sup> half of 2023.

In order to join PICASSO, the TSOs need to establish aFRR energy market management, make major changes in LFC controllers, and implement the balancing platform interfaces. The necessary activities and milestones for this will be described and planned in the roadmap for 2<sup>nd</sup> generation of NBM.

Even though when the Nordic TSO's joins MARI and PICASSO, and the balancing market bids will be part of the European markets, the onboarding will bring only minor impacts into BSP's/BRP's IT solutions and procedures. This is due to the fact that technical interfaces, market management and activations remains similarly organized as before.

## 4 Roadmap

Below is a description of TSOs proposal of roadmap for 1<sup>st</sup> generation NBM, including 15 minutes time resolution.

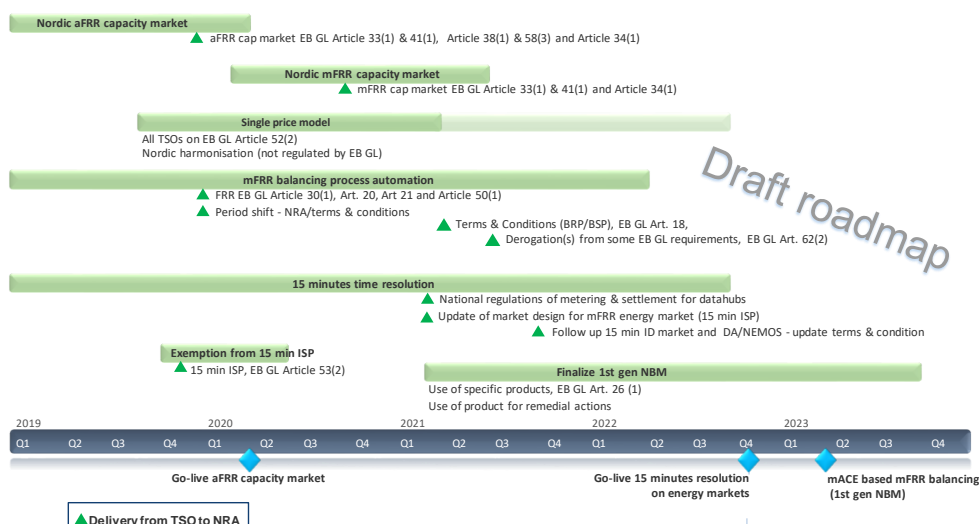


The main objective for the timeline has been to identify dates for major milestones, specifically go-live of 15 minutes time resolution. Activities that are not on critical path for the major milestones, can get a changed timeline during detailed project planning.

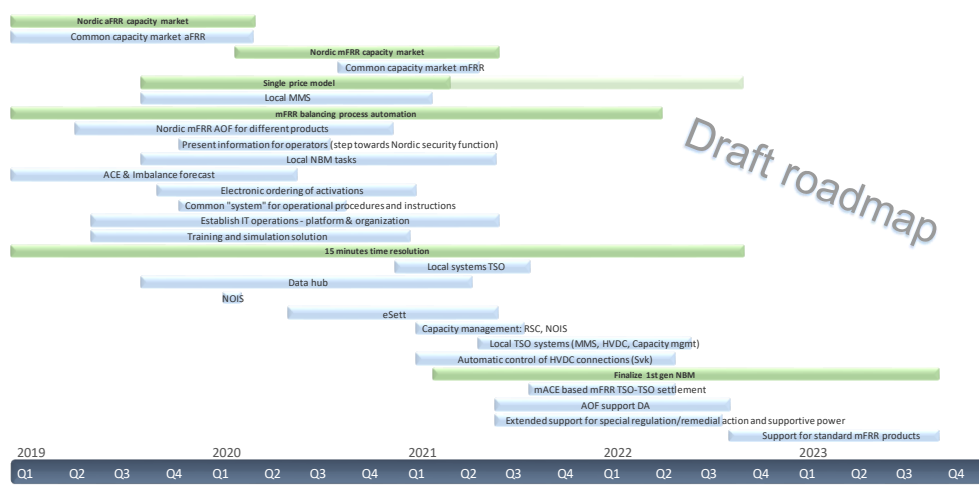
There are some key principles that have major impact on the timeline:

- Regulatory processes are distributed in time.
- The market reform of "mFRR balancing process automation" is implemented before "15 minutes resolution". Both must be in place before the milestone "Go-live 15 minutes resolution on energy markets". Starting with mFRR balancing process automation will reduce timeline risk and give time to solve unforeseen operational and IT-solution issues. The needed automation and new balancing process is a major change for the TSOs and need sufficient time to develop and introduce.
- The timeline milestone for go-live of single price model is not yet decided. The TSOs will assess and analyse alternatives further during consultation process.

The illustration below shows the main regulatory processes for each of the market reforms. Time for delivery from TSOs to NRAs for major deliverable are indicated in the illustration.



The illustration below shows main IT activities for each of the market reforms.



#### 4.1 Milestones

The table below shows the major milestones. When this roadmap is finalised after the consultation, the milestone "Go-live 15 minutes resolution on energy markets" will be set, and not planned to change. The other milestones could be changed when detailed project planning is done.

Milestone	Date (draft)	Comment
Go-live Single price model	TBD	
Go-live aFRR capacity market	March 2020	

Milestone	Date (draft)	Comment
Go-live mFRR capacity market	Q3/2021	
Go-live 15 minutes time resolution (mFRR energy- and Intraday markets)	Q4/2022	Initial date. Will be updated after consultation process.
Go-live mACE based mFRR balancing (1 <sup>st</sup> gen NBM)	2023	Includes further automation of balancing process and TSO-TSO settlement of exchanged mFRR
Go-live standard mFRR products	2023	

Before milestones for the regulatory process of each market reform can be decided a dialogue with NRAs is needed.

The TSOs also have some internal milestones that can be used for communicating progress in a transparent way. After more detailed project planning and implementation work, the TSO's will communicate planned milestone dates and progress to reach the milestones.

## 4.2 Uncertainty in the roadmap

The proposed roadmap aims to be both ambitious and realistic, and is based on today's knowledge and high level IT architecture.

As already described in this report, NBM and the transition to 15 minutes time resolution is an extensive change and modification of IT platforms, operational procedures and legal regulations for the Nordic TSOs.

Today's Nordic TSO balancing processes that are mainly based on manual procedures and operator experience, will be formalized and highly automated, which is a great challenge and brings uncertainties to the roadmap planning.

The road map is considered realistic with a moderate level of uncertainty. The need for additional contingency (risk reserve) in the roadmap will be assessed throughout the consultation process period and will be reflected in the finalized roadmap report.

## 5 Stakeholder involvement

### 5.1 Revising the roadmap

This version of the roadmap presents mainly TSOs' view on the timeline, and the roadmap and report is subject to stakeholder consultation. Details regarding consultation period can be found at [NBM webpage](#).

The TSOs will need a review period to consider the stakeholder feedback before presenting the final roadmap. When the final roadmap is presented it will include information on what changes has been made

Active dialogue with NRAs are important and will be done both during the consultation and review period.

## 5.2 NBM communication

The Nordic TSOs wish for transparent and efficient involvement of all relevant stakeholders for the whole implementation period of NBM.

Following the publication of updated roadmap, the close involvement and dialogue with stakeholders continues both on Nordic and on national levels. The common [NBM webpage](#) remains to be the main source for updates and information on progress, as well as information and links to all formal regulatory applications.

The common Nordic stakeholder reference group NBM will arrange seminars and webinars on a regular basis. Webinars will cover both specific parts of the implementation as well as provide information on a more general level. Information from the Nordic stakeholder reference group meetings as well as webinars are made available in the NBM webpage.

## 6 Abbreviations and definitions

**aFRR energy activation market** denotes the market where BSPs submit aFRR energy bids and the process where the TSO or TSOs activate them in merit order based on the real time need of balancing energy taking available cross border transmission capacity into account. There is currently no Nordic aFRR energy activation market in operation.

**BRP** - Balance Responsible Party. A market participant or its chosen representative responsible for its imbalances.

**BSP**- Balancing Service Provider. A market participant with reserve-providing units or reserve-providing groups able to provide balancing services to TSOs.

**DSO** - Distribution System Operator.

**Dual imbalance pricing** means that, for a given ISP in a given imbalance price area, the price for negative imbalance is not equal to the price for positive imbalance in sign and/or size. Dual imbalance pricing is currently applied for the BRP production portfolio.

**Dual imbalance position** means that each balance responsible party has two final imbalance portfolios per imbalance area (bidding zone): the first is equal to the sum of its external commercial trade schedules and internal commercial trade schedules from generation corrected with the imbalance adjustment, and the second is equal to the sum of its external commercial trade schedules and internal commercial trade schedules from consumption corrected with the imbalance adjustment. Dual BRP position is currently applied in the Nordics, however, productions schedules are used instead of trade schedules.

**EBGL** - Electricity Balancing Guideline. (Commission Regulation EU 2017/2195).

**eSett** – Joint Nordic company performing imbalance settlement for Finland, Sweden, Norway and in the future also for Denmark.

**FAT** – Full Activation Time is the time from a BSP is notified to deliver either aFRR or mFRR, to the product must be fully delivered.

**ISP** - Imbalance Settlement Period. Time units for which Balance Responsible Parties` imbalance is calculated.

**LFC** - Load-Frequency Control. Refers to an automated control process which restores the system frequency and the power flows between predetermined LFC areas to the nominal (planned) values.

**mACE** - modernized ACE control is a conceptual denotation of an automatic activation process of aFRR and mFRR. The need for balancing energy is determined on zonal level (LFC area) but the activations are determined in a central optimization function which combine zonal information on the balancing needs, bids and available transmission capacity and based on that optimizes the global activation including netting.

**MARI** - Manually Activated Reserves Initiative. The European implementation project for the creation of the European mFRR platform.

**mFRR energy activation market** denotes the market where BSPs/BRPs submit mFRR energy bids and the process where the TSO or TSOs activate them in merit order based on forecasted or real time need of balancing energy taking available cross border transmission capacity into account. The Nordic Regulation Power Market is currently the mFRR energy activation market.

**MTU** - Market Time Unit. The period for which the market price is established or the shortest possible common time period for the two bidding zones, if their market time units are different.

**NBM** - Nordic Balancing Model.



**NEMO** - Nominated Electricity Market Operator

**Single price model** is used throughout this report as a denotation of several planned changes in the imbalance settlement scheme including Single imbalance price, Single BRP position, updated calculation of the imbalance price and calculation of a portfolio based on trade schedules.

**PICASSO** – Platform for the International Coordination of the Automatic frequency restoration process and Stable System Operation. The European implementation project for the creation of the European aFRR platform.

**Single imbalance pricing** means that, for a given ISP in a given imbalance price area, the price for negative imbalance and the price for positive imbalance are equal in sign and size. Single imbalance pricing is currently applied (with some minor deviations) for the BRP consumption portfolio.

**Single imbalance position** means that each balance responsible party has one single final imbalance portfolio per imbalance area (bidding zone) equal to the sum of its external commercial trade schedules and internal commercial trade schedules corrected with the imbalance adjustment.

**SOGL** – System Operation Guideline (Commission Regulation EU 2017/1485).

**TSO** - Transmission System Operator.