

Short-term markets

FUTURE DEVELOPMENTS

Nordic TSOs | January 2020

FINGRID

ENERGINET

Statnett

**SVENSKA
KRAFTNÄT**

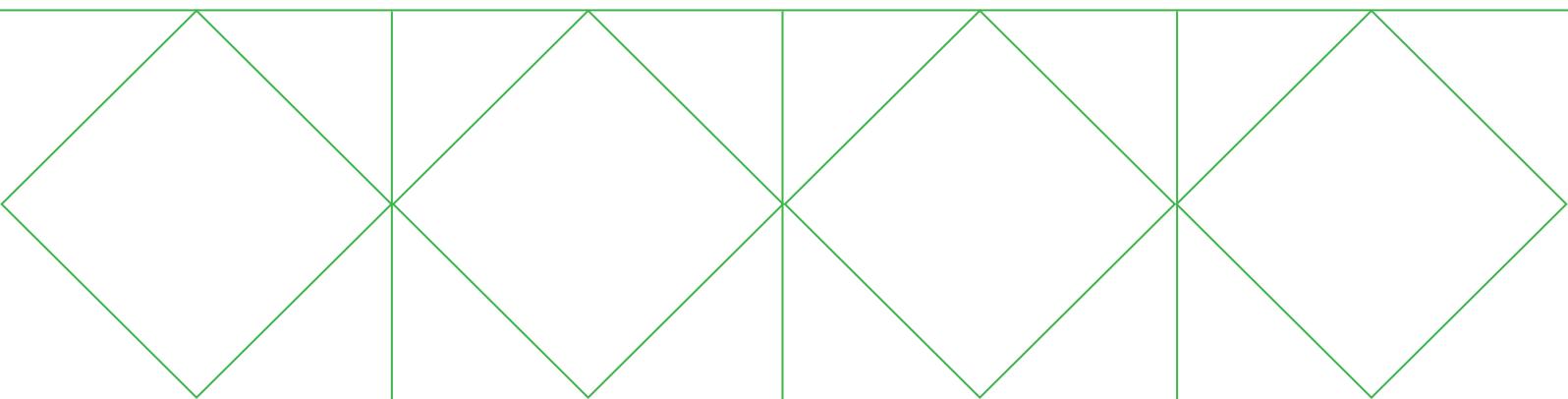
Foreword

The Nordic TSOs are currently working intensively to develop and implement new solutions for short-term markets, especially in the balancing timeframe. This is done in response both to the challenges arising from the changing power system, but also due to new European regulations. In most cases, it involves development of new market design, new operational procedures but also significant IT development. The work is carried out within very demanding timelines and requires full attention of the TSOs and a good cooperation with stakeholders.

At the same time as this work is ongoing it is also necessary to look further ahead. The power system is in continuous change and we do not expect that the changes that are currently being

implemented will be the last development in the market design. Going beyond the currently agreed solutions implies far bigger uncertainties, higher complexity and possible alternative pathways.

To initiate an early dialogue with all stakeholders the Nordic TSOs developed a discussion paper that explored possible market-based solutions for the future short-term markets. The discussion paper has been consulted and the summary of stakeholders' responses has been published as a separate document. The involvement of stakeholders is vital for setting the vision for the future developments and the Nordic TSOs have received valuable input for the further development work addressed in this document.



Executive summary

This document prepared by the Nordic TSOs (Energinet, Fingrid, Statnett and Svenska kraftnät) presents elements affecting the future short-term markets. In this document, "short-term markets" indicate the present intraday and balancing market timeframes, as well as potential future stronger integration with the day-ahead market timeframe.

The document presents topics for development after the stakeholder consultation and addresses the possible actions needed to move towards future short-term markets.

The Nordic TSOs have already agreed on a roadmap for implementation of the Nordic Balancing Model (NBM). This roadmap includes implementation of automatic frequency restoration (aFRR) and manual FRR (mFRR) capacity markets, single price model, mFRR energy activation markets and 15 min time resolution. Plans for the connection to the European aFRR and mFRR energy activation market platforms (MARI and PICASSO) have been also taken into account in the roadmap. The Nordic TSOs have indicated major milestones in the roadmap for the implementation of the NBM, where implementation of 15 min time resolution is foreseen in Q2 2023 and connection to the European platforms before the year 2025. In addition, the implementation of the common capacity calculation methodology and the establishment of the Nordic Regional Coordination Centre shall be during years 2020 – 2023.

This document explores market-based solutions for the future short-term markets beyond the year 2025 taking the foreseeable changes in electricity market and power system into account.

It is expected that trading in the short-term markets increases in the future implying that market timeframes such as day-ahead, intraday and balancing timeframe and market time units¹

could be reconsidered to reflect trading needs in shorter timeframes and market time units. Furthermore, it could be considered, if there is a need to move gate closure times closer to real-time to facilitate the short-term markets and still meet the TSOs need to maintain the grid security.

Several EU wide and regional platforms will be established – to comply with legal requirements – requesting access to the physical transmission capacity for the same delivery period. These platforms will require tighter coordination of the transmission capacity allocation in the form of common transmission capacity management. In addition, a new allocation model could be considered – especially for balancing timeframe – to take effectively the grid constraints and the geographical location of production and consumption offers into account.

This document presents priorities for the future short-term markets until the 2030's reflecting the changes to be considered in the future allocation model, common transmission capacity management, market timeframes and market platforms. Some of the possible changes will require amendments to the EU legislation and co-operation at the European level. Objectives and priority topics to be further explored in order to move towards future short-term markets identified by the Nordic TSOs are listed in Table 1. The development work for majority of the priority topics may be performed parallel, but some of the topics require input from the experiences of the development work related to another topic(s) and thus are to be performed in succession. Pilot projects and lessons learnt from these pilot projects is a way forward for several topics (e.g. flexibility markets, locational information and intraday gate closure time).

Table 1. Objectives and priority topics to be explored for the future short-term markets.

Objectives	Topics
Deliver all available transmission capacity for different market timeframes	Common transmission capacity management to facilitate co-existence of and participation in several market platforms
Ensure robustness and diminish entry barriers for market participants	Increase transparency: additional information from the Nordic market in the ENTSO-E Transparency Platform and measures to tackle ownership and sensitivity of data in the future
Ensure simple access for market participants	Interaction between individual market platforms taking available transmission capacity into account
Facilitate easy market access for flexibility resources	Market structure for flexibility markets and coordination with other platforms
Ensure operational security	More detailed locational information of generation and consumption resources for capacity allocation in different timeframes
Facilitate market participants to balance themselves as near real-time as possible	Intraday gate closure closer to real-time
Ensure good liquidity and proper market design	Monitoring developments in the day-ahead and intraday markets after implementation of intraday hybrid model and changes in intra-day gate closure time, and follow up with suitable measures if necessary

1. Introduction

In this document, "short-term markets" indicate the present intraday and balancing market timeframes, as well as potential future stronger integration with the day-ahead market timeframe.

The transition of energy system towards sustainability with increased variable wind and solar production will change the physical characteristics (such as frequency deviations, inertia and short-circuit current) of the electricity power system. The changing demand patterns (such as electric vehicles, flexible loads and storages), and the variable wind and solar generation require markets to be introduced closer to real-time operation. New generation resources and demand patterns might increase fluctuation of power flows in the transmission and distribution grids and complicate forecasting of congestions in these grids. These changes imply that importance of short-term markets increases in the future. The market design should reflect and facilitate the changes in production resources, demand patterns and physical characteristics of the electricity power system.

Several EU wide and regional platforms are planned according to the current EU legislation inclusive Clean Energy Package. These platforms may need to allocate cross-zonal transmission capacity for the same delivery period. The coordination between these platforms is vital for the efficient capacity allocation. Besides these new platforms, the electricity market will move towards higher resolution in timewise and possibly towards geographically larger markets with smaller bidding zones.

EU legislation (especially guideline on capacity allocation and congestion management (CACM) ² sets requirements to the cross-zonal capacity pricing for the day-ahead and the intraday timeframe. Pricing shall reflect market congestion. For the day-ahead timeframe with implicit auction, this shall amount to the difference between the corresponding day-ahead clearing prices of the relevant bidding zones. For the intraday timeframe, where the continuous trading matching algorithm is applied, capacity pricing shall be

based on actual orders. The first step for the intraday timeframe is to allow implicit auctions to complement the continuous trading (so-called hybrid model). In addition to this, the solution for pricing in shorter timeframes is to be addressed to ensure that trades are treated equally in all timeframes and the pricing reflects the scarcity of cross-zonal capacity.

New technologies – like automation, robots and smart grids – may challenge the market design, but also provide opportunities to change it. These possibilities can be used to enable trading closer to real-time, to introduce geographically larger markets (including also DSOs' grids) and to establish a variety of smarter market platforms communicating with each other.

The NBM is the program for updating the Nordic balancing process in order to facilitate increased volumes of variable renewable energy in the system, European market integration and improved balancing market efficiency while maintaining operational security in the most cost-effective manner. The NBM program has created a roadmap for implementation³.

This roadmap includes the implementation of aFRR and mFRR capacity markets, single price model, mFRR energy activation markets and 15 min time resolution. Plans for the connection to the European aFRR and mFRR energy activation market platforms (MARI and PICASSO) have also been taken into account. In the roadmap, the Nordic TSOs have indicated major milestones for the implementation of the NBM, where implementation of 15 min time resolution is foreseen in Q2 2023 and connection to the European platforms before year 2025.

This document explores solutions for future short-term markets taking the foreseeable changes in the electricity market and the power system beyond the year 2025 into account and assuming that the NBM roadmap has been implemented. Furthermore, the document indicates the need for further exploration on specific topics, which also requires involvement of other stakeholders than the Nordic TSOs.

2. Future developments of short-term markets

The future short-term markets cover effects of several market platforms, solutions for better usage of the locational information and impact on the market timeframes. The developments should reflect the needs of market participants, TSOs and DSOs to facilitate future short-term markets and secure system operation due to the ongoing transition in the energy system.

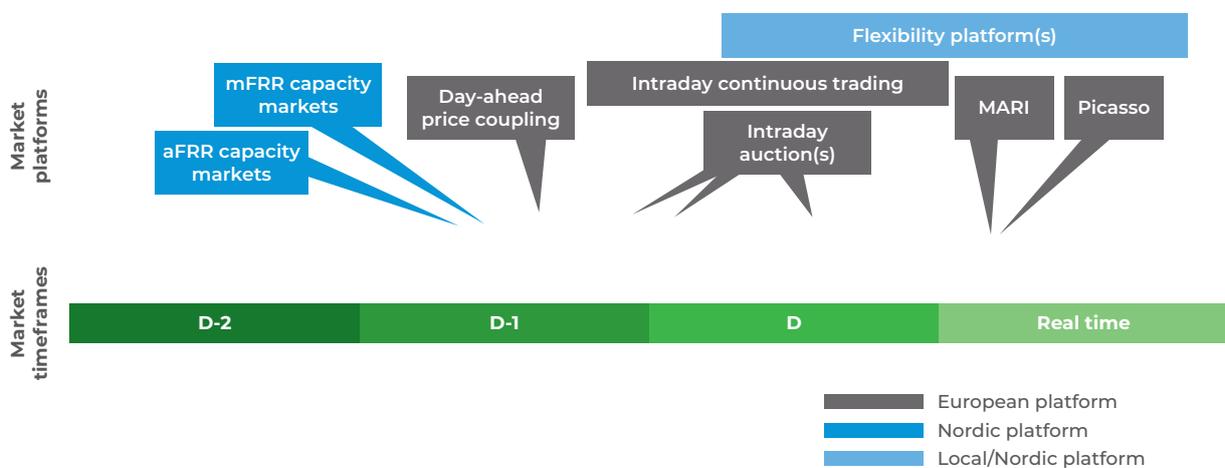
2.1 Market structure and platforms

Several EU wide market platforms for physical trading will be established in the coming years (see Figure 1). In addition, also regional and local platforms will be established to facilitate market integration and market-based procurement of resources. The TSOs or third parties (e.g. Nominated Electricity Market Operators, NEMOs) operate these platforms. Trading in these platforms is based on auctions or continuous trading. Some of these platforms will allocate the transmission capacity for the same delivery period. Furthermore, time span between the gate closure of the previous market timeframe and

gate opening of the following market timeframe will be shorter than today (e.g. in case, the future intraday auction has to meet the requirement set for complementary intraday auctions in Article 63(2) of the CACM, where continuous trading within and between the relevant bidding zones may be stopped for a limited time period of time before the intraday cross-zonal gate closure, which shall not exceed 10 minutes).

Market participants from the Nordic countries can trade in several European platforms (e.g. currently DA price coupling and intraday continuous trading platforms and in the future mFRR/aFRR energy trading and intraday auction platforms) and Nordic platforms (e.g. aFRR/mFRR capacity trading platforms, aFRR/mFRR energy trading platforms⁴). Besides, there will also be intraday auctions on the European level (three intraday auctions in accordance with recent ACER decision⁵ and foreseen platforms for flexibility markets on national/regional level. All these platforms need to have access to the physical transmission capacity in different timeframes.

Figure 1. Market platforms for future markets.



In continuous trading, incoming orders are executed one by one based on a "first come first serve" principle. On the contrary, in auctions orders are competing directly with each other. It is also possible to have combinations of the solutions where the continuous and auction models take place one after other or to have consecutive auctions. Currently single intraday coupling is based on continuous trading and single day-ahead coupling on auction model.

Once transmission capacity pricing is introduced into the intraday timeframe, the pricing shall reflect market congestion (as defined in CACM) and shall be based on actual orders. It has been decided by ACER5 that a hybrid model, where transmission capacity is priced in auctions, will be implemented in the intraday timeframe. To reach efficiency it is important that the liquidity is adequate and that the geographical scope is large enough.

There are also several other development trends that should be considered. Robotic trade has significantly increased the number of transactions in the markets with continuous trading leading to needs of system performance upgrade. CACM requires implementation of many new features of the trading algorithms and the number of bidding zones in the platform continues to increase. In addition, demand side participation by offering the flexibility to the wholesale markets and the impacts to trading behaviour coming from the change of the market timeframes places new requirements to the market platforms. New markets for inertia, reactive power, black start capability and batteries are also future potential developments.

Introduction of transmission capacity pricing, interaction between market platforms with possibility of bidding simultaneously for different purposes and other changes explained in this document lead to a need for an updated platform structure. Compatibility with developments with the European platforms also needs be ensured to have access to large markets, increase market liquidity, and support European integration. There are several alternatives for how the future structure could look like and these should be monitored and analysed further:

- In medium term a hybrid solution finds a permanent place in the short-term market structure; liquidity increases and both auctions and continuous trading will have their natural roles.
- It could also happen that hybrid solution turns out to be less successful and new solutions for future are needed. One solution could be returning to continuous trading, or another structure is found. (For example, some kind continuous mini auctions could be established to comply with requirements set in Article 55 of CACM).
- In the longer term, a solution where different markets and products are more coordinated/integrated might be an alternative. There would be integrated transmission capacity allocation, including day-ahead, intraday and balancing timeframes, as well as even DSO-TSO needs, and market results could be optimized collectively. In this case an auction model (consecutive or not) for the matching could be a possible solution. This solution could potentially decrease the complexity created with several market platforms and give simple access to market participants to bid their resources.
- There may be also come creative solutions based on robotic trade based on decentralized matching or rolling timeframe e.g. rolling intraday auctions for the subsequent 24 hours and shorter continuous trading before intraday auctions as delivery period or apply only intraday auctions for day-ahead and intraday timeframe.

Currently transmission capacity is given first to day-ahead market for allocation and then remaining capacity after day-ahead allocation will be given for intraday allocation. This kind of coordination is not efficient with several platforms allocating capacity for the same delivery period or with shorter timings between gate closures and gate openings between adjoining markets. In the future, the common transmission capacity management could take care of the coordination between different market timeframes and market platforms so that the physical transmis-

sion capacity is allocated efficiently and only once and that there are not double reservations in the physical transmission capacity.

Within the common transmission capacity management, the physical transmission capacity will be accessed by individual platforms, i.e. platforms where different kind of resources – like intraday energy, balancing energy, reserves, flexibility – are traded. Access rules to the transmission capacity should be defined for each platform including such as matching model (with grid modelling) and access timings (gate opening and closing times). Market platforms could be decentralized or centralized. However, it should be made easy for market participants to submit their bids to these individual platforms and the possibility of bidding simultaneously for different purposes should be facilitated. This needs studies e.g. on interfaces to the common capacity management for individual market platforms for day-ahead, intraday and balancing timeframes as well as for flexibility and DSO-TSO co-operation, and a concept how one bid could be offered to several markets.

The common capacity management could be applied to coordinate transmission capacity reservation starting with the intraday platforms (hybrid model) to minimise the effects of the intraday auctions to the intraday continuous trading and afterwards extending the common transmission capacity management to cover also the day-ahead platform. The platforms may

apply the current zonal model and results of the transmission capacity allocation could be transferred between different platforms by the common transmission capacity management solution. Parallel with this development, platforms for balancing markets (platforms for aFRR/mFRR capacity and energy markets) could apply also the common transmission capacity management (possibly with more detailed local modelling). This development could be followed by co-optimised cross-zonal capacity allocation for short-term markets between TSOs' and NEMOs' market platforms. At a later stage, the common transmission capacity management could cover all timeframes from day-ahead until real-time operation. This solution could allow access from the flexibility platforms, where more detailed modelling of grid constraints could be needed.

Transparency should be increased to ensure robustness of the market structure and to diminish entry barriers for market participants. This may be facilitated e.g. by introducing additional information from the Nordic markets to the ENTSO-E Transparency Platform. Furthermore, ownership and sensitivity of published data in the environment of several market platforms should be tackled.

In order to have more clarity on the above direction, the Nordic TSOs propose objectives and priority topics as seen in Table 2 to be explored to develop market structures and platforms for the future short-term markets.

Table 2. Objectives and topics to be explored to develop market structures and platforms for the future short-term markets.

Objectives	Topics
Deliver all available transmission capacity for different market timeframes	Common transmission capacity management to facilitate co-existence of and participation in several market platforms
Ensure robustness and diminish entry barriers for market participants	Increase transparency: additional information from the Nordic market in the ENTSO-E Transparency Platform and measures to tackle ownership and sensitivity of data in the future
Ensure simple access for market participants	Interaction between individual platforms taking available transmission capacity into account

2.2 Using flexibility to solve congestions

It is expected that the new market-based congestion-management solutions, such as flexibility markets, will be beneficial for the market participants, DSOs and TSOs. In many situations, flexibility from market participants can be used to solve congestions in transmission and distribution grids. This requires coordinated access mechanisms to the customers with flexibility resources.

Flexibility markets could enable energy resource owners (e.g. storage operators, demand response actors, electric vehicles, end users, (renewable) power plants) to provide their flexibility in consumption or generation to the flexibility market platform. When setting the minimum bid size in the flexibility markets it should reflect the amount of flexibility. These resources can be used by markets or by TSO or DSO. These markets can be local or wider-area markets and market participants may balance themselves near real-time (e.g. after intraday gate closure) and in real-time.

In order to utilize the flexibility and to foster market liquidity, there is a need to adjust the market design to make it possible to accept bids and offers from new flexibility providers. Goal should be to bring an easy access for the customers' "hidden" flexibility to the markets and let it freely compete with the traditional resources of flexibility. Role of the market plat-

forms could possibly be a neutral intermediary between flexibility demand from system operators and flexibility providers active in the relevant region, supervise price formation and guarantee a high level of transparency for this new market. Flexibility markets could be integrated with other markets in order to ensure liquidity.

New market platforms could support TSO and DSO needs by procurement of ancillary services. To facilitate this, offers on the new market platforms need to include additional information (like locational information and ramp rate for a balancing product) compared to regular offers in the current intraday market. Besides, utilization of data as near real-time as possible and as transparently as possible (based on e.g. open data, smart meters and data hub) are important for successful implementations.

It is important to support, participate and share experiences from ongoing pilot projects in order to learn more about practical solutions for coordination mechanisms between TSO and DSO needs and market platforms. In this context, clear roles and responsibilities of different actors shall be addressed and understanding of the role of the flexibility markets should be increased.

In order to have more clarity on the above direction, the Nordic TSOs propose the objective and priority topic as seen in Table 3 to be explored to develop flexibility markets for the future short-term markets.

Table 3. Objective and priority topic to be explored to develop flexibility markets for the future short-term markets.

Objective	Topic
Facilitate easy market access for flexibility resources	Market structure for flexibility markets and coordination with other platforms

2.3 Locational information for allocation

New transmission and distribution assets can be commissioned to facilitate fluctuating power flows due to increased variable production resources, but it is not economically efficient to build grids that all possible power flows can be accommodated. Fluctuations in power flows may introduce changes in the location of congestions, and it could be challenging to define bidding zones based on frequently changing location of congestions. These fluctuations therefore might call for changes in the capacity calculation and capacity allocation model to ensure operational security and efficient congestion management.

In accordance with CACM, the flow-based approach will be implemented in intraday timeframe when single intraday coupling (XBID solution) allows flow-based constraints to be taken in the allocation into account. Reassessment of the intraday cross-zonal capacity shall be done at the frequency the Common Grid Model for the intraday timeframe is made available, for each intraday auction and in case of a fault in the power system. The latest available Common Grid Model is applied in the reassessment of cross-zonal capacities. Any change in the cross-zonal capacity (increase or decrease) due to a reassessment shall be released to the intraday market without undue delay.

Implementation of the flow-based capacity calculation methodology is a step forward from the current net transmission capacity approach towards taking better into account the locational information within a bidding zone as it models better the power flows in the meshed transmission grids for the capacity allocation phase⁶. Yet, it still might not solve efficiently the congestion management in the grid, where the location of congestions frequently changes. Furthermore, it applies forecasts of generation and consumption – not actual bids – when defining the flow-based parameters for the cross-zonal capacity allocation, which might lead to inefficiencies in the capacity allocation phase.

The new approach for the transmission capacity allocation could include the topology of the grid and its parameters, enabling the more accurate calculation of power flows in the meshed grids and taking the grid losses and location of gener-

ation and consumption into account. This more accurate allocation model requires that the location of generation and consumption bids should be given in more detailed level. This means that orders – demand and sell orders – should be given with higher geographic resolution, even with unit bidding⁷ if there is forecasted grid congestions for a bid. It is possible that unit bidding is applied only in those bidding zones, where grid constraints within the bidding zone limit the trading. The bidding zones without internal grid constraints still apply the current approach with portfolio bidding. This solution may, however, have consequences with respect to a "level playing field" of market participants that needs to be assessed.

The essence of the new model would be the application of optimal power flow (OPF) related techniques firstly in the balancing timeframe to determine the optimal allocation of generation and consumption, while satisfying the physical laws that govern the power flows and the grid constraints. The result of this new model is an economically efficient allocation of resources. Zonal pricing can still be applied, but pricing rules should be carefully designed to ensure proper incentives.

Possibilities of a zonal model with smaller bidding zones in addition to grid investments could be investigated as an alternative for more detailed locational modelling in the balancing timeframe.

If a transition to a more detailed locational modelling is envisaged, there is a need for a step-wise approach and launching pilot projects to gain practical experience from the locational modelling. Furthermore, it should be explored which changes are possible within the current legal framework – especially guideline on electricity balancing (EB)⁸ - and start preparing for changes that are deemed necessary for the future Nordic power system. It should be recognized that time horizon for such change covering the short-term market timeframe would be 5–10 years depending on the needed changes in the model.

In order to have more clarity on the above direction, the Nordic TSOs propose the objective and priority topic as seen in Table 4 to be explored to develop locational information for future short-term markets.

Table 4. Objective and priority topic to be explored to develop locational information for the future short-term markets.

Objective	Topic
Ensure operational security	More detailed locational information of generation and consumption resources for capacity allocation in different timeframes

2.4 Market timeframes

Gate opening time for the intraday timeframe

ACER decided⁹ in accordance with CACM that gate opening time shall be 15 CET D-1 from 1 June 2018 on all bidding zone borders in the Nordic capacity calculation region. Nordic TSOs do not foresee – reflecting also stakeholders' views – a need to change gate opening time of 15 CET D-1 in near future. Future changes in the gate opening time could be linked to the possible redesign of day-ahead and intraday timeframes. It is important that all EU TSOs develop their scheduling system and processes in order to start being able to provide non-zero cross-zonal capacity, e.g. the remaining capacity from day-ahead allocation, to the market at the intraday gate opening time.

Different intraday gate opening times for the cross-zonal trading and the trading within a bidding zone may be applied, but preferably, they should be aligned. Stakeholders view that having a shorter gate opening time after day-ahead markets only inside a bidding zone is better than waiting for a decision on implementing a shorter gate opening time after day-ahead market on a wider market area. Any change to the current gate opening times should be carefully analysed in order to minimize the negative effects to the integrated markets.

Gate closure time for intraday timeframe

ACER has decided¹⁰ that gate closure time shall be 30 minutes before delivery period for the bidding zone border Estonia – Finland, and 60 minutes before delivery period for all other European bidding zone borders. After 1 January 2021, the gate closure time shall be defined in relation to the start of the relevant intraday market time unit.

European TSOs propose to have gate closure time for mFRR/aFRR energy market to be 25

minutes before real-time, which is nearer real-time than gate closure time for intraday timeframe and compliant with Clean Energy Package legislation.

It should not be ruled out that in some bidding zones there could be different gate closure times for the cross-zonal trading and the trading within a bidding zone. There might not be any immediate need to harmonize the gate closure time across Europe. However, there is a need to understand the impacts of changing the gate closure time closer to the delivery period. It should be noted that as long the intraday market is based on a zonal model, this change may also result in infeasible schedules that need to be corrected by the TSO during the real-time operation.

Stakeholders have requested to have gate closure time as close the real-time as possible. A practical next step could be to conduct a Nordic study together with stakeholders about the need and consequences to change the gate closure times towards real-time taking account of the lessons learnt from pilot projects with shorter gate closure timings.

Experiences from implementation of 15-minute imbalance settlement period and 15-minute products in markets could be used to evaluate if it is beneficial to move towards shorter time interval for the imbalance settlement period and trading time units¹⁰. Such evaluations could be performed when the 15-minute imbalance settlement period and products have been in place for some years.

In order to have more clarity on the above direction, the Nordic TSOs propose the objective and priority topic as seen in Table 5 to be explored to move gate closure time for intraday timeframe closer to real-time for future short-term markets.

Table 5. Objective and priority topic to be explored to move gate closure time for intraday timeframe closer to real time for the future short-term markets

Objective	Topic
Facilitate market participants to balance themselves as near as possible real-time	Intraday gate closure closer to real-time

Redesign of market timeframes

Forecasting wind and solar production for 12 – 36 hours before delivery period is challenging, which might make the management of variable generation and increased flexibility in the current market design difficult. The accuracy of the forecasts increases near real-time operation implying that short-term market timeframes could be used to adjust forecasts made in the day-ahead timeframe. Thus, there might be a need to reconsider the present market timeframes: the purpose of the day-ahead market might be moving towards hedging rather than real-time physical trading, and short-term markets - including intraday and flexibility markets – might be used more for real-time physical trading. Introduction of the 15-minute imbalance settlement period and 15-minute products in the short-term markets could also help market participants to balance themselves better.

The Nordic TSOs expect that market participants may increase their trading in the intraday timeframe implying that traded volumes move from the day-ahead timeframe to the intraday

timeframe. Market participants might consider the day-ahead timeframe too long before delivery period for bidding their volatile physical resources. However, need for liquid price formation (i.e. reference price) for physical resources remains. Redesigning day-ahead and intraday timeframes after implementation of intraday hybrid model and changes in the intraday gate opening and closure times could be studied.

Increased trading in the intraday timeframe may have effects also to the financial markets and hedging in the forward market timeframe because currently the financial markets apply prices from the day-ahead market as a reference price. Volumes and liquidity of the day-ahead markets could be monitored together with other physical markets and appropriate actions taken to ensure the reliable reference price formation for the financial markets.

In order to have more clarity on the above direction, the Nordic TSOs propose the objective and priority topic as seen in Table 6 to be explored to develop the market design for future short-term markets.

Table 6. Objective and priority topic to be explored to develop the market design for the future short-term markets.

Objective	Topic
Ensure good liquidity and proper market design	Monitoring developments in the day-ahead and intraday markets after implementation of intraday hybrid model and changes in intra-day gate closure time and follow up with suitable measures if necessary

2.5 Towards real-time trading in the future short-term markets – list of priorities

In order to facilitate real-time trading in the future short-term markets, changes to the market timeframes, coordination between individual platforms and introduction of locational information for generation and consumption in grid models during the capacity allocation phase could be expected. Further, transparency is of outmost importance when trading close to (or in) real-time, in order to ensure robustness and diminish entry barriers for market participants.

The priority topics identified by the Nordic TSOs for the future short-term market development work are summarised in Table 7. The development work for majority of proposed topics may be performed parallel, but some of the topics need input from the development work related to another topic(s) and thus could be performed in succession. Pilot projects and lessons learnt from the pilot projects are a way forward for several topics (e.g. flexibility markets, locational information and intraday gate closure time). The priority topics need involvement of several parties.

Table 7. Priority topics to be explored for the future short-term markets.

Objectives	Topics
Deliver all available transmission capacity for different market timeframes	Common transmission capacity management to facilitate co-existence of and participation in several market platforms
Ensure robustness and diminish entry barriers for market participants	Increase transparency: additional information from the Nordic market in the ENTSO-E Transparency Platform and measures to tackle ownership and sensitivity of data in the future
Ensure simple access for market participants	Interaction between individual market platforms taking available transmission capacity into account
Facilitate easy market access for flexibility resources	Market structure for flexibility markets and coordination with other platforms
Ensure operational security	More detailed locational information of generation and consumption resources for capacity allocation in different timeframes
Facilitate market participants to balance themselves as near real-time as possible	Intraday gate closure closer to real-time
Ensure good liquidity and proper market design	Monitoring developments in the day-ahead and intraday markets after implementation of intraday hybrid model and changes in intra-day gate closure time and follow up with suitable measures if necessary

3. Conclusion

Chapter 2 identified topics for market structure, market platforms, market timeframes and cross-zonal capacity allocation model to move towards real-time trading in the future short-term markets. The identified topics may request changes in the European legislation and the European wide implementation, especially in Regulation 943/2019 and amendments in the existing network codes. However, Clean Energy Package might not deliver the needed changes and another legislative package beyond Clean Energy Package might be needed to facilitate better the transition occurring in the electricity power system.

The Nordic TSOs have consulted stakeholders and after consultation finalised this document addressing the possible priority topics to move towards solution for the future short-term markets. Stakeholders' active involvement is vital also after completion of this document and the Nordic TSOs will continue the dialogue about the future development with all stakeholders on how the short-term markets should evolve to meet the challenges introduced by the transition towards a clean energy system.

¹ Market time unit means 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

² COMMISSION REGULATION (EU) 2015/1221 of 24 July establishing a guideline on capacity allocation and congestion management. OJ L 197. 25.7.2015, pages 24 – 72.

³ Nordic Balancing Model – Roadmap report. November 2019. Report is available at www.nordicbalancingmodel.net.

⁴ To be substituted by European aFRR/mFRR energy activation platforms (PICASSO and MARI).

⁵ Decision No 01/2019 of the Agency for the cooperation of energy regulators of 24 January 2019 establishing a single methodology for pricing intraday cross-zonal capacity.

⁶ The two-step model is used, where the first step is to calculate flow-based parameters and available margins, and the second step is to allocate cross-zonal capacity based on calculations in the first step.

⁷ In Norway, this is already the case today

⁸ COMMISSION REGULATION (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing. OJ L 312. 28.11.2017, pages 6 – 53.

⁹ Decision No 04/2018 of the Agency for the Cooperation of Energy Regulators of 24 April 2018 on all Transmission System Operators' proposal for intraday cross-zonal gate opening and intraday gate closure times.

¹⁰ Note however that Article 7.2 in the Electricity Regulation of the Clean Energy Package states: "Nominated electricity market operators shall provide market participants with the opportunity to trade in energy in time intervals at least as short as the imbalance settlement period in both day-ahead and intraday markets".

