BSP - Implementation Guide

Nordic MMS - aFRR capacity market

Business process: aFRR capacity market

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Revision History

Version	Release	Date	Changed by	Comments
0.8	Draft A	28.06.2018	Stein-Ole Gabrielsen	Initial Release
0.9	Draft B	12.07.2018	Stein-Ole Gabrielsen	Updated after review. First draft of Market result and reserved CZC
0.93	Draft C	03.09.2018	Stein-Ole Gabrielsen	Updated matrix for capacity and Market result
0.98	Draft D	26.09.2018	Stein-Ole Gabrielsen	Updated after comment from NMEG
1.0	Released	05.12.2018	Stein-Ole Gabrielsen	Final version
1.1	Released	18.06.2019	Stein-Ole Gabrielsen	Updated with • New structure of the accepted bid message • Added code for the role BSP (A46)
1.2	Draft	10.07.2019	Jan Möhr	Added support for data provider role and bidding on behalf of principal BSPs through third party agents. Added additional bid validation rules for maximum qualified quantities and maximum number of bids per portfolio. Added a description of republishing, withdrawal and non-purchase scenarios.
1.3	Released	28.08.2019	Stein-Ole Gabrielsen	Minor updates, feedback from NMEG
1.4	Released	23.10.2019	Jon-Thomas Eliassen	Corrected party code type
2.0	Draft	16.10.2020	Jon-Thomas Eliassen	General review and updates Message type changes New version of Balancing Document New pricing model
2.1	Draft	19.10.2020	Jon-Thomas Eliassen	Corrected chapter Update/cancel principles Removed invalid description in chapter Volumes and Prices
2.2	Draft	10.11.2020	Jon-Thomas Eliassen	Price unit change from MWH to MAW on price_Measure_Unit.name
2.3	Released	17.12.2020	Jan Möhr	General review and updates
2.4	Released	08.02.2021	Jon-Thomas Eliassen	Fixed spelling error in message type in chapter ECP
2.5	Released	26.02.2021	Jon-Thomas Eliassen	Accepted bids are now sent using ReserveAllocationResult_MarketDocument
2.6	Released	02.06.2021	Jon-Thomas Eliassen	Updated chapter 2.3.4 "Acknowledgement" and chapter 4.1.7 "Dependencies governing the Acknowledgement_MarketDocument": Description of element InError_Period.

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				Updated domain.mRID for Denmark. Improved documentation on how to cancel bids.
2.7	Released		Bent Atle Bjørtomt/Øystein Vatland/Fredrik Laane/Jan Møhr	Section Accepted bids: • Clarification, only one reason will be returned. Section Dependencies governing the ReserveBid_MarketDocument: • reserveBid_Period.timeInterval must cover a whole CET day. • Minimum bid size by increments of 1MW Other changes: • Corrected misleading sequence diagram, Ackowledge message is onlys sent as response to a bid submission. • ECP service code has been changed from "MFRRCAP" to "NO-MFRRCAP" • It is now supported to send bids per bidding zone instead of control area to allow independent planning and bid submission processes per bidding zone. This is done by specifying bidding zones in the document domain.mRID element. • A BSP can now be configured in NMMS to receive market result messages, even if the BSP did not submit any bids for the auction. • Added missing descripion of attribute *auction.mRID* in *Balancing_MarketDocument*

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1 Introduction

1.1 Background

1. Automatic frequency restoration reserves (aFRR) is one of several different types of Balancing Services that TSOs use for balancing of the Nordic synchronous area.

2. Nordic MMS has been developed by the Nordic TSOs to allow a joint procurement of aFRR balancing capacity before the day ahead market runs.

3. NMMS also allows the consideration of geographical distribution of reserves and network constraints.

4. Reservation of Cross-zonal Capacity will be based on a socioeconomic optimisation.

1.2 Scope

This document covers the technical implementation details when integrating with Nordic MMS and provides information about the processes required interact with an aFRR capacity market. Both functional and technical aspects are covered. The intended users of this document are the participating BSPs.

The main processes described are:

- Bid handling process
- Market clearing process

1.3   Terms and definitions

Acronym	Term	Definition
aFRR	Automatic frequency restoration reserves	*The FRR that can be activated by an automatic control device designed to reduce the FRCE/ACE to zero*
BRP	Balance Responsible Party	*A market participant or its chosen representative responsible for its imbalances*
BSP	Balancing Services Provider	*A market participant with reserve-providing units or reserve-providing groups able to provide balancing services to TSOs*
CIM	IEC Common Information Model	
CZC	Cross Zonal Capacity	*The cross-zonal transmission capacity between two bidding zones*
ECP	Energy Communication Platform	*Reference implementation of MADES standard*
MADES	Market Data Exchange Standard	*Communication IEC standard designed by ENTSO-E*
MOL	Merit Order List	
NTC	Net Transfer Capacity	*The trading capacity, also called NTC (Net Transfer Capacity), is capacity made available to trading between the bidding zones. The trading capacity is calculated as the transmission capacity less the regulating margin.*
TSO	Transmission System Operator	*A party that is responsible for a stable power system operation (including the organisation of physical balance) through a transmission grid in a geographical area. In the Nordic synchronous area, there are four TSOs: Svenska kraftnät, Fingrid, Energinet.dk and Statnett.*
	connecting TSO	*the TSO that operates the scheduling area in which balancing service providers and balance responsible parties shall be compliant with the terms and conditions related to balancing;*

1.4   References

Ref [1]   IEC 62325-451-1, *Framework for energy market communications – Part 451-1: Acknowledgement business process and contextual model for CIM European market*

Ref [2]   The Nordic aFRR Capacity Market rules

Ref [3]   ENTSO-E Reserve Bid document – UML model and schema

Ref [4]   ENTSO-E Balancing Document – UML model and schema

Ref [5]   ENTSO-E Reserve Allocation Result document – UML model and schema

Ref [6]   ENTSO-E Acknowledgement document

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2 Business context

2.1 Timeline

The aFRR capacity market involves several operational phases. The diagram below shows the timeline for the aFRR capacity market.
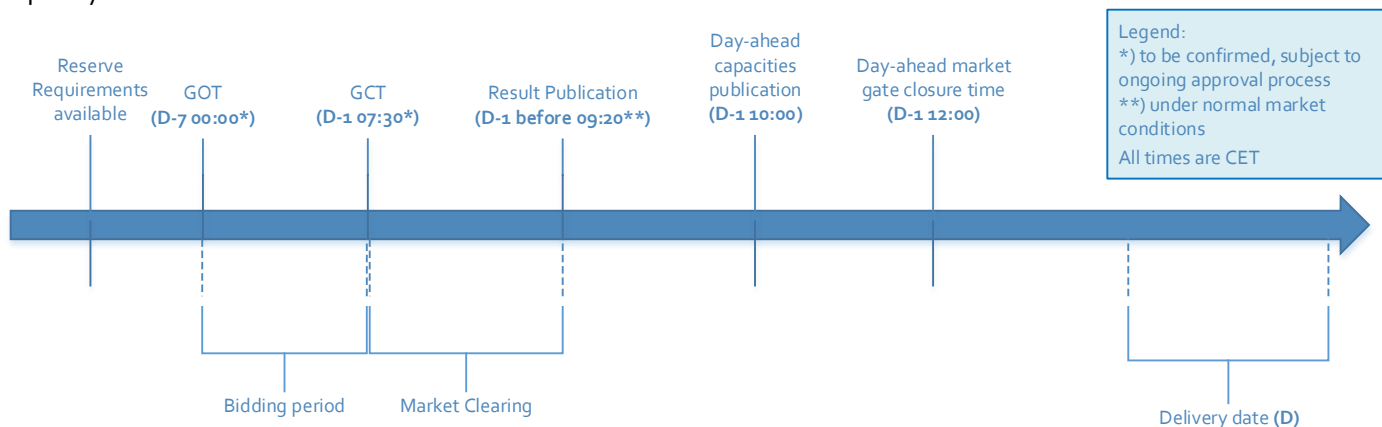
Figure 1 timeline

o Reserve requirements are published in regular intervals on the TSOs websites and visible in Nordic MMS

o Between the aFRR capacity market Gate Opening Time (GOT) and the aFRR capacity market Gate Closure Time (GCT), the BSPs can submit and update their bids (Bidding period).

o After gate closure, the "Market Clearing" runs. The Bid Selection Optimisation is executed and the market results are published to BSPs and TSOs. . The TSOs have the possibility to extend the bidding period.

o Day-ahead capacities publication: At 10:00 CET available capacities on interconnectors and in the grid are published

o Day-ahead market gate closing time: Buyers and sellers have until 12:00 CET to submit their bids to the day ahead market.

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2.2 System context

The diagram below shows the system context for the aFRR capacity market. It shows the internal processes required in the Nordic MMS system and how Nordic MMS integrates with the BSPs and other participating systems. It also shows how a BSP can use the web frontend of Nordic MMS to enter bids and retrieve information.

This document provides detailed information about the message exchanges between Nordic MMS and the BSP. The other exchanges are shown for information purposes only and are outside the scope of this document.
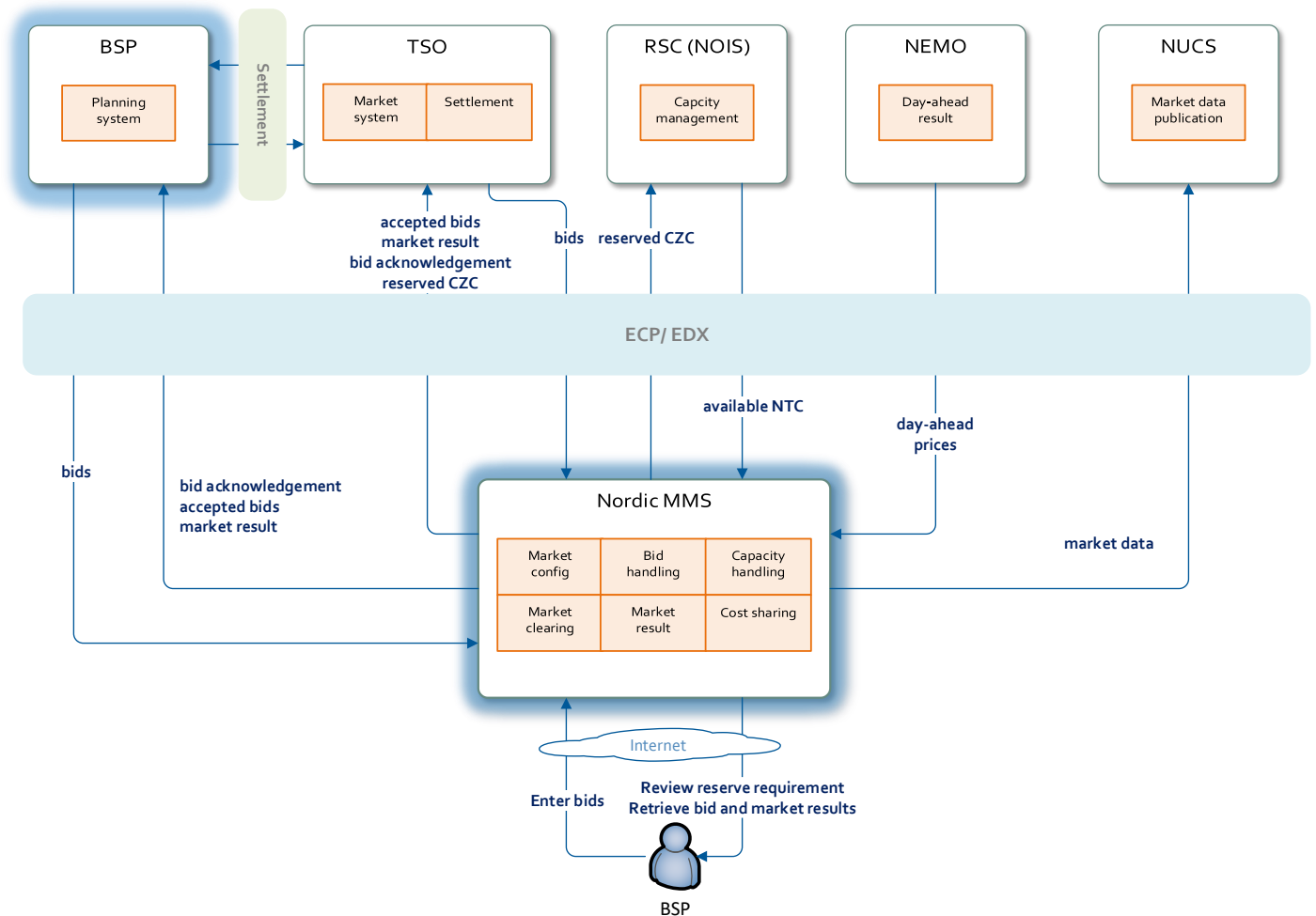
Figure 2 System context diagram

2.2.1 Interface description

The table below provide an overview of the flows between Nordic MMS and the BSPs. The tables show that IEC CIM is used as data exchange format and ECP/ EDX is used as communication platform. Please refer to chapter 4.2 for more details related to ECP/EDX.

Sender	Receiver	Data	Channel	Document
BSP	Nordic MMS	Bids	ECP/ EDX	iec62325-451-7-reservebiddocument.xsd – version 7.1
Nordic MMS	BSP	Acknowledgement	ECP/ EDX	iec62325-451-1-acknowledgementdocument.xsd – version 8.0
Nordic MMS	BSP	Accepted bids	ECP/ EDX	iec62325-451-7-reserveallocationresult.xsd – version 6.0
Nordic MMS	BSP	Market result	ECP/ EDX	iec62325-451-6-balancing.xsd – version 4.2

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2.3   General rules

The aFRR business process flows assume certain basic rules. These rules are described below.

2.3.1   Date and time

Date and time are expressed using the standard XML format for date and time: YYYY-`MM-DDTHH:MM:ssZ`, formatted using the universal time standard **UTC** by adding a 'Z' behind the time - like this: 2018-06-14T22:00:00Z

2.3.1.1   Document coverage

The beginning and ending date and time of the period covered by the document shall cover just one CET/CEST day.

2.3.1.2   Daylight saving time

- In **winter** the period is from 23:00 UTC to 23:00 UTC

- In **summer** the period is from 22:00 UTC to 22:00 UTC

- On the date of the change from winter to summer time, the period is from 23:00 UTC to 22:00 UTC. This change occurs on the last Sunday in March at 01:00 UTC

- On the date of the change from summer to winter time, the period is from 22:00 UTC to 23:00 UTC. This change occurs on the last Sunday in October at 01:00 UTC

2.3.2   Document identification and revision number

The document identification must be unique over time for the sender in question. Furthermore, the document identification itself should not have any significant meaning. The revision number is not used and shall always be equal to '1'.

2.3.3   Update/cancel principles

In general, a new received document will always completely replace a previous received document. **Update** of any time series is done by sending a new document honouring these rules

- A new document mRID (document identification)

- The same revision number (always equal to '1')

- A newer created date-time

- The same *period/day, domain, auction.mRID and subject market participant* (for bids) as for the data being updated

I.e. to **cancel** one or more time series, a new document is submitted honouring the above rules, omitting the bids that should be cancelled.

2.3.3.1   Cancel all bids

In order to cancel all bids by a given sender, day, and control area, a new document should be submitted with a dummy `Bid_TimeSeries` with element status and value `A09` = cancelled.

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The day is specified as normal using the `reserveBid_Period.timeInterval` element, and the control area is specified using the `domain.mRID` element, see details in 4.1.4: "Dependencies governing the ReserveBid_MarketDocument".

The dummy timeseries must include the status element and a reference to the market using element `auction.mRID`. Except for that, the content of the timeseries can by any values as long as they validate according to the xsd schema, see Ref [5].

Working example:

```xml
<ReserveBid_MarketDocument>
…
  <Bid_TimeSeries>
      <mRID>DUMMY-VALUE</mRID>
      <auction.mRID>AFRR_CAPACITY_MARKET</auction.mRID>
      <businessType>B74</businessType>
      <acquiring_Domain.mRID codingScheme="A01">DUMMY-VALUE</acquiring_Domain.mRID>
      <connecting_Domain.mRID codingScheme="A01">DUMMY-VALUE</connecting_Domain.mRID>
      <quantity_Measure_Unit.name>MAW</quantity_Measure_Unit.name>
      <currency_Unit.name>EUR</currency_Unit.name>
      <price_Measure_Unit.name>MAW</price_Measure_Unit.name>
      <divisible>A02</divisible>
      <blockBid>A02</blockBid>
      <status>
          <value>A09</value>
      </status>
      <flowDirection.direction>A01</flowDirection.direction>
      <marketAgreement.type>A01</marketAgreement.type>
      <Period>
          <timeInterval>
              <start>2000-01-01T00:00Z</start>
              <end>2000-01-01T00:00Z</end>
          </timeInterval>
          <resolution>PT60M</resolution>
          <Point>
              <position>1</position>
              <quantity.quantity>0</quantity.quantity>
              <price.amount>0</price.amount>
          </Point>
      </Period>
  </Bid_TimeSeries>
</ReserveBid_MarketDocument>
```

2.3.4   Acknowledgement

For the bid submission process, an acknowledgement document, as defined in Ref [6] is generated as response, either completely accepting the received document or rejecting it completely. Partly accept is not used. The codes and values used in this document are provided in chapter 4.1.7

The acknowledgement will always contain a document level `Reason`, with either code `A01` (Message fully accepted) or `A02` (Message fully rejected).

The acknowledgement may also contain further document level `Reason`(s), explaining document level errors.

The acknowledgement may also contain one or more `Rejected_Timeseries`, with one or more timeseries level `Reason`(s).

The acknowledgement may also contain one or more `InError_Period` within the `Rejected_Timeseries`, with one or more `Reason`(s) for a given time interval.

See example code snippet below:

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```xml
<Acknowledgement_MarketDocument>
…

  <Rejected_TimeSeries>
      <mRID>4CDF6AAA-4C0D-98DB-94CDE58FB4B5</mRID>
      <InError_Period>
          <timeInterval>
              <start>2021-01-07T00:00Z</start>
              <end>2021-01-07T01:00Z</end>
          </timeInterval>
          <Reason>
              <code>A59</code>
              <text>All quantities of block bid must be equal.</text>
          </Reason>
      </InError_Period>
      <Reason>
        <code>A22</code>
        <text>Invalid BSP</text>
      </Reason>
  </Rejected_TimeSeries>
  <Reason>
    <code>A02</code>
    <text>Document fully rejected.</text>
  </Reason>
  <Reason>
    <code>A51</code>
    <text>The attribute createdDateTime cannot be in the future.</text>
  </Reason>
<Acknowledgement_MarketDocument>
```

2.3.5   Time series period

Within a time series, the position must always begin with '1' and be incremented by '1' for each subsequent position, forming a series of contiguous numbers covering the complete range of the period. Furthermore, *gaps* in the time series are allowed. In this case, the time series will comprise of several periods to indicate the gaps. See code snippet below.

```xml
<Bid_TimeSeries>
...

        <Period>
          <timeInterval>
              <start>2018-09-17T03:00Z</start>
              <end>2018-09-17T05:00Z</end>
          </timeInterval>
          <resolution>PT60M</resolution>
          <Point>
              <position>1</position>
              <quantity.quantity>100</quantity.quantity>
              <minimum_Quantity.quantity>100</minimum_Quantity.quantity>
```

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```xml
                    <price.amount>25.20</price.amount>
                </Point>
                <Point>
                    <position>2</position>
                    <quantity.quantity>100</quantity.quantity>
                    <minimum_Quantity.quantity>100</minimum_Quantity.quantity>
                    <price.amount>25.20</price.amount>
                </Point>
            </Period>
            <Period>
                <timeInterval>
                    <start>2018-09-17T15:00Z</start>
                    <end>2018-09-17T17:00Z</end>
                </timeInterval>
                <resolution>PT60M</resolution>
                <Point>
                    <position>1</position>
                    <quantity.quantity>100</quantity.quantity>
                    <minimum_Quantity.quantity>100</minimum_Quantity.quantity>
                    <price.amount>25.20</price.amount>
                </Point>
                <Point>
                    <position>2</position>
                    <quantity.quantity>100</quantity.quantity>
                    <minimum_Quantity.quantity>100</minimum_Quantity.quantity>
                    <price.amount>25.20</price.amount>
                </Point>
            </Period>
        </Bid_TimeSeries>
```

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3 Business process

The market rules and the market definitions for the aFRR capacity market are described in Ref [2]. This chapter provides information related to the business rules that apply.

3.1 The aFRR capacity market sequence diagram

The sequence diagram for the aFRR capacity market is depicted below. Note that the last two shown exchanges are provided for information only and are outside the scope of this document. Please refer to local user guides for further details.
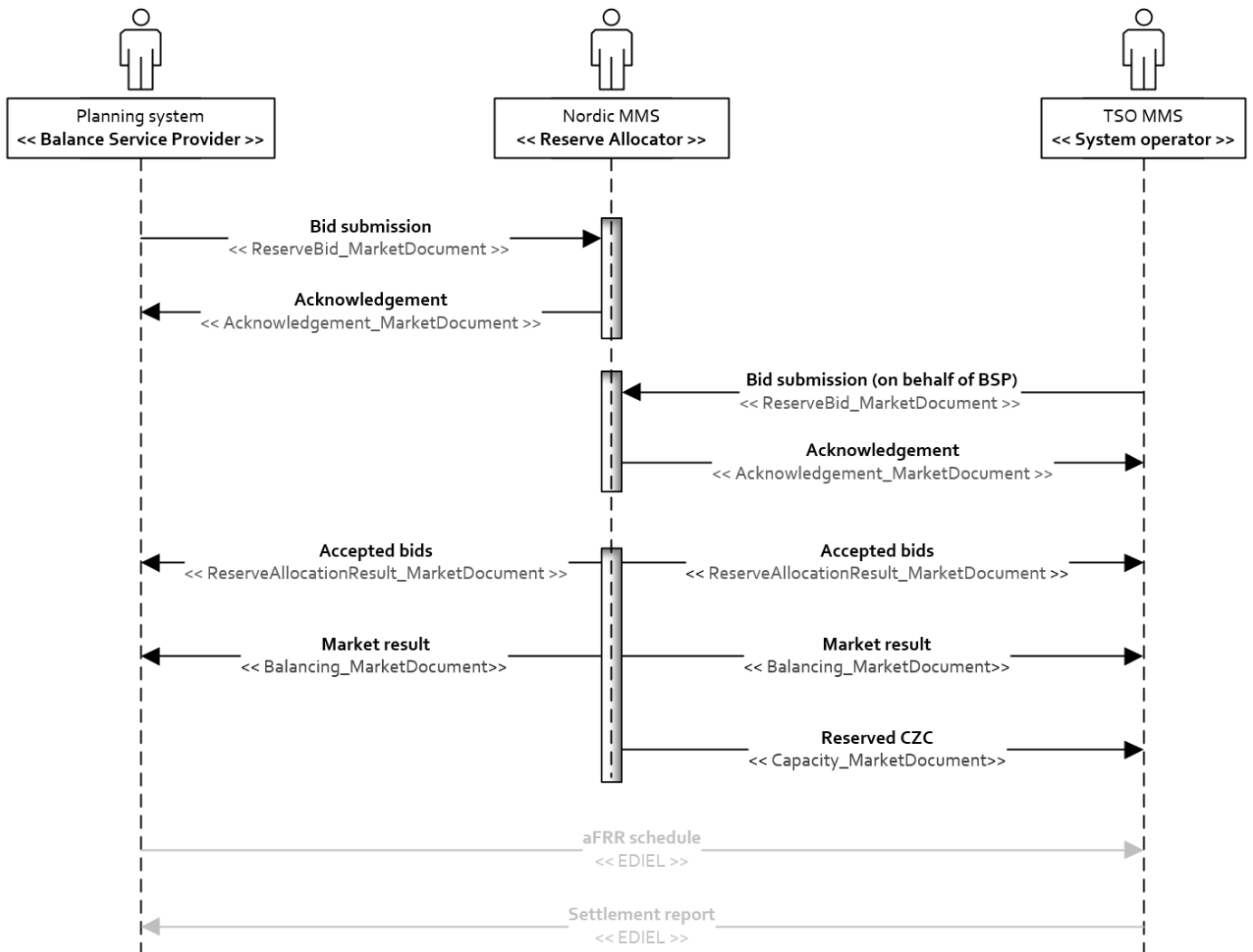

Figure 3 Sequence diagram for the aFRR capacity market

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3.2 Bid submission

During the bidding phase, the participating BSPs provide all information related to offers for the aFRR capacity market. The *ReserveBid_MarketDocument* is used to provide this information. Alternatively, bids can be submitted via the Nordic MMS web user interface. The same business rules apply for both alternatives. For a general description of the ReserveBid_MarketDocument schema, please refer to Ref [3] . The codes and values to be used in this document are provided in chapter 4.1.4.

3.2.1 Business rules

The following business rules apply to the bid submission process

3.2.1.1 General

- A Reserve Bid Document contains a set of bids (a bid is represented by a time series)
- A Reserve Bid Document shall be for only one *subject party*
- The ECP endpoint used to send the data must be associated with the subject party either by:
  o The subject party being the same as the sender and being directly associated with endpoint used
  o The subject party having an active agent-principal(BSP) relationship with the agent identified in the sender market participant (logical sender) and by the sender ecp end point (physical sender)
- The delivery period for a bid must belong to the same tender period for all bids in a Reserve Bid Document
- One Reserve Bid Document can be sent per control area, which includes all bids for all bidding zones the BSP has a portfolio in. It is also possible to send Reserve Bid Document per bidding zone. The document scope (control area or bidding zone) defines the set of bids replaced by the new document sent in. The number of bids submitted may not exceed the maximum number of bids set per portfolio

3.2.1.2 Bid quantity

- Bid quantity may vary for all hours in the time series
- Bid quantity (and minimum bid quantity) must be in the interval $[min\ quantity, max\ quantity]$, given by the Market parameters for the auction
- Bid quantity (and minimum bid quantity) must be a multiple of the quantity factor, given by the Market parameters for the auction
- Bid quantity may not exceed the BSP portfolios qualified max quantity per regulation direction and bidding zone

3.2.1.3 Bid price

- Bid price must be present and have the same value for all positions in a time series
- Bid price must be in the interval [min price, max price], given by the Market parameters for the auction
- Bid price must be a multiple of the price factor, given by the Market parameters for the auction

3.2.1.4 Block bids and linked bids

- All quantities of a block bid must be equal and represent a continuous interval of hours
- A block bid cannot be part an exclusive group
- Bids in the same exclusive group must belong to the same bidding zone (*connecting_Domain.mRID*)
- Only one up and one down bid in the same bidding zone can be linked into the linked group
- The bid price of both linked bids must be equal
- A block bid cannot be linked together with a non-block bid
- An exclusive group must contain at least two bids

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The use of linked up/down bids is subject to on-going approval by the national regulatory authorities. Until approval is granted by all Nordic NRAs, NMMS will reject bid messages with linked up/down bids.

3.2.2 Allowed bid type combinations

Bids can be either divisible or indivisible ("D"), and be linked in time (Blockbids: "B") regulation direction (linked up/down "L") or mutually exclusive (exclusive bids "E").

The table below describes each of these bid properties, and every allowed combination of these properties.

Case	Divisible (D)	Block (B)	Joint linked up-and-down (L)	Exclusive (E)	Description
0	O	O	O	O	single bid – Indivisible, non-block bid can span one or more hours (discontinuous interval is allowed). Each hour is cleared separately, i.e. the bid can be accepted or rejected separately hour by hour. The accepted quantity must either be equal to the offered quantity or zero. The result can be different in every hour of the bid.
D	P	O	O	O	single bid – varying quantity – Divisible, non-block bid has the same rules as described in case **0** with the difference that it can be accepted in the range between minimum and offered quantity. The divisibility is expressed by the presence of the minimum quantity. The minimum quantity can be also zero. The result can be different for every hour of the bid.
B	O	P	O	O	Indivisible block bid spans multiple consecutive hours (discontinuous interval is not allowed) with the same quantities per hour. In all hours, the bid must be either fully accepted or rejected.
DB	P	P	O	O	Divisible block (between minimum and offered quantity) bid spans multiple consecutive hours (discontinuous interval is not allowed) with the same quantities per hour. In all hours, the bid must be either accepted (between minimum and offered quantity) or rejected. I.e. it is not possible to accept the bid in one hour and reject it in another hour.
L	O	O	P	O	Joint linked up-and-down bids consist of two linked bids for different directions with the same price and hour(s). Both linked bids must have the same price and both must be either accepted or rejected; the offered quantity can be, however, different hour by hour. There are no links in time. The partial acceptance of the bid is not allowed.

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DL	P	O	P	O	The same as case L with the exception that, for each hour, the bid can be accepted also partially – between minimum and offered quantity. If the minimum quantity of one of two linked bids is equal to zero, it is allowed to fully reject that bid and at the same time accept the other linked bid – this specific situation does not violate the rules for bids linking. Please note that it is possible to link together one divisible and one indivisible bid.
BL	O	P	P	O	The same as case **L** with the exception that both bids must be either fully accepted in all hours or fully rejected in all hours. It is not allowed to link one block and one non-block bid.
DBL	P	P	P	O	Combination of cases **DL** and **BL**: both bids must be either accepted in all hours or rejected in all hours but the accepted quantity can be between minimum and offered quantity.
E	O	O	O	P	Exclusive bids in the same group (they have the same exclusive group ID) are mutually exclusive for the same hour (block bids cannot be part of the exclusive bid group). The bid can be accepted in the given hour only if all other bids in the group are rejected.
DE	P	O	O	P	The same case as **E** with the difference that the bid can be accepted also partially (between minimum and offered quantity). Please note that the exclusive group can contain both divisible and indivisible bids.
LE	O	O	P	P	If joint linked up-and-down bid is part of the exclusive group (see case **E**), both corresponding linked bids must be part of the exclusive group and they both must either be accepted or rejected together, i.e. they are not considered as mutually exclusive. Both linked bids must have the same price.
DLE	P	O	P	P	This is the combination of the cases **DE** and **LE**: if the bid is accepted, the second linked bid must be also accepted and all other bids in the exclusive group must be rejected. In contrast to the case LE, the bid can be accepted also partially (between minimum and offered quantity).

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3.2.3 Invalid bid type combinations

Case	Divisible (D)	Block (B)	Joint linked up-and-down (L)	Exclusive (E)	Description
BE	O	P	O	P	Block bid cannot be part of the exclusive group.
DBE	P	P	O	P	Block bid cannot be part of the exclusive group.
BLE	O	P	P	P	Block bid cannot be part of the exclusive group.
DBLE	P	P	P	P	Block bid cannot be part of the exclusive group.

3.3 Market result publishing

When the bid selection optimization process is completed, and the result from the auction is ready, the following information is published from the Nordic MMS system:

Information		Sent to BSP?
Accepted bids *ReserveAllocationResult_MarketDocument*		**Yes** - own bids, both procured and offered
Market result *Balancing_MarketDocument*	Volumes	**Yes**
	Prices	**Yes** - market price only

For a general description of the ReserveAllocationResult_MarketDocument schema, please refer to Ref [5]
For a general description of the Balancing_MarketDocument schema, please refer to Ref [4]

Settlement of accepted bids will use the pay-as-cleared pricing methodology, meaning that the market result will include clearing prices pr. bidding zone, market time unit and regulation direction with the settlement price being included both in the balancing market document and the reserve allocation result market document.

3.3.1 Accepted bids

- The *ReserveAllocationResult_MarketDocument* as defined in 4.1.5 is used to provide a status the of the bids that was submitted to the auction. The BSPs receive information about their *own* bids, and one of the following reasons are used to indicate the status:
    - o bid is accepted (**A73**)
    - o bid is not accepted (**B09**)
    - o bid has been divided to permit acceptance (**A72**)
    - o Tender unavailable in MOL list (the bid is rejected by TSO) (**B16**)

Nordic MMS distributes one *ReserveAllocationResult_MarketDocument* per BSP, control area / TSO and market result publication run. BSPs which did not enter bids into an auction do not receive market result messages.

Agents will receive accepted bids in separate messages per principal BSP.

3.3.2 Market results - Volumes and prices

The *Balancing_MarketDocument* as defined in 4.1.6 is used to provide information about the market prices and the total volume per hour and direction. The codes and values to be used in this document are provided in chapter 4.1.6. Nordic MMS distributes one *Balancing_MarketDocument* message per BSP and market result publication run. BSPs which did not enter bids into an auction do not by default receive market result messages. A BSP can however be flagged in Nordic MMS to receive the market results messages even if the BSP does not enter bids into an auction. To enable this the BSP should contact their local TSO

3.3.3 Republishing of market results

Nordic MMS can republish the market results multiple times due to different reasons:

- If the auction result is valid but cannot be processed by recipients due to inconsistencies in party identifiers. In this case, master data in the local MMS or in Nordic MMS requires to be updated before the market result is republished.

- Republishing can also be initiated when communication with some or all recipient endpoints has previously failed.

To support the update/cancel principle described in 2.3.3 and ensuring that the new market result replaces any earlier received market results, all documents that are sent will have new document mRID and updated createdDateTime.

3.3.4   Withdrawal of market results

Nordic MMS can withdraw the market result because of an invalid clearing result. As part of a withdrawal process, Nordic MMS will send out new market result messages with the following changes:

- Any previous accepted or partially accepted bids are changed to not accepted → the reason code is set to **B09 -** Bid not accepted

- All accepted volumes in the total market results are set to 0

- The price element is not included

Nordic MMS allows auction results to be published and withdrawn multiple times for one auction run.

3.3.5   Finish with Non-Purchase

Finish with non-purchase is a special market result, where

- All reason codes in the accepted bids message are set to **B09 -** Bid not accepted
- All accepted volumes in the total market results are set to 0

There are three possible scenarios for such zero results to be distributed:

- There are no reserve requirements
- No auction result has been published within the final publication deadline
- The auction has been cancelled because of extraordinary market conditions or a permanent failure during market clearing

Non-purchase market results completely replace and invalidate earlier published results.

Åpen informasjon / Public information

4 Annex

4.1 Dependency matrices

This chapter provides the dependencies for the documents used to support the aFRR capacity market

4.1.1 Classification

The dependency matrices describe the classification of the attributes. The following are classifications are used:

- M – The information is mandatory, i.e. the element is mandatory n the XSD schema
- R – The information is required, i.e. the element is not mandatory in the XSD schema but is required by the business process
- D – The information is dependent, i.e. the presence depends on certain condition(s)

4.1.2 Coding Schemes

When communication with the aFRR capacity market platform, the coding scheme to identify senders and receivers can vary by TSO. The local TSO defines which coding scheme and party code to use for the market participants it is responsible for.
Some sender / receiver systems like NMMS use fixed codes and codingscheme A01.

Code	Coding Scheme	Description and reference
A01	EIC	Energy Identification Codes: https://www.entsoe.eu/data/energy-identification-codes-eic/
A10	GS1/ GLN	Global Location Number, provided by GS1: https://gepir.gs1.org/index.php/search-by-gln
NSE	Swedish national	
NFI	Finnish national	
NDK	Danish national	
NNO	Norwegian national	

4.1.3 Bidding zones

The aFRR capacity market consists of the following bidding zones:

Name	TSO	mRID	Coding scheme
DK2	Energinet	10YDK-2--------M	EIC
FI	Fingrid	10YFI-1--------U	EIC
NO1	Statnett	10YNO-1--------2	EIC
NO2	Statnett	10YNO-2--------T	EIC
NO3	Statnett	10YNO-3--------J	EIC
NO4	Statnett	10YNO-4--------9	EIC
NO5	Statnett	10Y1001A1001A48H	EIC
SE1	Svenska kraftnät	10Y1001A1001A44P	EIC

SE2	Svenska kraftnät	10Y1001A1001A45N	EIC
SE3	Svenska kraftnät	10Y1001A1001A46L	EIC
SE4	Svenska kraftnät	10Y1001A1001A47J	EIC

4.1.4   Dependencies governing the ReserveBid_MarketDocument

ReserveBid_MarketDocument		`iec62325-451-7-reservebiddocument.xsd – version 7.1`
mRID	M	Unique identification of the document
revisionNumber	M	Constant value of "**1**"
Type	M	**B40** – Complete Reserve Bid Document
process.processType	R	**A51** - Automatic frequency restoration reserve
sender_MarketParticipant.mRID	M	Identification of the party sending the document Identification is supported by several coding schemes. See chapter 4.1.2: "Coding Schemes"
sender_MarketParticipant.marketRole.type	M	**A46** – Balancing Service Provider (BSP) **A39** – Data Provider Agents sending on behalf of BSPs must use market role `A39` when submitting bids. See chapter 4.3: "Agents and Data Providers acting on behalf of BSPs"
receiver_MarketParticipant.mRID	M	**10V1001C--000284** (Nordic MMS) **A01** - EIC coding scheme
receiver_MarketParticipant.marketRole.type	M	**A34** – Reserve Allocator
createdDateTime	M	Date and time of document creation (in ISO 8601 UTC format) `YYYY-MM-DDTHH:MM:SSZ`
reserveBid_Period.timeInterval	M	The period covered by the document (in ISO 8601 UTC format) `YYYY-MM-DDTHH:MMZ` Start and end interval must define an entire CET Day
domain.mRID	M	**EIC identification of the document scope:**

		Either control area :
		Denmark: 10Y1001A1001A796
		Finland: 10YFI-1--------U
		Norway: 10YNO-0--------C
		Sweden: 10YSE-1--------K
		or bidding zone mRID
		A01 - EIC coding scheme
subject_MarketParticipant.mRID	M	Identification of the party responsible for the bid
		Identification is supported by several coding schemes. See chapter 4.1.2: "Coding Schemes"
subject_MarketParticipant.marketRole.type	M	**A46 –** Balancing Service Provider (BSP)

Bid_TimeSeries		
mRID	M	Unique identification of the time series
auction.mRID	M	Constant value of "**AFRR_CAPACITY_MARKET**"
businessType	M	**B74** – The time series provides an offer to provide reserves.
acquiring_Domain.mRID	M	**10Y1001A1001A91G** (Nordic Market Area)
		A01 - EIC coding scheme
connecting_Domain.mRID	M	The EIC identification of the bidding zone where the bids are placed. See chapter: 4.1.3: "Bidding zones".
		A01 - EIC coding scheme
quantity_Measure_Unit.name	M	**MAW** – megawatt
currency_Unit.name	R	**EUR** – euro
price_Measure_Unit.name	R	**MAW** - megawatt
divisible	M	**A01** = Yes - quantity may be reduced stepwise down to the minimum quantity **A02** = No - no reduction possible on the quantity

linkedBidsIdentification	D	The identification used to associate bids that are to be linked together. For aFRR CM, this element is restricted to Up/Down-linking of bids. I.e. if the Up-bid is selected, then the Down-bid with the same linkedBidsID must be selected. Not used if the bid not linked The use of linked up/down bids is subject to on-going approval by the national regulatory authorities. Until approval is granted by all Nordic NRAs, NMMS will reject bid messages with linked up/down bids with the following reason code: **A59**: Linking of bids in up and down direction is not allowed in this market.
exclusiveBidsIdentification	D	The identification used to associate bids that are to be linked together. If one bid is selected then all others with the same exclusiveBidsID cannot be selected Not used if the bid is not part of an exclusive group

blockBid	R	**A01** - Yes - all quantities within the time interval must be selected **A02** – No
flowDirection.direction	M	**A01** - Up **A02** - Down
marketAgreement.type	O	**A01** – daily
Period		
timeInterval	M	Period covered (in ISO 8601 UTC format)
resolution	M	**PT60M** – the precision of the interval that the different points within the time series cover is *one hour*
Point		
position	M	Position within the time interval. Sequential value beginning with **1**
quantity.quantity	M	Offered quantity
price.amount	R	The price of the product offered
minimum_Quantity.quantity	D	The minimum quantity must be present if bid is marked as divisible (A01) and must not be present when the bid is market as indivisible (A02). Must be specified as the same value across all points across all periods of the bid.

4.1.5 Dependencies governing the ReserveAllocationResult_MarketDocument

ReserveAllocationResult_MarketDocument		iec62325-451-7-reserveallocationresult.xsd – version 6.0
mRID	M	Unique identification of the document
revisionNumber	M	Constant value of "**1**"
type	M	**A38** - Reserve allocation result document
process.processType	R	**A51** - Automatic frequency restoration reserve
sender_MarketParticipant.mRID	M	**10V1001C--000284** **A01** - EIC coding scheme
sender _MarketParticipant.marketRole.type	M	**A34** – Reserve Allocator
receiver_MarketParticipant.mRID	M	Identification of the party receiving the document Identification is supported by several coding schemes. See chapter 4.1.2: "Coding Schemes"
receiver_MarketParticipant.marketRole.type	M	**A46 –** Balancing Service Provider (BSP) **A39 –** Data Provider, see chapter 4.3: "Agents and Data Providers acting on behalf of BSPs"
createdDateTime	M	Date and time of document creation (in ISO 8601 UTC format) YYYY-MM-DDTHH:MM:SSZ
reserveBid_Period.timeInterval	M	Period covered (in ISO 8601 UTC format) YYYY-MM-DDTHH:MMZ
domain.mRID	M	EIC of the TSOs Control Area Denmark: **10Y1001A1001A796** Finland: **10YFI-1--------U** Norway: **10YNO-0--------C** Sweden: **10YSE-1--------K** **A01** - EIC coding scheme
TimeSeries		

mRID	M	An identification that uniquely identified the time series
bid_Original_MarketDocument.mRID	M	Constant value of **"NA"**
bid_Original_MarketDocument.revisionNumber	M	Constant value of **"1"**
bid_Original_MarketDocument.bid_ TimeSeries.mRID	M	The identification of the time series that was used in the original tender - the reference to the bid
bid_Original_MarketDocument.tendering_ MarketParticipant.mRID	M	The ID of the tendering party Identification is supported by several coding schemes. See chapter 4.1.2: "Coding Schemes"
auction.mRID	M	Constant value of **"AFRR_CAPACITY_MARKET"**
businessType	M	**B95** – Procured capacity
acquiring_Domain.mRID	M	**10Y1001A1001A91G** (Nordic Market Area) **A01** - EIC coding scheme
connecting_Domain.mRID	M	The EIC identification of the bidding zone where the bids were placed. See chapter: 4.1.3: "Bidding zones". **A01** - EIC coding scheme
marketAgreement.type	M	**A01** – daily
marketAgreement.mRID	M	Constant value of **"NA"**
quantity_Measure_Unit.name	M	**MAW** – megawatt
currency_Unit.name	R	**EUR –** euro
price_Measure_Unit.name	R	**MAW -** megawatt
flowDirection.direction	M	**A01** - Up **A02** - Down
Reason (within Time Series)		
code	M	**One of these codes will be provided:** **A72** - The original bid quantity has been divided to enable it to be accepted. **A73** - Tender in question has been accepted **B09** - Bid not accepted

		B16 – Tender unavailable in MOL list (the bid is rejected by TSO)
text	D	A reason for rejection can be specified by the TSO and will be included here. Only present if reason code = `B16`

Period		
timeInterval	M	Period covered (in ISO 8601 UTC format) `YYYY-MM-DDTHH:MMZ`
resolution	M	**PT60M** – the precision of the interval that the different points within the time series cover is *one hour*
Point		
position	M	Position within the time interval. Sequential value beginning with **1**
quantity	M	The **accepted quantity** identified for a point For ReasonCode `A73`: quantity is > 0 For ReasonCode `A72`: quantity is ≥ 0 For ReasonCode `B09` and `B16`: quantity is $= 0$
price.amount	D	The **accepted price** identified for a point For ReasonCode `A73` and `A72`: price.amount is present For ReasonCode `B09` and `B16`: price.amount is not present The accepted price can be different from the original offered price
secondaryQuantity	R	The **offered quantity** identified for a point For all supported ReasonCodes: secondaryQuantity is present
bid_Price.amount	R	The **offered price** identified for a point For all supported ReasonCodes: bid_Price.amount is present

4.1.6 Dependencies governing the Balancing_MarketDocument

Balancing_MarketDocument		iec62325-451-6-balancing.xsd – version 4.2
mRID	M	Unique identification of the document
revisionNumber	M	Constant value of "**1**"
type	M	**B34 –** Market result document
process.processType	R	**A51** - Automatic frequency restoration reserve
sender_MarketParticipant.mRID	M	**10V1001C--000284** **A01** - EIC coding scheme
sender _MarketParticipant.marketRole.type	M	**A34** – Reserve Allocator
receiver_MarketParticipant. mRID	M	Identification of the BSP receiving the document Identification is supported by several coding schemes. See chapter 4.1.2: "Coding Schemes"
receiver_MarketParticipant. marketRole.type	M	**A46 –** Balancing Service Provider (BSP) **A39 –** Data Provider, see chapter 4.3: "Agents and Data Providers acting on behalf of BSPs"
createdDateTime	M	Date and time of document creation (in ISO 8601 UTC format) `YYYY-MM-DDTHH:MM:SSZ`
area_Domain.mRID	R	**10Y1001A1001A91G (**Nordic Market Area**)** **A01** - EIC coding scheme
period.timeInterval	M	The period covered by the document (in ISO 8601 UTC format) `YYYY-MM-DDTHH:MMZ`
TimeSeries		
mRID	M	An identification that uniquely identifies the time series
businessType	M	**C17** – Market price and volume
acquiring_Domain.mRID	M	**10Y1001A1001A91G** (Nordic Market Area) **A01** - EIC coding scheme

connecting_Domain.mRID	M	The EIC identification of the bidding zone. See chapter: 4.1.3: "Bidding zones".
		A01 - EIC coding scheme
marketAgreement.type	R	**A01** – daily
flowDirection.direction	R	**A01** - Up **A02** - Down
currency_Unit.name	R	**EUR** – euro
quantity_Measure_Unit.name	M	**MAW** – megawatt
price_Measure_Unit.name	R	**MAW** - megawatt
auction.mRID	R	Constant value of "**AFRR_CAPACITY_MARKET**"

Period		
timeInterval	M	Period covered (in ISO 8601 UTC format) `YYYY-MM-DDTHH:MMZ`
Resolution	M	**PT60M** – the precision of the interval that the different points within the time series cover is one hour
Point		
Position	M	Position within the time interval. Sequential value beginning with **1**
Quantity	R	Total volume procured
procurement_Price.amount	R	Market price

4.1.7 Dependencies governing the Acknowledgement_MarketDocument

Acknowledgement_MarketDocument		iec62325-451-1-acknowledgement.xsd – version 8.0
mRID	M	Unique identification of the document
createdDateTime	M	Date and time of document creation (in ISO 8601 UTC format) `YYYY-MM-DDTHH:MM:SSZ`
sender_MarketParticipant.mRID	M	**10V1001C--000284** **A01** - EIC coding scheme
sender_MarketParticipant.marketRole.type	M	**A34** – Reserve Allocator
receiver_MarketParticipant.mRID	M	Identification of the BSP receiving the acknowledgement Identification is supported by several coding schemes. See chapter 4.1.2: "Coding Schemes"
receiver_MarketParticipant.marketRole.type	R	**A46** – Balancing Service Provider (BSP) **A39** – Data Provider, see chapter 4.3: "Agents and Data Providers acting on behalf of BSPs"
received_MarketDocument.mRID	R	Information extracted from the bid document
received_MarketDocument.revisionNumber	R	Information extracted from the bid document
received_MarketDocument.createdDateTime	R	Information extracted from the bid document
Rejected_TimeSeries		
mRID	D	Identification of the rejected time series
Reason	D	One or more of the reasons described below
InError_Period	D	One or more of the periods with error described below
InError_Period		
timeInterval	M	Period covered (in ISO 8601 UTC format)
Reason	M	One or more of the reasons described below
Reason		

| code	M	**A01**- Message fully accepted **A02**- Message fully rejected **A05** – Sender without valid contract. Used if the BSP is not eligible for aFRR in the current bid area **A57** - Deadline limit exceeded/Gate not open **A59** – Not compliant to local market rules Other reason codes may also be used.
text	R	A specific reason for the rejection can be specified and included here. E.g. `«Time series ID»: The exclusive group must contain at least two bids`

4.2 ECP

ECP is the integration channel that is supported for communication with the aFRR capacity market platform and will be used for

- submitting bids to the platform
- receiving acknowledgment documents from the platform
- receiving accepted bids and market prices and volumes from platform

4.2.1 How it Works

ECP delivers messages from the sender to a recipient within single ECP Network. Messages transported through the ECP Network can be any text or binary data. For aFRR, IEC CIM is used as data exchange format. Alongside with the message, ECP transfers also message metadata. These are (among others) information about sender and recipient. The former is used by platform to authenticate the message sender. ECP consists of three main components: *endpoint*, *component directory* and *broker*. See figure below:
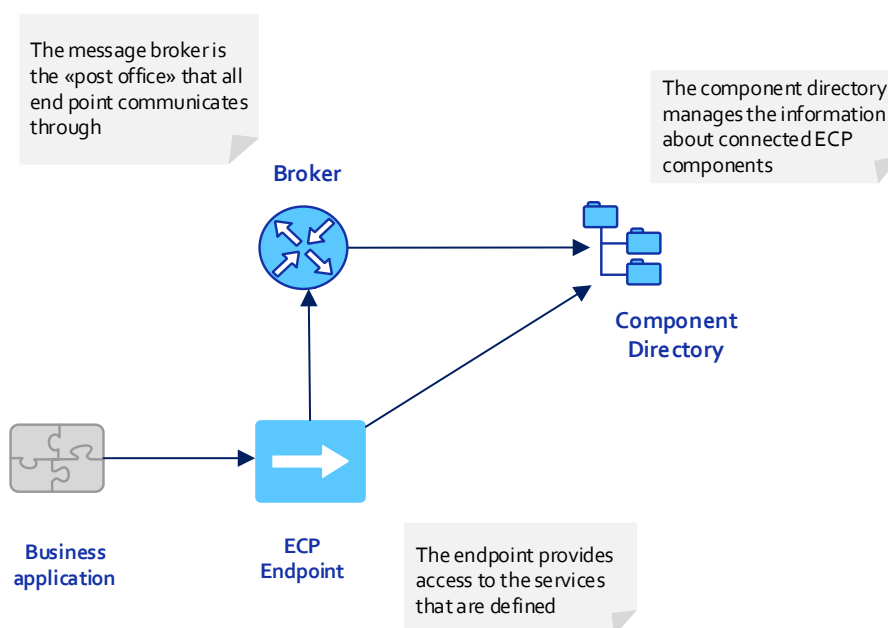
Figur 4 ECP Main Components

4.2.2 EDX

EDX is an extension to ECP, and is used to define the network configuration, and introduces the concept of services, service providers and consumers. The two central parts of the EDX network is the service catalogue and the toolbox. An EDX network consists of multiple toolboxes and a single service catalogue. These components communicates via ECP and is responsible for distribution of the network configuration. Messaging occurs directly between the toolboxes. Se figure below for EDX network overview:
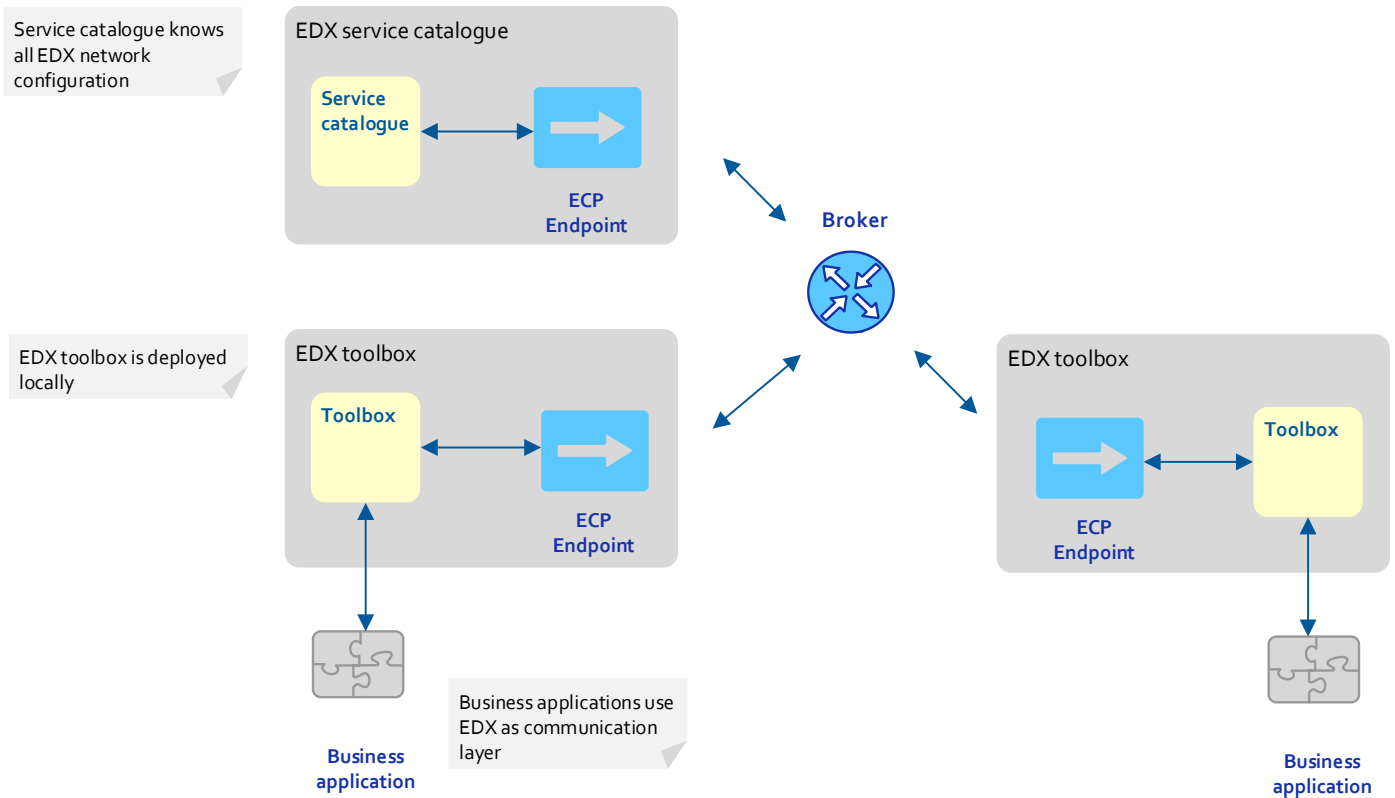
4.2.3   How to connect

Please refer to the installation package and documentation provided by your local TSO.

4.2.4   ECP/EDX for aFRR Capacity Market

4.2.4.1   Which message types to use

The table below shows the ECP message types used for the aFRR Capacity Market:

Process	Sender	Format	ECP message type
Bid	BSP	`iec62325-451-7-reservebiddocument.xsd`	MO-MCC-BIDS
Bid acknowledgement	Nordic MMS	`iec62325-451-1-acknowledgement.xsd`	MO-MCC-BIDS-ACK
Accepted bids	Nordic MMS	`iec62325-451-7-reserveallocationresult.xsd`	MO-MCC-ACCEPTED-BIDS-BSP
Market Result	Nordic MMS	`iec62325-451-6-balancing.xsd`	MO-MCC-MARKET-RESULTS

4.2.4.2   Which service to use

The addressing convention used for communicating in the ECP network is *SERVICE-service.code*. For aFRR Capacity Market the service code is AFRRCAP. Hence, addressing in aFRR Capacity Market is **SERVICE-AFRRCAP**.

4.3   Agents and Data Providers acting on behalf of BSPs

Nordic MMS supports authorizing third parties (agents) and their users to bid and receive market results on behalf of one or more principal BSPs (the party delegating the right to bid and receive market results).

The authorized parties can, but do not have to have own portfolios in Nordic MMS.

The authorization scheme allows the agent's ECP end point to be used to send bids and receive market results for one or more subject party (principal BSP).

For this purpose the endpoint has to belong to and identify the agent acting as a data provider on behalf of the principal BSPs. The agent's party code has to be set as the sender_MarketParticipant.mRID in the message and the its sender_MarketParticipant.marketRole.type needs to be set to A39 – data provider.

In order to authorize an agent, the principal BSP needs to request an authorization for the agent party from it's responsible TSO. The BSP needs to provide both the agent's party code and ECP endpoint. An agent can only be authorized for all or none of the principal BSPs bidding zones.

Once the association between the agent and the principal BSP is defined, the agent's users will have access to the bids and market results of the principal BSP. The agent's ECP endpoint will be allowed to submit bids and receive market results on behalf of the principal BSP.