BSP - Implementation Guide

mFRR energy activation market

15 min resolution and automated balancing

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Revision History

Version	Date	Changed by	Comments
1.0	17.12.2020	Nordic mFRR EAM project	First published version of the guide
1.1	14.06.2021	Nordic mFRR EAM project	*Added*: National bid attributes and products: - Faster activation and earlier deactivation - InclusiveBids - Period shift activation - Slower product bids (specific product) New documents: - Bid availability document - Reserve allocation result document - Acknowledgement document *Updated/added*: - Conditional linking - Activation heartbeat description - General rules for messaging - TSO specific: implementation plans - TSO specific: alternative channels
1.1.1	9.9.2021	Nordic mFRR EAM project	*Updated:* - Small modification of "Update and cancellation principles" - Validation rule for not allowing change of bid period and resource object - Adjusted description of 3.4 Activate bid process - Codes for type and processtype to Acknowledgement document - Document codes, and naming of document time interval attribute for Activation document - Reason codes for ReserveBid document and ReserveAllocationResult document - Implementation plan Svk and SN: removed pilot
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			o rule on connecting_Domain.mRID - Activation document: o new version 6.2 w/support for proper UUID o Document code for production smoothing (only Norway) o Reason in response - Implementation plan: o Statnett: description of transition o Svenska kraftnät: description of transition
1.1.3	13.5.2022		*Updated:* - Description of activation ordering process - Bid validation rules for non-standard product bids - Implementation plans - Transition phase Statnett and Svk - Other updates: o Message time series limit o Reference to namespace for ReserveBidDocument o Modified bid validation rule for complex bids o ReserveAllocationResult document – added price and short explanation of use
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			Svenska kraftnät specific: - Disturbance reserve - Updated Nation bid attributes support
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1.1.6	9.9.2024		*Energinet specific:* *- Energinet will not implement the heartbeat messaging process for Go-live*
1.2.0	17.09.2025		*Updated:* - References to golive mFRR EAM removed Fingrid specific: -Limit for bid submission -Voluntary bid identification -Conditional linking for inclusive bids -Reserve power plants Statnett specific: - Period shift for conditional linking - Non standard bids - Heartbeat timing Energinet specific: Added information about local model for Direct Activation Svenska kraftnät specific: - Updated heartbeat timing - Activate bid process, handling of failed bid validation

Table of contents:

1 Introduction

This implementation guide describes the interface between BSP and TSO for the mFRR energy activation market on 15 minute resolution and support for automated balancing.

1.1 Background

The mFRR Energy activation market (mFRR EAM) was put into operation 4th March 2025 as part of the Nordic Balancing Model (NBM) program. 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.

Information about the overall roadmap for the NBM program is available at the www.nordicbalancingmodel.net webpage.

1.2 Scope

This document covers the implementation of Nordic mFRR energy activation market and provides information about the processes required to support this market. Both functional and technical aspects are covered. The intended users of this document are the participating BSPs[1].

The main processes described are:

- Bid collection process, including
    - CIM-based xml message format for collecting bids
    - Bid attributes
- Energy activation process
    - Scheduled activation, Direct activation
    - Electronic ordering and heartbeat
- Settlement process
    - ReserveAllocationReport showing all activations for a given BSP

[1] In Denmark the BSP role has not been separated from the BRP role, so in Denmark the target audience for this document is the BRP. Whenever the term BSP is used throughout this document it should be interpreted - for Denmark - as the «BRP acting as BSP»

1.3 Terms and definitions

Acronym	Term	Definition
AOF	Activation Optimization Function	*The role to operate the algorithm applied for the optimisation of the activation of Balancing Energy bids within a Coordinated Balancing Area.*
BEGCT (BSP GCT)	Balancing Energy Gate closure time	*The point in time when submission or update of a balancing energy bid is no longer permitted*
BEGOT	Balancing Energy Gate opening time	*The first point in time when submission of a balancing energy bid is permitted*
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	*A standard for describing information about an electrical network. The European style market profile is a profile derivation from the CIM to harmonize the energy market data exchanges in Europe.*
CZC	Cross Zonal Capacity	*The cross-zonal transmission capacity between two bidding zones*
DA	Direct activation / direct activatable bid	*Activation of standard mFRR product bid(s) at any point of time following the point of scheduled activation of the quarter hour and until the point of scheduled activation of the subsequent quarter hour.*
FAT	Full Activation Time	*The period between the activation request by the connecting TSO and the corresponding full delivery of the concerned product*
ECP	Energy Communication Platform	*Reference implementation of MADES standard*
ISP	Imbalance Settlement Period	*The time unit for which balance responsible parties' imbalance is calculated*
MADES	Market Data Exchange Standard	*Communication IEC standard designed by ENTSO-E*
MOL	Merit Order List	*A list of balancing energy bids sorted in order of their bid prices, used for the activation of those bids*
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.*
SA	Scheduled activation / schedule activatable bid	*Activation of standard mFRR product bids at a specific point in time with respect to the period of time for which the bids were submitted. The scheduled activation time is once per quarter hour.*
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;*
TSO GCT	TSO energy bid submission gate closure time	*The latest point in time when a connecting TSO can forward the balancing energy bids received from a balancing service provider to the activation optimisation function*

1.4 References

Ref [1] mFRR Implementation Framework https://consultations.entsoe.eu/markets/mfrr_implementation_framework/

Ref [2] Common Information Model (CIM) and CIM based documents. ENTSO-E implementation guides, see ENTSO-E Electronic Data Interchange (EDI) Library

Ref [3] Acknowledgement: IEC 62325-451-1: Acknowledgement Business Process And Contextual Model For CIM European Market.

Ref [4] EIC codes: The Energy Identification Coding (EIC)

Ref [5] ENTSO-E codelist: Common information model (CIM) European style market profile

Ref [6] European platform - MARI : Manually Activated Reserves Initiative (entsoe.eu)

Ref [7] Nordic Trading System BRS: This document is a Business Requirement Specification (BRS) detailing the document exchanges related to trade in the Nordic energy market

Ref [8] Nordic Operate BRS: This document is a Business Requirement Specification (BRS) detailing the document exchanges related to operation of the Nordic energy market.

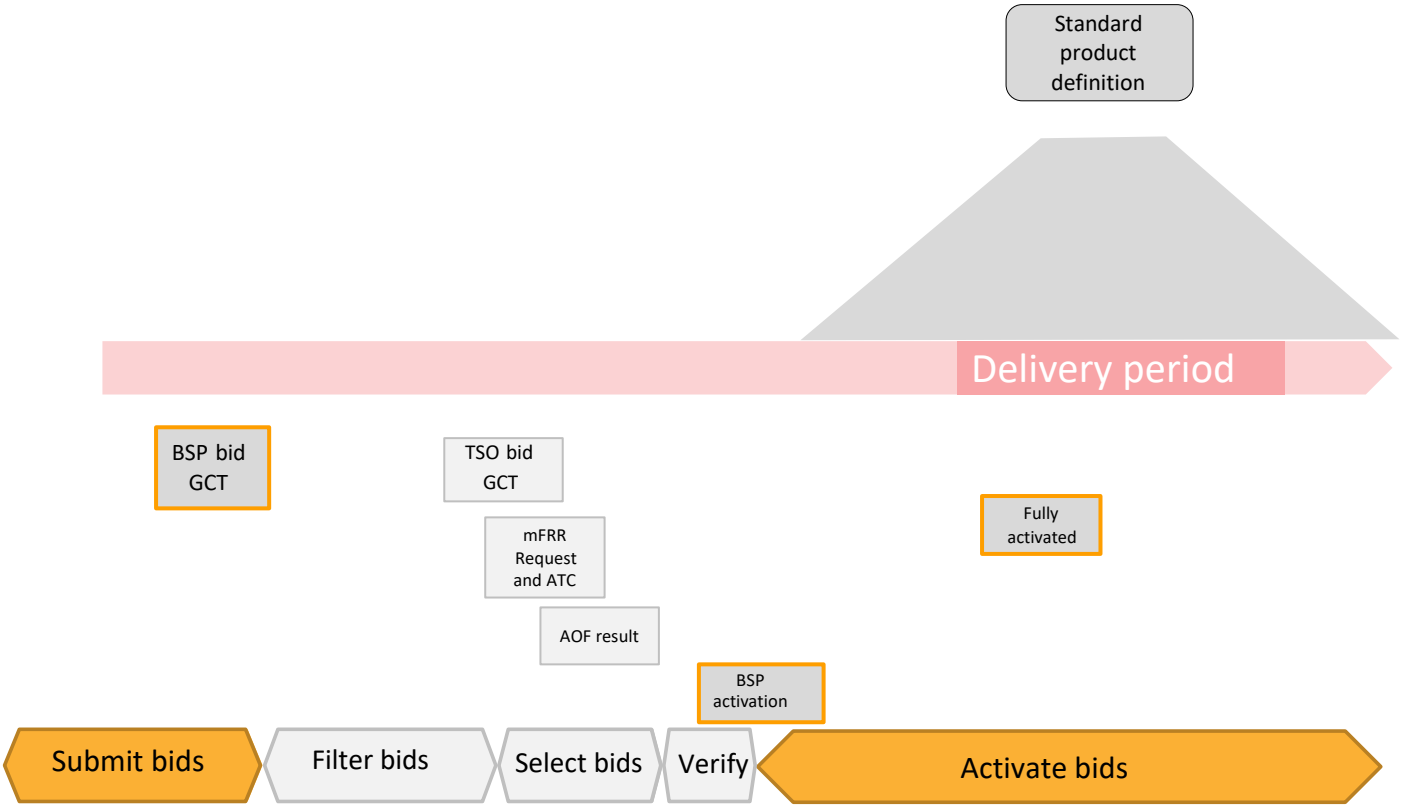
Ref [9] NMEG Code List Library: Description of additional codes used for the Nordic Market, Code list schema.

Ref [10] Nordic TSOs - Memo - Process for activating products

2 Business context

2.1 Overall process and timeline

In the figure below the timing for the bidding and activation processes is illustrated. The subprocesses and timing where the BSP is involved are indicated in orange colour.



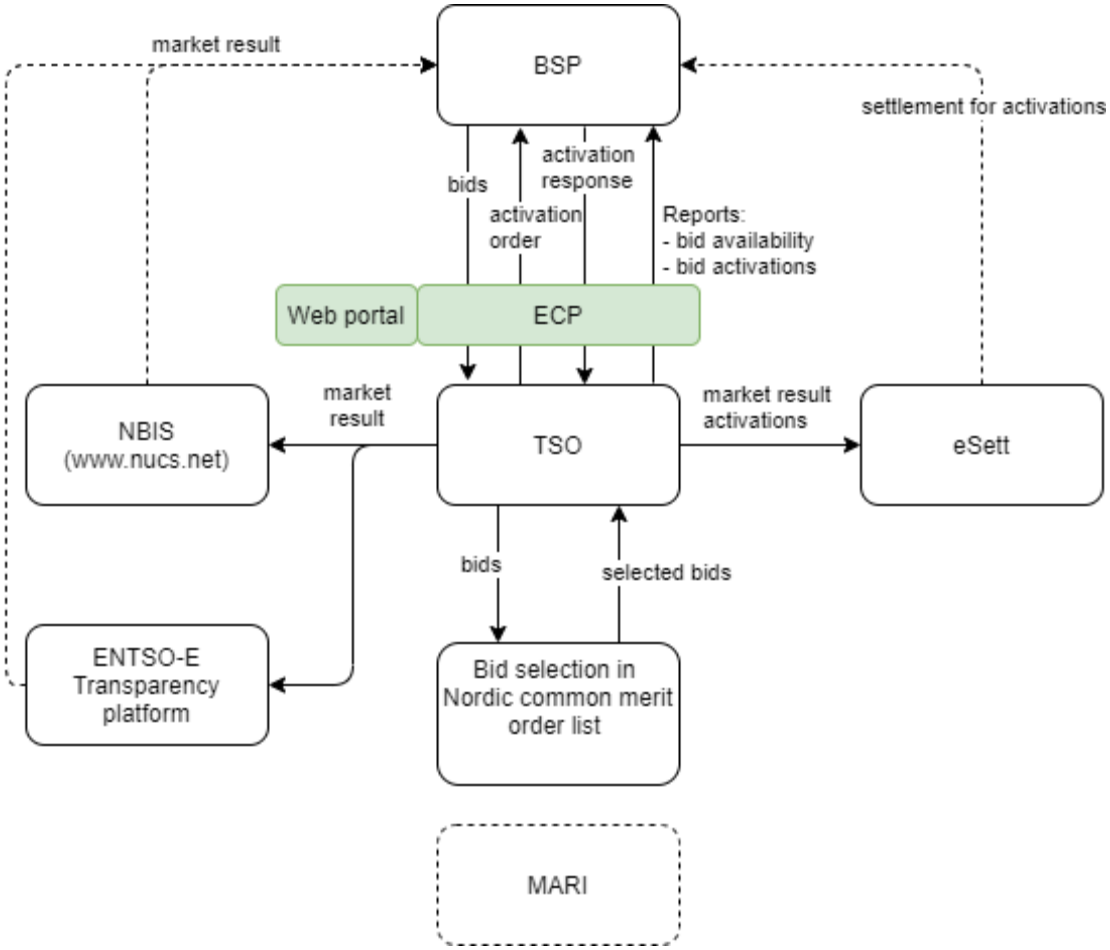
The timing is detailed in the table below. Notice that the timing will change when connecting to MARI. The reason for having different timing of the processes before golive of MARI, is to allow more time for the TSOs to assess bid availability and remediate grid congestions before and after the AOF bid selection process.

	Today	When connecting to MARI
BSP GCT (BEGCT bids)	QH-45	QH-25
TSO GCT	QH-15	QH-12
TSO mFRR request	QH-14	QH-10
AOF run	QH-14	QH-10
AOF results	QH-11	QH-8
TSO verification period		
Activation orders are sent to BSPs	QH-7.5	QH-7.5

QH refers to beginning of each quarter hour (MTU)

2.2 System context

The diagram below shows the system context of the mFRR energy activation market from a BSP viewpoint. This document provides detailed information about the message exchanges between BSP and TSO. The other exchanges are shown for information purposes only and are outside the scope of this document



2.3 Fallback

2.3.1 Bid collection

Each TSO has redundant mechanisms to receive bids from BSPs. In addition to machine-to-machine via ECP, it could be a web solution, e-mail, etc. See more on the TSO specific details in chapter 4.

2.3.2 Bid selection

In cases where the automatic solutions don't work, there is fallback solutions in use by each TSO. This fallback algorithm does not take all bid attributes into account and cannot guarantee a bid selection where all bids that are in-the-money are selected (e.g. not selecting up regulation bid with lower bid price than the marginal price). Unforeseeably rejected bids can potentially happen in normal operation but is more likely to happen in fallback situations.

2.3.3 Activation

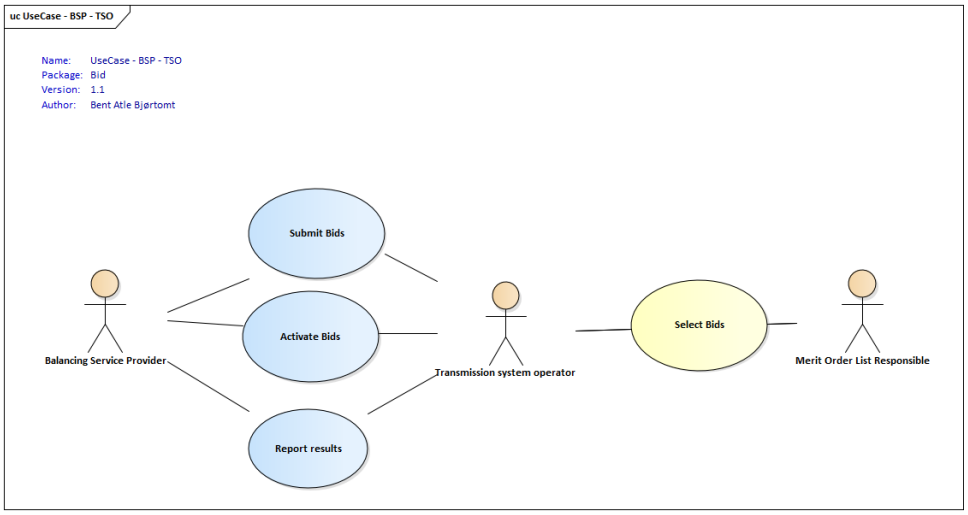
Each TSO has a redundant mechanism to order bid activation. TSO specific details on the redundancy mechanism and handling of issues with communication with BSPs are described in chapter 4.

3 Business process

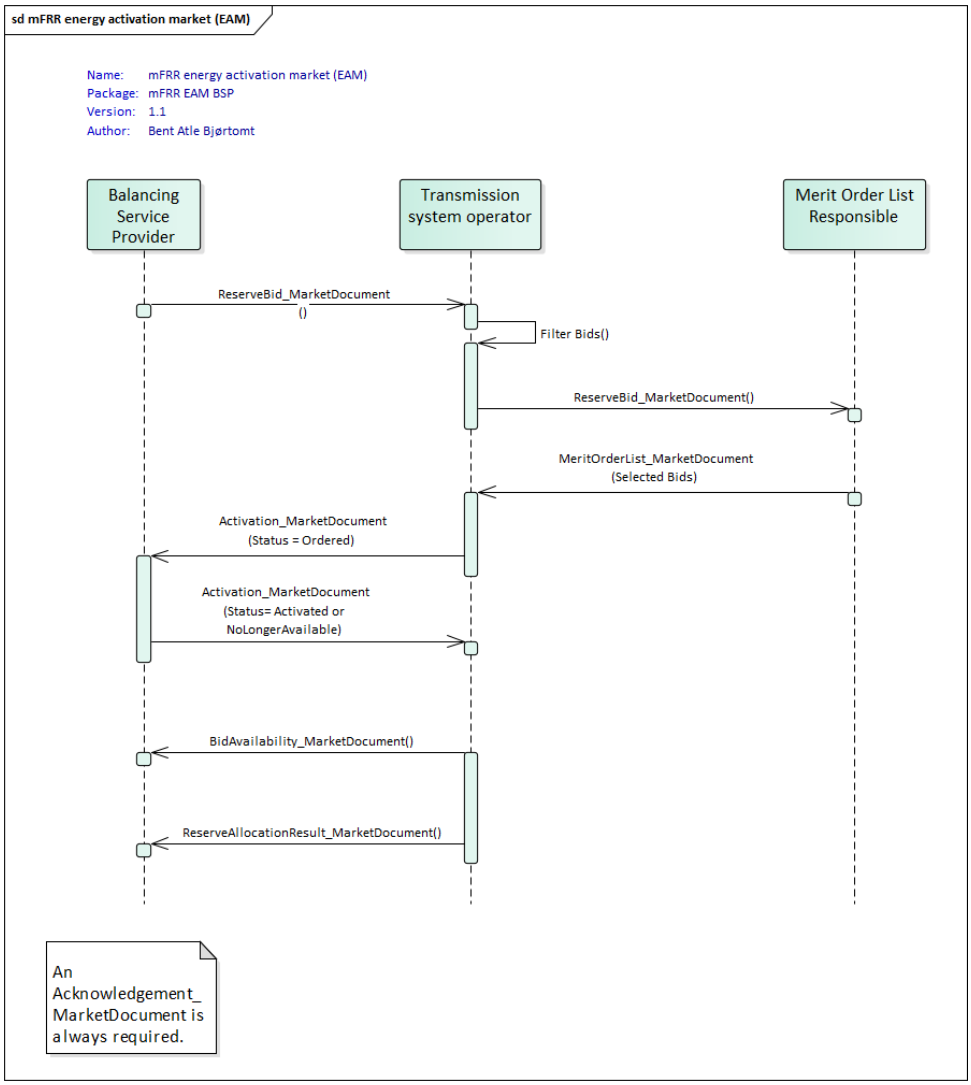
This chapter describes the mFRR EAM process from a BSP perspective with a focus on implementation of message exchanges. In addition to this implementation guide the BSPs need to comply with the relevant national Terms & Conditions, that will be updated accordingly.

3.1 mFRR Business process

This is an overview of the business processes included in the mFRR energy activation market.



3.2 The mFRR energy activation market sequence diagram



The role "Merit Order List Responsible" operates the AOF and is responsible for selecting bids for activation. The role is common Nordic until connecting to MARI.

3.3 Submit bid process

Bids can be submitted in a *ReserveBid_MarketDocument*. A bid is placed in the market when the TSO has provided a positive *Acknowledgement* referring to the bid document.

3.3.1 Stepwise implementation of product characteristics

	Today	**When connecting to MARI**
Currency	EUR	EUR
Maximum/minimum price (EUR/MWh)	10 000/-10 000	15 000/-15 000 At a later stage this will be changed to: 99 999/-99 999
Price granularity (EUR)	0.01	0.01
Minimum bid size (MW)	1 or 10 [1]	1
Maximum bid size (MW)	9 999 (technical limit)	9 999 (technical limit)
Bid granularity (MW)	1	1
Activation granularity (MW)	1 or 0.1 [2]	1
BSP bid time resolution for price and volume (minutes).	15	15
Marginal price resolution (minutes)	15	15
Full Activation Time, FAT (minutes)	12.5 or 15 [3]	12.5

[1] Statnett currently has a minimum bid volume of 10 MW, but allows BSP's to deliver one bid between 5 and 9 MW per resource object, direction and MTU.

[2] The normal activation granularity is 1 MW. For Statnett and Svenska kraftnät: in cases with multiple divisible bids on the same price as the clearing price the bids will be selected pro rata with activation granularity 0.1 MW.

[3] In SVK FAT is 12.5 min. BSPs can get exemption for FAT. FG and EN also has a FAT of 12.5 min, but allows BSPs to apply FAT up to 15 min.

3.3.2 Attribute descriptions

In this chapter bid attributes are described. The attributes are either common to all Nordic countries or specific to certain countries. In order to understand and utilize the bid attributes it is useful to define three *types* of bids:

- *Simple bids* have one price and are valid for one period. Simple bids are either *fully divisible*, *divisible* with a minimum volume or *indivisible.*
- *Complex bids* are composed of a combination of simple bids for one period. The combination can be either an exclusive, inclusive or a multipart bid group.
- *Linked bids* are linked between time periods. E.g. a bid in period 2 is linked to a bid in period 1. The link can be a technical link or a conditional link.

Attributes common for all Nordic countries

The following attributes are standard product attributes and are supported by all TSOs.

Type	Bid attribute	Description
Simple bids One bid, one price	Minimum offered volume CIM: Point.minimum_Quantity.quantity	A minimum volume to be activated for a divisible bid.
	Indivisible Bids CIM: BidTimeSeries.divisible	A standard mFRR balancing energy product bid, which cannot be activated partially. Therefore, the volume of an indivisible bid is always activated altogether.
Complex bids Combination of simple bids	Exclusive Group CIM: BidTimeSeries. exclusiveBidsIdentification	The exclusive bid is a group of bids within the same quarter hour, where solely one of the bids can be activated; hence, the activation of a bid belonging to an exclusive bid excludes the activation of the other bids belonging to the same group.
	Multipart (Parent/child) CIM: BidTimeSeries. multipartBidIdentification	A multipart bid consists of two or more simple bids within the same quarter hour. The bids must have different prices but may have the same or different volumes. A component of an upward multipart bid cannot be activated unless all other components with a lower price have been activated up to their entire offered volumes. A component of a downward multipart bid cannot be activated unless all other components with a higher price have been activated up to their entire offered volumes.
Bids linked in time Between consecutive quarter hours	Conditional bids CIM: BidTimeSeries. Linked_BidTimeSeries	Conditional linking is the linking of bids (only simple standard-product bids) in subsequent quarter hours. Conditional linking is used to adjust the availability of a bid in QH0 (available/non-available) based on the activation outcome of linked bids in previous quarter hours QH-1 and/or QH-2.
	Technically linked bids	Technical linking is the linking of bids (simple or complex) in two or more subsequent quarter hours. Technical linking ensures that a bid in QH0 is not available for clearing if the bid in the previous quarter hour was activated in direct activation (DA). This is

	CIM: BidTimeSeries. linkedBidsIdentification	important in order not to activate the same balancing resource twice.
Activation type	Scheduled, or Scheduled and Direct CIM: BidTimeSeries. standard_MarketProduct. marketProductType	Activation type "Scheduled and Direct" are standard mFRR balancing energy product bid that can be activated at any point of time following the point of scheduled activation of the quarter hour for which the bid is submitted and until the point of scheduled activation of the subsequent quarter hour. Every direct activatable bid is scheduled activatable bid as well. All supported activation types can be used with both simple and complex bids. NB: Denmark has a slightly different model for Direct Activation. See Energinet specific section in chapter 4.

National bid attributes

See chapter 4 for TSO specific information on which attributes are implemented and additional information on usage of the bid attributes.

Bid attribute	**Description**
Maximum duration CIM: BidTimeSeries. maximum_ConstraintDuration.duration	BSPs include information on the technical limitations regarding how long a bid can be activated. This attribute is necessary to allow BSP to send in bids in advance so that they do not need to update bid if they are activated. When using maximum duration, technical linking of the bids must be used. All the linked bids must have the same maximum duration. A bid which supports direct activation cannot have a maximum duration which is less than 30 minutes.
Resting time CIM: BidTimeSeries. resting_ConstraintDuration.duration	The BSP can add information on the required minimum duration between the end time of an activation and a following activation. The resting time applies regardless of the length (number of quarter hours) of the preceding activation. When using resting time, technical linking of the bids must be used. All the linked bids must have the same resting time.
Inclusive bids CIM: BidTimeSeries.inclusiveBidsIdentification)	If one bid is activated, all bids in the complex group (e.g. a resource downstream) must also be activated.
Locational information on bids CIM: BidTimeSeries.registeredResource.mRID	More detailed location on where the resources in the bid are situated, than bidding zone.

Period shift CIM: BidTimeSeries.Reason.code	Bids are activated for a shorter period than the whole Market Time Unit around period shift to resolve structural imbalances.
Faster activation CIM: BidTimeSeries. activation_ConstraintDuration.duration	Bids that can support a FAT that is faster than standard FAT.
Slower activation CIM: BidTimeSeries. activation_ConstraintDuration.duration	Bids that have a FAT that is slower than standard FAT. Slower activation is only allowed for non-standard product (A02) bids.

3.3.3 Bid validation rules

Document level

- The bid document must be submitted by the BSP and received by the TSO after the BEGOT and before the BEGCT of every bid in the document.

All bids:

- Bid size min/max and resolution
- Price resolution
- Time period is within the document time period
- Divisible bids have provided a Minimum offered volume

Exclusive group bid:

- All bid components must have the same market product type
- All bid components must refer to the same market period
- All bid components must belong to the same bidding zone
- None of the bid components can be part of a multipart or inclusive bid

Inclusive group bid:

- All bid components must have the same price
- All bid components must be in the same direction
- All bid components must have the same market product type
- All bid components must refer to the same market period
- All bid components must belong to the same bidding zone
- None of the bid components can be part of an exclusive or multipart bid

Multipart bid:

- All bid components must have different prices
- All bid components must be in the same direction
- All bid components must have the same market product type
- All bid components must refer to the same market period

- All bid components must belong to the same bidding zone
- None of the bid components can be part of an exclusive or inclusive bid

Technical linking:

- Technical linking is allowed for both simple bids and for complex bids.
  All components of a technically linked complex bid (multipart, exclusive or inclusive) must have the same value in the linkedBidIdentification attribute.
- Technical linking of simple bids can be used in combination with conditional linking.
- Technical linking ID must be unique within the MTU. That is, within an MTU only one simple bid or one complex bid (with all its bid components) can use a given technical link ID.
- All bids in a technical link must belong to the same bidding zone.

Conditional linking:

- Conditional linking is only allowed for simple bids. Both the referenced bids and the referencing bid must be simple. For Statnett: conditional linking for complex bids is allowed for period shift (Z04). For Fingrid: Conditional linking may also be used for inclusive bids.
- A bid in QH0 may be linked to maximum three bids in QH-1 and maximum three bids in QH-2
- It is not permitted to link a given bid in QH0 more than once to a given bid in QH-1 or QH-2
- For each link a condition must be associated
- Conditional bids that try to establish a link to a non-existing bid are not allowed. It is the responsibility of a BSP not to place bids with invalid links. For example, if a BSP cancels a bid, which has other bids linked to that bid, those links will become invalid. Any bid with an invalid link will not be considered in the bid selection.
- All bids in a conditional link must belong to the same bidding zone.

Rules for evaluation of availability of conditional linked bids:

- A bid is regarded as activated if the TSO has sent activation order for the bid to the BSP, regardless of the response from the BSP
- A conditionally available bid in MTU0 (i.e. bid with status A65) becomes completely unavailable when at least one of the conditional links indicate unavailability due to the outcome of the linked bid in MTU-1 or MTU-2
- A conditionally available bid in MTU0 becomes unavailable for direct activation when at least one of the conditional links indicate unavailability for direct activation due to the outcome of the linked bid in MTU-1 or MTU-2
- A conditionally unavailable bid in MTU0 (i.e. bid with status A66) becomes available when at least one of the conditional links indicate availability due to the outcome of the linked bid in MTU-1 or MTU-2
- A conditionally unavailable bid in MTU0 becomes available for direct activation when at least one of the conditional links indicate availability for direct activation due to the outcome of the linked bid in MTU-1 or MTU-2
- A bid that is activated for period shift is regarded as *activated subject to SA* (status A55, A59, A58, A67, A69, A72)

Rules for updating bids:

- A bid cannot be changed from simple bid to complex bid (exclusive, inclusive or multipart). Instead, the original bid must be cancelled, and a new bid submitted.
- A complex bid cannot be partially cancelled. All bids in a complex bid must be cancelled; or a bid must be converted to a simple bid and cancelled, then the rest of the complex bid will remain.

- The time period of a bid cannot be changed. If a bid has been submitted with incorrect time period, the bid must be cancelled and a new bid (with new bid identification) must be submitted for the correct time period.
- The resource object of a bid cannot be changed. If a bid has been submitted with incorrect resource object, the bid must be cancelled and a new bid (with new bid identification) must be submitted for the correct resource object.
- Each TSO may decide not to allow changing of the market product type. Please see chapter 4 TSO specific information, Bid submission.

See chapter 5.6 for general rules on updating and cancellation of bids.

3.3.4 Bid validation rules for non-standard product bids

The following bid attributes are allowed for non-standard product bids (marketProductType = A02):

- Simple bids, divisible or indivisible
- Technical linking: all bid components must have the same market product type
- Maximum duration, Resting time
- Activation time

Non-standard product bids cannot use complex bid groups or conditional linking.

3.3.5 Bid acknowledgement

Each time a BSP submits a Reserve bid document to the TSO, the TSO will return an Acknowledgement document. If all bids in the bid document are valid a positive Acknowledgement will be returned. If one or more of the bids in the bid document are invalid, according to the bid validation rules, a negative Acknowledgement will be returned and all bids in the document will be rejected. The negative Acknowledgement will contain error codes and text that indicate the reason for why the bids are not valid.

If acknowledgement is not received, the BSP should interpret the missing acknowledgement as a problem. The BSP should check the status of submitted bids by using the web interface provided by the TSO and set bids to corresponding status in own system.

Please see chapter 4 for TSO specific information about the bid submission process (e.g. cut-off time and handling of delayed acknowledgements).

3.4 Activate bid process

The TSO sends activation orders for selected bids to the respective BSPs every 15 minutes for scheduled activation. Whenever there is a sudden need for activation, the TSO sends an activation order for selected bids for direct activation. Scheduled activation orders cover only one period of 15 minutes. Direct activation orders cover the remaining of the 15-minute period where the activation starts and the next 15-minute period. Denmark has a slightly different model for direct activation (see the Energinet section in chapter 4 for more information).

The activation process should be automated as much as possible, and ideally fully automated, to ensure timeliness and accuracy of activations.

3.4.1 Activation order message

The TSO orders activation of bids by sending an *Activation_MarketDocument* to the BSP. An activation document may contain activation orders for multiple bids.

The BSP is accountable[2] for the activation(s) once the order document is received by the ECP-endpoint of the BSP and can immediately start preparing for ramp up of the activation(s).

The BSP sends an *Acknowledgement_MarketDocument* to the TSO to confirm that the activation order document has been received.

3.4.2 Activation response message

The BSP then sends an activation response message to the TSO to confirm that each of the activation orders will be fulfilled or cannot be fulfilled if the resource has become unavailable for activation.

The activation response message is sent as an *Activation_MarketDocument* where all the activation order time series from the activation order document are included.

For each activation order time series that will be fulfilled, the Status must be "*Activated*". If an activation order time series cannot be fulfilled, the *Status* of that timeseries must be "*Unavailable*" and a reason should be provided in the *Reason*-element.

The BSP is required to return the activation response message to the TSO within 2 minutes, measured from the time the activation order document is sent from the TSO until the time the response message is received by the TSO. However, activation response messages are able to be received by the TSO up to 15 min, measured from the time the activation order document is sent from the TSO until the time the response message is received by the TSO. See table below for TSO specific handling of late responses.

If late responses happen regularly, the BSP must take measures to improve the timeliness of activation responses to comply with the response time requirement.

The TSO sends an *Acknowledgement_MarketDocument* to the BSP to confirm that the activation response message has been received.

The BSP may send an updated activation response message to change status of one or more time series from "*Activated*" to "*Unavailable*", but not vice versa.

[2] In Denmark, if the BSP responds with status "Unavailable", the BSP is no longer accountable, see text below.

Accountability of activations in Finland, Norway and Sweden:

The BSP is accountable for the activation regardless of the activation response. That is, the BSP is accountable both in the case of status "*Activated*" and status "*Unavailable*", as well as in the case of late response or no response

Accountability of activations in Denmark:

If the TSO receives an activation response message with status "*Unavailable"* within the response time limit and the reason for unavailability is acceptable, the BSP is no longer accountable for the activation. If the TSO receives an activation response later than 2 minutes after sending the activation order, the response will be rejected with a negative *Acknowledgement*.

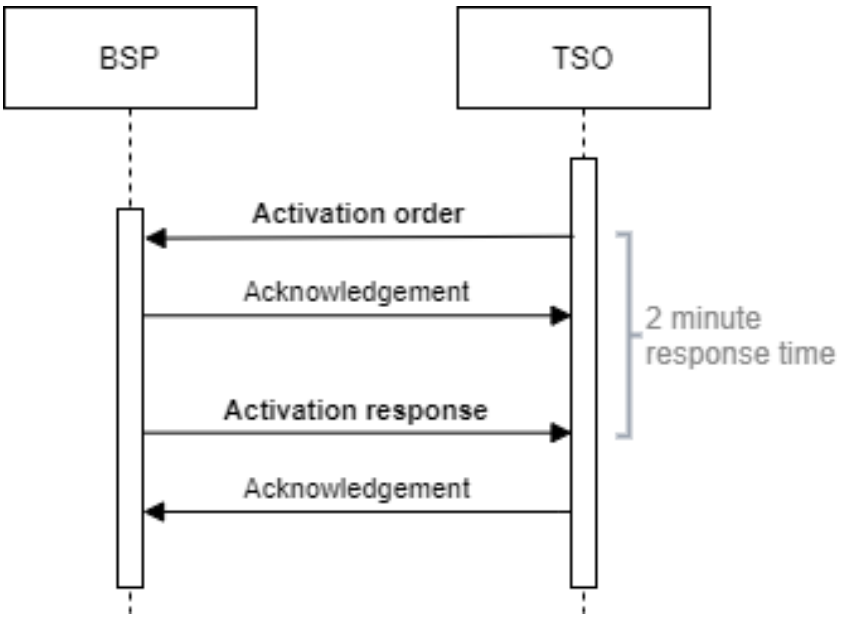


Figure 1 Activation ordering sequence diagram

Examples of activation responses from BSP:

Finland, Norway and Sweden:

Activation Response: activation time series status	When	What should BSP do	BSP accountable for activation?
Activated	< 2 min	BSP should activate	Yes
Unavailable	< 2 min	BSP should NOT activate	Yes
Activated	> 2 min	BSP should activate	Yes
Unavailable	> 2 min	BSP should NOT activate	Yes
<no response>		BSP should activate	Yes
Late response (> 2 min) *Activated* or *Unavailable*		BSP should activate if Activated	Yes
Updated from *Activated* to *Unavailable*	< 2 min or > 2 min	BSP should NOT activate	Yes
Updated from *Unavailable to Activated*	< 2 min or > 2 min	BSP should NOT activate This change of status is not allowed. Acknowledgement from TSO will have the status "Message fully rejected".	Yes

Denmark:

Activation Response: activation time series status	When	What should BSP do	BSP accountable for activation?
*Activated**	< 2 min	BSP should activate	Yes
*Unavailable**	< 2 min	BSP should NOT activate	No
Activated	> 2 min	BSP should activate (Acknowledgement from TSO will have the status "Message fully rejected".)	Yes
Unavailable	> 2 min	BSP should activate (Acknowledgement from TSO will have the status "Message fully rejected".)	Yes
<no response>		BSP should activate	Yes

* BSP may update the activation response within the 2-minute time limit from Activated to Unavailable, but not vice versa.

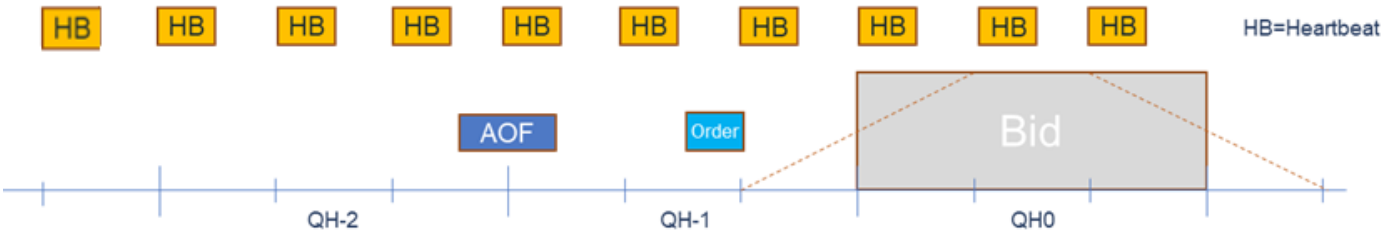
3.4.3 Activation heartbeat

Due to the high criticality of the activation process it is necessary to implement a way to monitor the status of the automated activation process and quickly and accurately detect issues.

The monitoring system is based on periodic heartbeat activations messages. A heartbeat activation is an "empty" activation order that BSPs shall receive, process and respond to like a real activation order. The processing of the order should be done by the same systems as for real activation orders. But the heartbeat activation order should not result in any real balancing energy activation.

The BSP should monitor the activation ordering process and correct issues if there is a problem with any of the activation messages (both heartbeats and real orders).

It is important that the BSP responds correctly and timely to both heartbeats and real activation orders. If the BSP does not respond to the heartbeat the TSO may consider the BSP to be unavailable for activation.



Heartbeat activation order will be sent for every 5-minute period to BSPs participating in mFRR EAM. (Statnett sends heartbeat at different time intervals, see 4.3.2 for more details.)

The heartbeat activation order will contain:

- order_ MarketDocument.mRID = unique order id
- A "dummy" time series with
    - TimeSeries.mRID = "ACTIVATION_HEARTBEAT"
    - acquiring_Domain.mRID = control area (bidding zone for a normal activation)
    - registeredResource.mRID = "DUMMY_RESOURCE"
    - quantity = 0

Monitoring of activation heartbeat

The BSP should monitor the entire activation ordering process including the ECP endpoint and identify and correct issues if there is a problem with activation messages for heartbeat or real orders. Please refer to chapter 4 for TSO specific information about heartbeat and handling of issues with the activation process. Note that the heartbeat process is not implemented in Denmark and Finland.

3.5 Publication and reporting of market results

3.5.1 Publication of market prices and volumes

Market prices and volumes for the mFRR energy activation market will be published on the ENTSO-E Transparency platform (transparency.entsoe.eu) as well as the Nordic Transparency platform NBiS (www.nucs.net).

3.5.2 Activated bids per BSP

A report of each BSP's activated bids will be sent from the TSO to the BSP after each ISP (Imbalance settlement period) in a *ReserveAllocationResult_MarketDocument*. In Sweden and Finland the report will be sent after each ISP (Imbalance settlement period). In Norway the report will be sent after each ISP, in addition to once per day (around 01:20 CET). In Denmark the report will be sent once per day (around 04:20 CET). Please see Appendix 1 for further details on the message document.

3.5.3 Bid availability report

Submitted bids must be available for activation ordering. If bids, for any reason, become unavailable for activation before BEGCT, the BSP must cancel the bids. In cases where bids become unavailable for activation after BEGCT, the BSP must inform the TSO as quickly as possible by phone.

The TSO will for each market period assess the availability of activation for each bid.

The TSO can mark a bid unavailable for different reasons, e.g.:

- local congestions
- unavailability of the BSP electronic ordering process
- to meet any constraints specified in the bid

The TSO will inform the BSP about bids that have been marked unavailable for activation by sending a *BidAvailability_MarketDocument*. The report will be sent after each ISP. Please see Appendix 1 for further details on the message document.

4 TSO specific information

4.1 Energinet

4.1.1 Submit bid process

Minimum bid volume

Energinet will allow a minimum bid volume of 1 MW from go-live of mFRR EAM.

National bid attributes

Bid attribute	**Implemented**
Maximum duration	Yes
Resting time	Yes
Inclusive bids	No
Locational information on bids	Yes (Locational information will be a list of substations indicating where the bid is feeding into the grid)
Period shift	No
Faster activation	No
Slower activation	Yes (Bids with a FAT slower than the standard product will not be forwarded to the AOF, but may be activated locally when circumstances call for it)
Activation type	Only activation type *Scheduled* is allowed. Direct activation is not allowed until MARI.

Conditional bids

Conditional bid types A71 (= Available for DA if linked bid subject to DA), and A72 (= Available for DA if linked bid subject to SA) are not supported.

Rules for updating bids

The market product type of a bid cannot be changed. If a bid has been submitted with incorrect market product type the bid must be cancelled and a new bid (with new bid identification) must be submitted for the correct market product type.

Communication channel

Communication between BRP and Energinet is CIM-based and via ECP/EDX.

Fallback for bid submission and/or activation process

Energinet will continue to use the concept of Emergency Volumes as fallback when the automated activation process fails.

If bid submission via ECP fails Energinet will support manual bid submission through the BRP Self Service Portal. Information about activated bids is also available through the BRP Self Service Portal.

4.1.2 Activate bid process

Heartbeat

Energinet will not implement the heartbeat messaging process for Go-live.

Special model for Direct Activation

Bids available for direct activation (referred to as the direct activatable bid) must have a technical link to another bid in the next quarter hour (referred to as the linked bid). When a bid is direct activated it will only be activated for the rest of the current quarter hour – not also for the next quarter hour, which is the expected behaviour in the ENTSO-E model for direct activation. Instead the linked bid will be activated for the next quarter. So the BSP is guaranteed activation for the rest of the current quarter and the complete next quarter – as in the ENTSO-E model – but it is two different bids being activated in the current and next quarter. Bids for direct activation most comply with the following rules:

- Bids available for direct activation must be marked as direct activatable (market product type A07)
- The direct activatable bid can have a technical link to a bid in the next quarter hour. If the link is present the bid in the next quarter hour will be activated, if the bid in the current quarater hour is direct activated.
- The direct activatable bid and the linked bid can have different price and volume.
- If the linked bid has a larger volume than the direct activatable bid, then the linked bid has to be divisible.
- The direct activatable bid will set/receive the marginal price for the current quarter while the linked bid will set/receive the marginal price for the next quarter hour.

4.1.3 TSO contact information

Any questions and concerns regarding this implementation guide, and the follow-up of the implementation in Energinet, can be directed to: electricitymarket@energinet.dk

4.2 Fingrid

4.2.1 Submit bid process

The Balancing energy gate opening time (BEGOT) for BSPs is 30 days. The preferred channel for bid submission is sending a reserve bid document via ECP/EDX[3].

Maximum number of bids per message is 2000.

[3] https://www.fingrid.fi/en/electricity-market/reserves_and_balancing/reserve-trading-and-information-exchange/ecp-messaging2/

National bid attributes

Bid attribute	Planned to be implemented
Maximum duration	No
Resting time	No
Inclusive bids	Yes
Locational information on bids	Yes (Locational information will be related to the reserve resources)
Period shift	No
Faster activation	No
Slower activation	No

Conditional bids

Conditional bid types A71 (= Available for DA if linked bid subject to DA), and A72 (= Available for DA if linked bid subject to SA) are not supported.

Inclusive bids may also be added as conditionally available or unavailable. All parts of an inclusive bid must have the same conditional links in the same order, and the linked bids in previous MTUs must be either inclusive bids or simple bids. Conditional linking to parts of an inclusive bid in previous MTU is not allowed.

To conditionally link an inclusive bid to a simple bid in a previous MTU, the *LinkedBid_TimeSeries.mRID* field value of each part of the inclusive bid should match the *Bid_TimeSeries.mRID* field value of the simple bid.

To conditionally link an inclusive bid to another inclusive bid in a previous MTU, the *LinkedBid_TimeSeries.mRID* field value of each part of the conditionally available inclusive bid should match the *inclusiveBidsIdentification* field value of the inclusive bid in the previous MTU.

Rules for updating bids

The market product type of a simple bid may be changed between A05 and A07.

Voluntary Bid Identification

Fingrid allows for BSPs to add a secondary Bid Identification to the bids. This is done using the Reason – attribute in the bid message. This secondary Bid ID can be plain language and does not have to be in any specific format such as UUID. This bid ID is allowed so that the BSP can more easily recognize the bid based on the identification. If a bid has a voluntary bid ID, it is also added to the activation message. More detailed information about the usage of the Reason-attribute is presented in the dependency matrices.

Alternative channel for bid submission

Additionally, bids may be submitted manually in TSO’s MMS (Vaksi Web). More detailed description of manual bid submission can be found in Fingrid's reserve trading and information exchange guidelines (Fingridin reservikaupankäynti- ja tiedonvaihto-ohje). Sending conditionally linked bids will not be possible via Vaksi Web, and there are other limitations for technical linking and complex bids in Vaksi Web.

4.2.2 Activate bid process

Notification of activation orders via SCADA

A Back-up channel for electronic activation which can be used simultaneously with ECP, is a notification in TSO's MMS (Vaksi Web) and an alert sent from TSO's SCADA to the BSP's SCADA via ELCOM. This back-up process requires a manual confirmation in Vaksi Web by the BSP.

Rounding of activation volumes

If a bid is activated party (0,1 MW resolution), Fingrid rounds the volume to be activated to the next full MW. In the case of aggregated bids, if the bid is activated party and this results in an activation on 0,01 MW resolution, the volume to be activated is rounded to 0,1 MW resolution.

Heartbeat

Fingrid has not implemented the heartbeat messaging process.

4.2.3 TSO contact information

Any questions and concerns regarding this implementation guide, and the follow-up of the implementation in Fingrid, can be directed to: reservit@fingrid.fi

4.3 Statnett

4.3.1 Submit bid process

National bid attributes

Bid attribute	**Implemented**
Maximum duration	Yes
Resting time	Yes
Inclusive bids	Yes
Locational information on bids	Yes
Period shift	Yes
Faster activation	Yes
Slower activation	No
Non-standard activation – mFRR-D	Yes
Non-standard activation – Other	Yes

Rules for updating bids

The market product type of a simple bid may be changed between A05 and A07.

Cut-off time

There is a 15-minute cut-off time for bid submission. Bid documents older than 15 minutes will not be processed. No negative acknowledgement will be sent to the BSP to avoid messages queueing up when the system is resuming message processing after an incident.

Period shift bids

In standard mFRR product bids the BSP can indicate in the *Reason*-element that the bid can be used for period shift if it is not selected for scheduled activation. The Reason code will also specify whether the bid can be used for period shift at the beginning of the quarter or the end of the quarter, i.e. the first or the last five minutes of the MTU.

Conditional linking can be used to avoid activation both before and after a quarter shift. A special conditional linking status may be used to specify the availability for period shift bids (Z04). This conditional linking status also allows linking to a component in a multipart bid or to the group identifier of a multipart, exclusive or inclusive bid. This is in contrast to all other conditional linking which only supports linking between simple bids.

The use of conditional linking is recommended for all BSPs delivering period shift bids.

If a BSP needs to provide period shift but does not want to submit a standard mFRR product bid the market product type "Period shift only" must be used. Period shift only bids must be simple indivisible bids.

Non standard bids

Statnett supports two types of non-standard bids: mFRR-D and Other non-standard. These bids can only be activated manually by the operator when needed. Non-standard bids must be submitted as simple, non-standard, technically linked bids. Rules of technical linking must be followed, e.g. technically linked non-standard bids must have same FAT. Default FAT will be used for non-standard bids which don't have a FAT defined. Default FAT values are 5 minutes for mFRR-D and 12,5 minutes for Other non-standard.

Non-standard bids have market product type A02, and the non-standard type is specified in the reason code. (See Appendix 1 for more details.)

Disturbance reserve (mFRR-D) bids

A BSP that participates in the local Statnett balancing capacity procurement of mFRR-D disturbance reserves shall deliver energy activation bids according to mFRR-D commitment. mFRR-D energy activation bids shall be fully activated within 15 minutes. The mFRR-D energy activation bids shall follow all bidding rules in the mFRR EAM unless stated otherwise in the mFRR-D terms and conditions. See dependency matrix in chapter 6.1 for further details.

Other non-standard bids

Other non-standard bids can have a FAT longer than 15 minutes. Other non-standard bids can be activated either electronically or by phone.

Alternative channel for bid submission

The recommended method for bid submission is by sending a reserve bid document via ECP. Alternatively, bids may be submitted in the manual user interface FiftyWeb (fiftyweb.statnett.no).

4.3.2 Activate bid process

Faster activation

Faster activation can be done for bids with activation time (CIM:*activation_ConstraintDuration.duration*) shorter than the minimum requirement for the standard product. When circumstances call for it, the TSO can order activation of such bids on a shorter notice.

For faster activation the TSO will respect the bid's *activation time* (FAT) and will not request activation on shorter notice than the activation time of the bid. For faster activation the *preparation time* (PT) is 1 minute. The last possible ordering time for faster activation is (FAT–PT)/2+PT minutes before the middle of the ramp.

Deactivation

The TSO can also order deactivation of bids, both for standard product bids with standard FAT and faster bids. When ordering earlier deactivation, the TSO will send an updated activation request with the same order identification (*order_ MarketDocument.mRID*) and the same bid identification for the time series, and where the time period of the activation ends earlier than in the original activation request.

Preparation time of 1 minute and ramping time of 4 minutes is always assumed for deactivation. The ordering time for deactivation is consequently always 3 minutes before the middle of the deactivation ramp.

Period shift activation

Period shift activations will be ordered periodically every 15 minutes based on the amount of structural imbalances around the period shift. All period shift activations for a given quarter hour will be ordered 7,5 minutes before the start of the quarter hour.

Each period shift activation will have a duration of 5 minutes in either the beginning of the quarter hour or in the end of the quarter hour. The period shift activation will be ordered using an *Activation_MarketDocument*.

Non-standard bids activation

Activation of mFRR-D bids will be ordered using the Activation Document and the code for Disturbance reserve.

Activation of Other non-standard bids will be ordered using the Activation Document with the code for Other non-standard for BSPs who support electronic ordering. Activation ordering of the Other non-standard product will be done by telephone for BSPs who do not support electronic ordering. Note that electronic vs. manual activation is configured on resource object level in the grid model at Statnett. BSP must contact Statnett if changes are needed.

Block profile is assumed for activation of non-standard bids (i.e. not ramped activation).

When Statnett activates a non-standard bid immediately, the start time of the activation is based on the activation time of the first bid. The activation end time of the first bid will be the end of the next MTU, similarly to direct activation of standard bids. Statnett will not activate a non-standard bid immediately if there is no technically linked bid in the next MTU (or if the latter has a different price, volume or resource object).

When Statnett registers a planned activation of a non-standard bid ahead of time, the activation will be ordered according to FAT and the start time of the activation is the beginning of the MTU of the bid. The activation end time of this bid will be the end of the MTU of the bid, similarly to scheduled activation of standard bids.

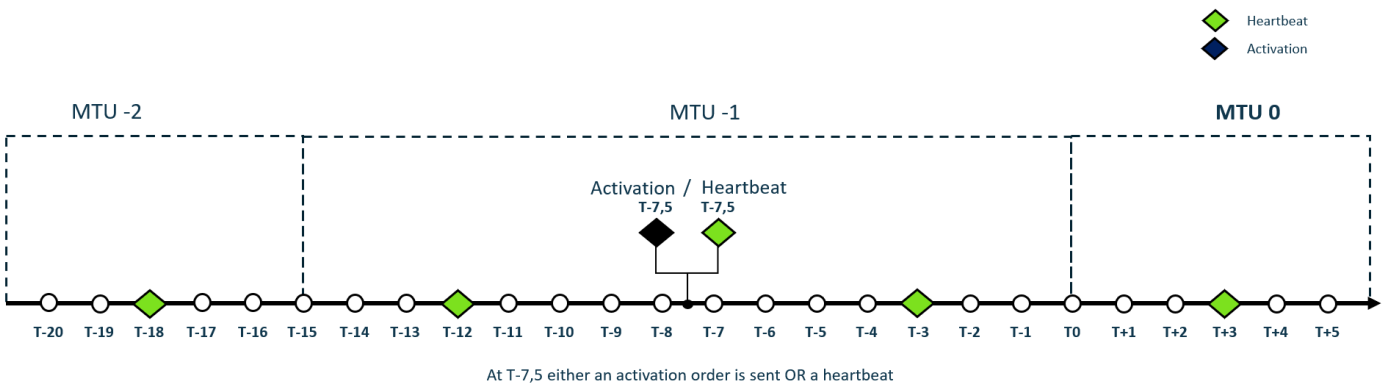
When continuing an ongoing non-standard activation, the activation of succeeding bids (with same technical link) are ordered at T-7,5 similarly to scheduled activation of standard bids.

Alternative channel for activation orders

The alternative channel for activation orders when electronic ordering via ECP is not available is manual communication by telephone.

Heartbeat

Statnett sends heartbeat two or three times per quarter. A heartbeat is sent at T-12 and T-3, and activation orders are sent at T-7,5. If Statnett doesn't order an activation at T-7,5 then a heartbeat is sent instead.



Note that if Statnett only orders activation of non-standard bids at T-7,5, then both activation order and heartbeat will be sent at T-7,5.

The expectation from the BSP's perspective is to always receive a message at T-7,5 (activation order or heartbeat). If a BSP has an ongoing system activation and doesn't receive any message at T-7,5, then the system activation must continue until a heartbeat is received at T-7,5 for a later MTU or Statnett orders the activation to stop over telephone.

BSP's can use 30 seconds as a guideline for technical limit when assessing whether a message is received or not. If a message is expected at T-7,5 and is not received within 30 seconds, the BSP can act as if the message has not been received.

When Statnett receives no heartbeat response within 2 minutes from a BSP, all bids from the BSP will be set to unavailable for the following MTU's:

Heartbeat	**MTU-1**	**MTU 0 (starting at T)**	**MTU 1**
T-18	Bids set unavailable	Bids set unavailable	
T-12	Bids set unavailable	Bids set unavailable	
T-7,5		Bids set unavailable	Bids set unavailable
T-3		Bids set unavailable	Bids set unavailable

When the BSP starts responding to heartbeat again, all bids that were set to unavailable due to missing heartbeat will be set available again for the current and two upcoming MTU's.

Statnett also accepts heartbeat responses with status A11 Unavailable, and interprets this is a missing heartbeat response.

4.3.3 TSO contact information

Any questions and concerns regarding this implementation guide, and the follow-up of the implementation in Norway, can be directed to: BSP@statnett.no.

4.4 Svenska kraftnät

4.4.1 Submit bid process

Minimum bid volume

Svk allows minimum bid size of 1 MW.

National bid attributes

Bid attribute	**Implemented**
Maximum duration	Yes
Resting time	Yes
Inclusive bids	No
Locational information on bids	Yes
Period shift	No
Faster activation	No
Slower activation	No
Non-standard activation - *Överbelastningshantering vid störning*	Yes

Rules for updating bids

The market product type of a simple bid may be changed between A05 and A07.

Cut-off time

There is a 6-minute cut-off time for bid submission. Bid documents older than 6 minutes will not be processed. No negative acknowledgement will be sent to the BSP to avoid messages queueing up when the system is resuming message processing after an incident.

Överbelastningshantering vid störning

A participant in the local procurement of resources for redispach with the pupuse to handle overloads in the event of disturbance, shall submit energy activation bids according to their procurement commitment. The bids shall be submitted as a simple, non-standard, indivisible, technically linked bid, with a defined activation time and reason code (time series) and shall follow all bidding rules unless stated otherwise in the *överbelastningshantering - störning* terms and conditions. See dependency matrix in chapter 6.1 for further details.

Alternative channel for bid submission

The recommended method for bid submission is by sending a reserve bid document via ECP. Alternatively, bids may be submitted in the manual user interface FiftyWeb.

Bids can either be uploaded through an XML-file where all supported bid attributes are accepted. Simple bids can also be added individually in the manual user interface. When adding bids this way a bid-ID is generated for each bid. The generated bid-id can be found and retrieved in the overview of submitted bids.

4.4.2 Activate bid process

Received activation bid documents need to be validated on timeseries mRID to ensure that the activation messages correspond to previously submitted bids.

If validation is not correct, BSP reject the activation and call BTI.

The BSP is allowed to respond to one activation message with multiple activation responses, i.e. BSP do not have to respond to each activation request with one activation response, but can split the response into several different messages.

Non-standard product activation

No electronic ordering for non-standard products. Activation of *överbelastningshantering vid störning* is described in terms and conditions for the local procurement. In Reserve allocation result document the activation is indicated in the Reason-element.

Alternative channel for activation orders

The alternative channel for activation orders is telephone. When telephone is used for activation a volume per regulation object is communicated to the BSP.

Heartbeat

Heartbeat activation order will be sent from TSO to BSP at xx:02, xx:07, xx:12 and so on to allow for the BSPs response time of 2 minutes. The heartbeat will be sent regardless of whether the BSP has submitted bids or not.

When no response to heartbeat activation is received from a BSP all bids for upcoming two quarters will be set to unavailable. When the BSP starts to respond to heartbeat activation again, the bids will be considered available again.

If no heartbeat activation message is received from the TSO, there is a problem with the communication and the BSP should start troubleshooting.

4.4.3 TSO contact information

Any questions and concerns regarding this implementation guide, and the follow-up of the implementation in Sweden, can be directed to: mfrr@svk.se.

5 General rules for messaging

5.1 Date and time

Date and Times are based on ENTSO-E Standards and shall be expressed in universal time (UTC+0) in compliance with ISO 8601 as YYYY-MM-DDThh:mm:ssZ. The last 'Z' stands for Zero and indicates UTC+0.

5.2 Daylight saving time

The full day is expressed as follows in UTC+0:

- A day is from 23:00 to 23:00 during winter time.
- A day is from 22:00 to 22:00 during summer time (daylight saving time).
- When changing from winter time to summer time there are 23 hours in the time series (from 23:00 to 22:00).
- When changing from summer time to winter time there are 25 hours in the time series (from 22:00 to 23:00).

5.3 Unique identifiers – UUID

Unique identifiers should be proper UUID v4 as per RFC 4122.

5.4 Document identification and revision number

The document identification must be unique over time for the sender in question and should be a proper UUID. The document identification will then not have any significant meaning. The revision number is not used and shall always be equal to '1'.

The same document identification UUID should be used in the BA Message ID in the ECP header to allow easier log tracing of messages.

5.5 Message size limit

The maximum allowed number of time series in a message is 4000.

If a BSP wants to submit more bids than this limit the bids must be split into several messages. To avoid risk of rejected bids, it is advised not to split complex bids or conditionally linked bids across multiple messages. If linked bids are sent in multiple messages the BSP must make sure bids for preceding MTUs are submitted and acknowledged before bids for the subsequent MTUs are sent.

The upper limit of number of bid messages sent from a BSP during one MTU is 100.

The total number of bid time series sent within an MTU should be kept at a reasonable level.

5.6 Update and cancellation principles

To update or cancel time series previously sent a new document is sent with the following information:

- A new unique document mRID (document identification)
- Fixed revision number (always equal to '1')

- A newer created date-time than the previously sent document
- The original bid timeseries mRID must always be used to identify the bid to be updated. Any bids with a new bid time series mRID, is considered as a new bid

For *ReserveBid_MarketDocument* and *Activation_MarketDocument* updates are done by sending the affected time series with new data. Cancellation of time series is done by sending value 0 for quantity. To ensure update of the correct time series the bid identification of the original time series must be used.

To update bids for upcoming MTUs only the updated bids should be sent in a new bid message. There is no need to resend unchanged bids.

It is not allowed to include bids for MTUs which are closed for bidding in a bid message, ref. 3.3.3 Bid validation rules.

For *BidAvailability_MarketDocument* and *ReserveAllocationResult_MarketDocument* a new document completely replaces a previously sent document for the same *period.* Cancellation of time series is thus done by omitting the time series in the new document.

5.7 Acknowledgement

For each electronic data interchange defined in this document, an acknowledgement document, as defined in IEC 62325-451-1, should be generated either accepting the whole received document or rejecting it completely.

- All received messages shall be validated at both a technical and an application level.
- The Acknowledgement document shall be used as the tool to exchange errors.
- At a technical level, the reason code in the acknowledgement document shall reflect the error type, and the reason text should have a reference to the element containing the error.
- At the application level, the reason code shall reflect the error type and the reason text should reflect the appropriate business rule that is broken.
- An Acknowledgement document may contain many reason objects, to reflect multiple errors in the received document.

5.8 Energy communication platform

All the messages described in this document shall be communicated over the Energy communication platform (ECP) provided by each TSO.

Implementation guide for ECP can be requested from the respective TSO.

6 Appendix 1 – Document attributes and dependencies

This chapter provides the attributes and dependencies for the documents used to support the mFRR energy activation market.

The following classifications are used for the attributes:

- M – Must be used for the document in the process described in this guide
- D – Must be used if a defined condition is met
- O – Optional, can be used

6.1 Bid document – Attributes and dependencies

ReserveBid_MarketDocument		iec62325-451-7-reservebiddocument.xsd – version 7.4 Denmark currently uses a specific version of the schema, please see local implementation guide.
mRID	M	Unique identification of the document. Proper UUID is required.
revisionNumber	M	Constant value of **1**
Type	M	**A37** - Reserve bid document
process.processType	M	**A47** – Manual frequency restoration reserve
sender_MarketParticipant.mRID	M	Identification of the party sending the document See 6.6 for supported coding schemes.
sender_MarketParticipant.marketRole.type	M	**A46 -** Balancing Service Provider (BSP) In Denmark BRPs act as BSP and must use the BSP-role.
receiver_MarketParticipant.mRID	M	Identification of the party receiving the document. One of: - Energinet.dk - Fingrid - Statnett - Svenska kraftnät **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) Start: YYYY-MM-DDTHH:MMZ End: YYYY-MM-DDTHH:MMZ
domain.mRID	M	EIC identification of the Control Area Denmark: **10Y1001A1001A796** Finland: **10YFI-1--------U** Norway: **10YNO-0--------C** Sweden: **10YSE-1--------K** **A01** - EIC coding scheme
subject_MarketParticipant.mRID	M	Identification of the party responsible for the bid See 6.6 for supported coding schemes.
subject_MarketParticipant.marketRole.type	M	**A46 -** Balancing Service Provider (BSP)

BidTimeSeries		
mRID	M	Unique identification of the bid. Proper UUID is required.
auction.mRID	O	Constant value of MFRR_ENERGY_ACTIVATION_MARKET
businessType	M	**B74 –** Offer
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 resource is located. Associated multipart, linked, conditional, inclusive and exclusive bids must be associated with the same bidding zone.
		A01 - EIC coding scheme
quantity_Measurement_Unit.name	M	**MAW** – megawatt
currency_Unit.name	M	**EUR** – euro
Divisible	M	**A01** = Yes - quantity may be reduced to the minimum bid size by increments of 1 MW **A02** = No - no reduction possible on the quantity, the bid is indivisible For non-standard *överbelastningshantering - störning* bids in Sweden: A02 must be used
linkedBidsIdentification	O	Unique identification used to associate technically linked bids. Proper UUID is required. Not used if bid is not technically linked. For non-standard *överbelastningshantering - störning* bids in Sweden all bids for the same regulation object must be technically linked
multipartBidIdentification	O	Unique identification used to associate multipart bids. Proper UUID is required. If bid with flowDirection.direction=A01 (Up) is accepted, then all associated bids with inferior price must also be accepted. If bid with flowDirection.direction=A02 (Down) is

		accepted, then all associated bids with superior price must also be accepted. Not used if bid is not multipart.
exclusiveBidsIdentification	O	Unique identification used to associate exclusive group bids. Proper UUID is required. If one bid is selected, then none of the other with the same exclusiveBidsIdentification can be selected. Not used if bid is not part of exclusive group bid.
inclusiveBidsIdentification	O	Optional for bids in Norway and Finland. Unique identification used to associate inclusive group bids. Proper UUID is required. All or none of the bids with the same “bid family” identification must be selected. For Finland this is used for aggregated bids. The same proportion of each bid is selected.
Status	M	**A06** – Available For conditionally linked bids, having one or several instances of Linked BidTimeseries: **A65** – Conditionally available **A66** – Conditionally unavailable
registeredResource.mRID	M	EIC or national code for the resource (regulation object). *For DK1 and DK2:* List of geotags indicating where the bid feeds into the grid. Comma separated list of 400kV, 220kV, 150kV (DK1) or 132kV (DK2) substations. If the bid feeds into different points in the grid (as with portfolio-based bids), all relevant substations must be provided. All substations in the list must be in the same bidding zone as the bid itself. An empty geotag list (an empty string) is allowed and will be interpreted as “all geotags”. *For Statnett:*

		The resource can either be a resource object or generator, and is specified with national market code (NOKG code for resource object and NOG code for generator).
flowDirection.direction	M	**A01** - Up **A02** - Down
energyPrice_Measurement_Unit.name	M	**MWH -** Megawatt hours.
activation_ConstraintDuration.duration	O	Activation time - The minimum time for full activation of the physical resource including preparation time and ramping time. For bids that have a standard FAT of 12,5 min (or 15 min in *Automated operation)* activation time can be left blank or omitted. *Applicable only to bids in Norway:* For bids that can be activated faster than 12,5 minutes the activation time should be specified and should assume a preparation time of 1 minute. E.g. PT3M (if ramping time is 2 min) PT5M (if ramping time is 4 min) PT10M (if ramping time is 9 min) *Applicable only to slower activation bids (in Denmark :* For bids with slower full activation time than 12,5 minutes (15 minutes from Go-live mFRR EAM) the activation time must be specified. *Applicable only to non-standard överbelastningshantering - störning bids in Sweden:* For bids in *överbelastningshantering - störning* procurment the activation time must be specified. See technical requirements in procurement.
resting_ConstraintDuration.duration	O	*Applicable to bids in Norway, Sweden, Denmark"* Resting time for the resource object after activation, in number of minutes, divisible by 15. E.g.: PT45M, PT60M, PT90M. Requires technical linking of bids.

		If no maximum duration time is specified, resting time for the resource object will be triggered when it has been activated a given MTU and isn't activated the following MTU. For bids in *överbelastningshantering - störning* procurement: see technical requirements in procurement.
maximum_ConstraintDuration.duration	O	*Applicable to bids in Norway, Sweden, Denmark* Maximum duration of activation for the resource object, in number of minutes, divisible by 15. E.g.: PT45M, PT60M, PT90M. If maximum duration is specified and resting time is not specified, a resting time of 15 minutes will be assumed. Requires technical linking of bids. For bids in *överbelastningshantering - störning* procurement activation: see technical requirements in procurement.
standard_MarketProduct.marketProductType	M	**A05** – Standard mFRR product eligible for scheduled activation only **A07** – Standard mFRR product eligible for scheduled and direct activation **A02** – Non-standard product not eligible for the scheduled or direct activation processes. **Z01** – Stand-alone period shift (period shift only). To be used when period shift is not combined with standard mFRR product (A05 or A07). Must be indivisible simple bids[4]. Applicable only to bids in Norway. Associated multipart, exclusive and inclusive bids must have the same value.
mktPSRType.psrType	O/M	Mandatory in Denmark. Not used in Finland, Sweden and Norway.

[4] When used, two conditionally linked bids must be submitted for adjacent MTUs

		Production type **B16** – Solar **B18** – Wind Offshore **B19** – Wind Onshore **B20** – Other
Note	O	**Only used in Denmark.** Custom text attribute for BRP usage only. The attribute will not be evaluated or used by the TSO. The value received will be copied unchanged to the Note attribute in the Activation_MarketDocument if the bid is activated.
Series_Period – exactly one instance per BidTimeSeries		
timeInterval	M	Period covered (in ISO 8601 UTC format). Must be 15 minutes. There must be one, and only one, period for each Bid_TimeSeries. Start: YYYY-MM-DDTHH:MMZ End: YYYY-MM-DDTHH:MMZ
Resolution	M	**PT15M**– the time resolution. Must equal the duration of the timeInterval.
Point – exactly one instance per Series_Period		
Position	M	Position is always **1**
quantity.quantity	M	Offered quantity
energy_Price.amount	D	The price of the product offered Price is mandatory, except for period shift only bids which cannot include price.
minimum_Quantity.quantity	D	The minimum quantity of energy that can be activated at a given time position It must be used for divisible bids and can be 0 (fully divisible) but must not be used for indivisible bids.

Linked_BidTimeSeries (associated with BidTimeSeries) - no more than three instances referring to each of MTU-1 and MTU-2, respectively		
mRID	O	mRID of a simple bid in MTU-1 or MTU-2
status	D	One of the following values shall be used when bid in MTU0 is conditionally available, i.e. BidTimeSeries.status = A65:

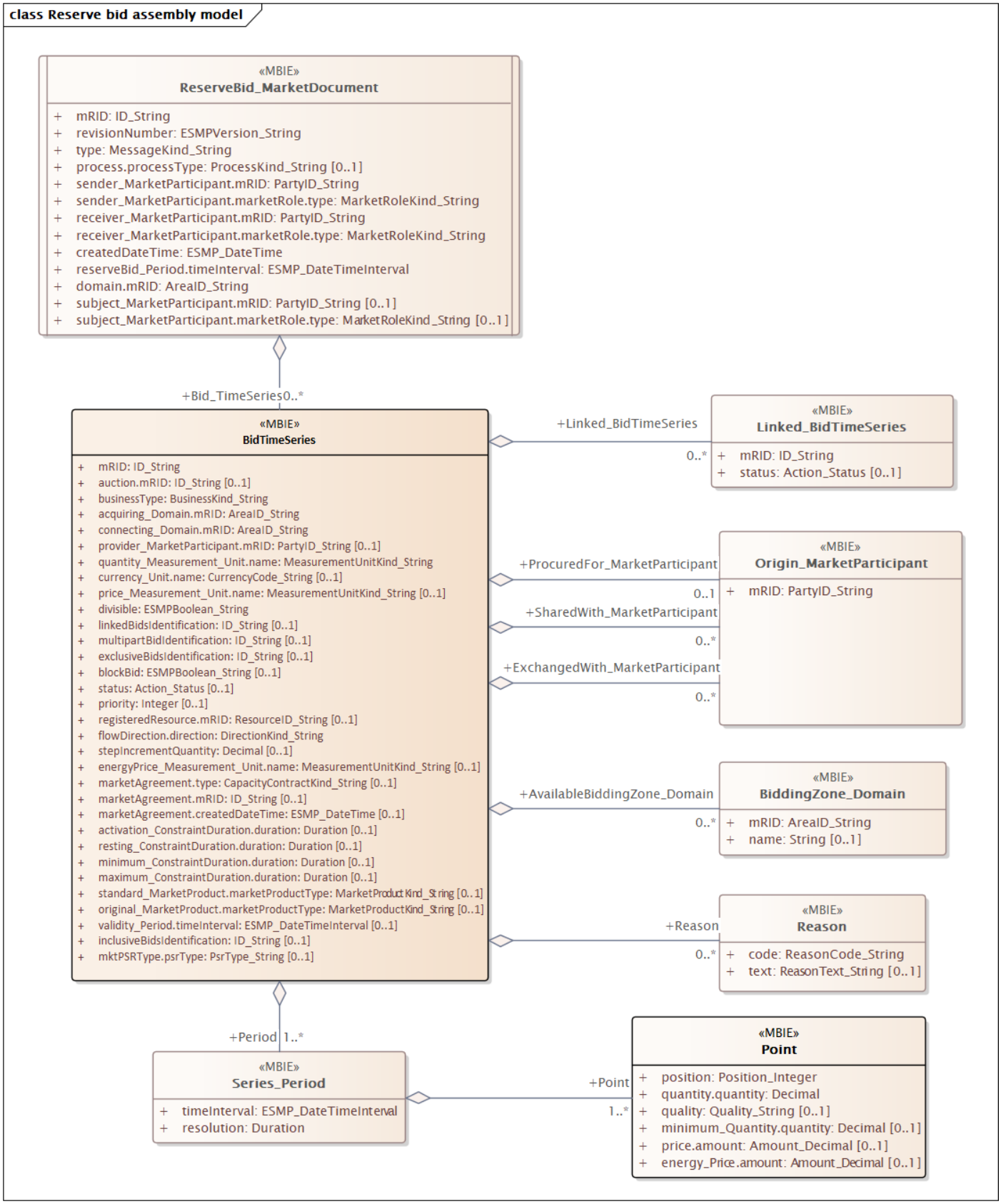
		A55 = Not available if linked bid activated A56 = Not available if linked bid not activated A59 = Not available if linked bid subject to SA A60 = Not available if linked bid subject to DA A57 = Not available for DA if linked bid subject to DA A58 = Not available for DA if linked bid subject to SA One of the following values shall be used when bid in MTU0 is conditionally unavailable, i.e. BidTimeSeries.status = A66: A67 = Available if linked bid activated A68 = Available if linked bid not activated A69 = Available if linked bid subject to SA A70 = Available if linked bid subject to DA A71 = Available for DA if linked bid subject to DA A72 = Available for DA if linked bid subject to SA (SA = scheduled activation, DA = direct activation, MTU = market time unit) See chapter 3.3.3. "Rules for evaluation of availability of conditional linked bids" for details *Applicable to period shift bids in Norway* The following value may be used when bid in MTU0 is available, i.e. BidTimeSeries = A06, and has support for period shift. The linked bid in MTU-1 can be either simple or complex. For complex bids the link can reference either the mRID of a single bid component of the complex bid, or the group identifier of the complex bid (i.e. multipartBidIdentification, exclusiveBidsIdentification, or inclusiveBidsIdentification) Z04 = Available for SA/DA, period shift beginning and period shift end if linked bid not activated, or Available for period shift end if linked bid subject to period shift end, or Available for SA/DA and period shift end if linked bid subject to SA, or Available for period shift end if linked bid subject to DA

Reason (associated with BidTimeSeries) – zero, one or two instances per BidTimeSeries		
code	D	Optional for mFRR standard product bids in Norway Period shift activation may be ordered: Z64 = Period shift, beginning of period Z65 = Period shift, end of period Mandatory for non-standard product bids:

		Z74 = Disturbance reserve[5] Z83 = Other non-standard bid For Finland, if BSP wants to add a voluntary secondary Bid ID to the bid: A95 = complementary information
text	O	If code A95 is used, the text field contains the secondary bid ID. Maximum number of characters is 100. Allowed characters: • Lower case letters • Upper case letters • Numbers • Underscore • Dash • Period • Colon

[5] *Norway*: *mFRR-D – driftsforstyrrelsesreserve, Sweden: Överbelastningshantering - störning, Finland: reserve power plants*

6.1.1 ReserveBid_MarketDocument assembly model



Note: the cardinalities indicated in the assembly model are further restricted for the implementation according to this guide, please see Attributes and dependencies table above.

6.2 Activation document – Attributes and dependencies

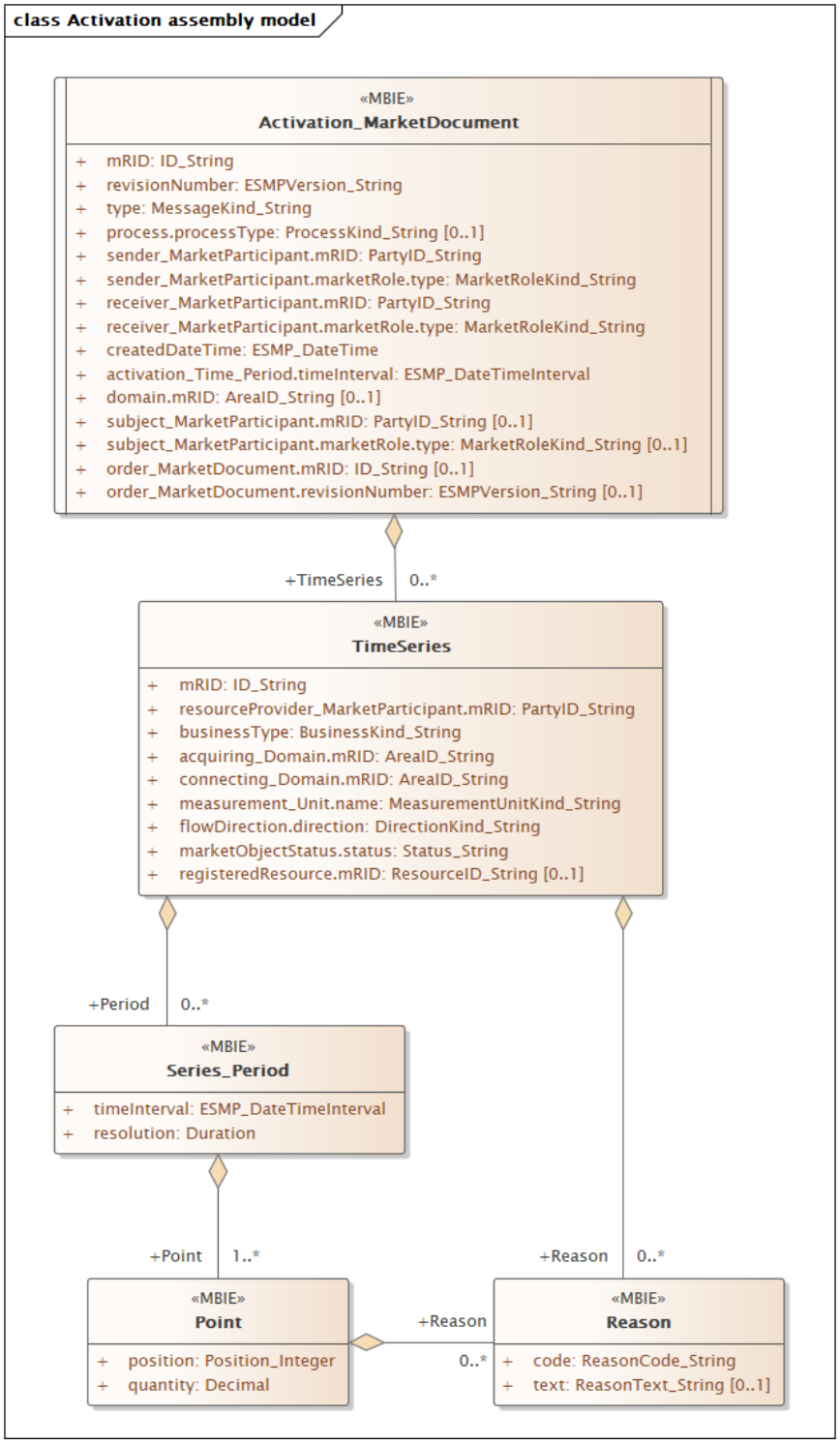
Activation_MarketDocument		iec62325-451-7-activationdocument – version 6.2
mRID	M	Unique identification of the document. Proper UUID is required.
revisionNumber	M	Constant value of **1**
Type	M	*For the request:* **A39** – SATCR activation (Scheduled activation) **A40** – DATCR activation (Direct activation) **Z37** – Faster than standard FAT (in Norway) **Z38** – Faster than standard deactivation time **Z39** – Slower than standard FAT **Z43** – Disturbance reserve **Z44** – Other non-standard **Z40** – Period shift activation (in Norway) *For the response:* **A41** – Activation response
process.processType	M	**A47** – Manual frequency restoration reserve
sender_MarketParticipant.mRID	M	Identification of the party sending the document See 6.6 for supported coding schemes.
sender_MarketParticipant.marketRole.type	M	*For the request:* **A04** – System Operator *For the response:* **A46** – Balancing Service Provider (BSP) **A27** – Resource Provider
receiver_MarketParticipant.mRID	M	Identification of the party receiving the document. See 6.6 for supported coding schemes.
receiver_MarketParticipant.marketRole.type	M	*For the request:* **A46** – Balancing Service Provider (BSP) **A27** – Resource Provider *For the response:* **A04** – System Operator
createdDateTime	M	Date and time of document creation (in ISO 8601 UTC format) YYYY-MM-DDTHH:MM:SSZ

activation_Time_Period.timeInterval	M	The period covered by the document (in ISO 8601 UTC format) Start: YYYY-MM-DDTHH:MMZ End: YYYY-MM-DDTHH:MMZ --- 1 MTU (Market Unit Time – 15 min) 2 MTUs (30 min.) for Direct activation (DA).
domain.mRID	M	EIC identification of the Control Area Denmark: **10Y1001A1001A796** Finland: **10YFI-1--------U** Norway: **10YNO-0--------C** Sweden: **10YSE-1--------K** **A01** - EIC coding scheme
subject_MarketParticipant.mRID	M	Identification of the party for whom the bid document is submitted. See 6.6 for supported coding schemes.
subject_MarketParticipant.marketRole.type	M	**A46** – Balancing Service Provider (BSP)
order_ MarketDocument.mRID	M	Unique identification of the activation order. The same order id is used in the request and the response. UUID.
order_MarketDocument.revisionNumber	M	The version of the activation order. Incremented with one for each transmission of the document from the System Operator. The same version is used in the request and the response.
TimeSeries – one or more instances		
mRID	M	Reference to the bid to be activated. Proper UUID is required, except for Heartbeat that uses fixed string "ACTIVATION_HEARTBEAT" is used.
resourceProvider_MarketParticipant.mRID	M	The identification of the Resource Provider.
businessType	M	**A97** – Manual frequency restoration reserve

acquiring_Domain.mRID	M	The EIC identification of the Nordic Market Area - 10Y1001A1001A91G **A01** – EIC coding scheme
connecting_Domain.mRID	M	The EIC identification of the bidding zone where the resource is located **A01** – EIC coding scheme
meaurement_Unit.name	M	**MAW** – megawatt
flowDirection.direction	M	**A01** – Up **A02** – Down
marketObjectStatus.status	M	*Only in the request:* **A10** – Ordered *Only in the response:* **A07** – Activated (confirmation that quantities in the time series have been activated) **A11** – Unavailable
registeredResource.mRID	O/M	EIC or national code for the resource (regulation object). Mandatory in Norway, Sweden and Denmark.
Note	O	Only used in Denmark. Custom text attribute for BRP usage only. Contains a copy of the text received in the Note attribute in the ReserveBid_MarketDocument. The attribute will only be present if the Note attribute in the ReserveBid_MarketDocument where present and contained a value different than the empty string.
Series_Period – exactly one instance per TimeSeries		
timeInterval	M	The start and end date and time of the time interval of the period of activation (in ISO 8601 UTC format) Start: YYYY-MM-DDTHH:MMZ End: YYYY-MM-DDTHH:MMZ
resolution	M	The time resolution is always the difference between the Time Interval End and the Time Interval Start.

		E.g.: PT15M (for a scheduled activation) PT24M (for a direct activation with duration of 24 minutes)
Point – exactly one instance per Series_Period		
position	M	Position is always **1**
quantity.quantity	M	Activated quantity
Reason (one or two instances) – only in the request		
code	O	**B22** – System regulation **B49** – Balancing For Fingrid: If Bid is associated with a secondary Bid ID, the secondary Bid ID is returned in a second Reason-instance **A95** – complementary information
text	O	For Fingrid: Secondary Bid ID
Reason (one or two instances) – only in the response		
code	D	To be used to provide a reason when *marketObjectStatus.status* is *A11 - Unavailable*: **B59** – Unavailability of reserve providing unit **999** – Errors not specifically identified For Fingrid: BSP can choose to return the secondary Bid ID in the response message in a separate Reason-instance, but this is not required. **A95** – complementary information
text	D	For activation response with status Unavailable a reason for the unavailability should be provided in free text format. For Fingrid: In the separate Reason-instance, the secondary Bid ID can be input.

6.2.1 Activation_MarketDocument assembly model



Note: the cardinalities indicated in the assembly model are further restricted for the implementation according to this guide, please see Attributes and dependencies table above.

6.3 Bid availability document – Attributes and dependencies

The bid availability document will be sent from TSO to BSP after each imbalance settlement period (ISP) only if any bids are made unavailable. In cases when the TSO has to resend reports, all MTUs for a given date will be resent as part of the same document.

BidAvailability_MarketDocument		urn:iec62325.351:tc57wg16:451-n:bidavailabilitydocument:1:1
mRID	M	Unique identification of the document. Proper UUID is required.
revisionNumber	M	Constant value of **1**
Type	M	**B45** – Bid availability document
process.processType	M	**A47** – Manual frequency restoration reserve
sender_MarketParticipant.mRID	M	Identification of the party sending the document. One of: - Energinet.dk - Fingrid - Statnett - Svenska kraftnät **A01** – EIC coding scheme
sender_MarketParticipant.marketRole.type	M	**A04** – System Operator
receiver_MarketParticipant.mRID	M	Identification of the party receiving the document. See 6.6 for supported coding schemes.
receiver_MarketParticipant.marketRole.type	M	**A46** – Balancing Service Provider (BSP)
createdDateTime	M	Date and time of document creation (in ISO 8601 UTC format) YYYY-MM-DDTHH:MM:SSZ
time_Period.timeInterval	M	The period(s) covered by the bid(s) referenced in the document (in ISO 8601 UTC format) Start: YYYY-MM-DDTHH:MMZ End: YYYY-MM-DDTHH:MMZ
BidTimeSeries – one or more instances		
mRID	M	Unique identification of the bid
bidDocument_MarketDocument.mRID	M	Constant value of **NA**
bidDocument_MarketDocument.revisionNumber	M	Constant value of **1**
requestingParty_MarketParticipant.mRID	M	EIC code of Party that requested the update of bid availability

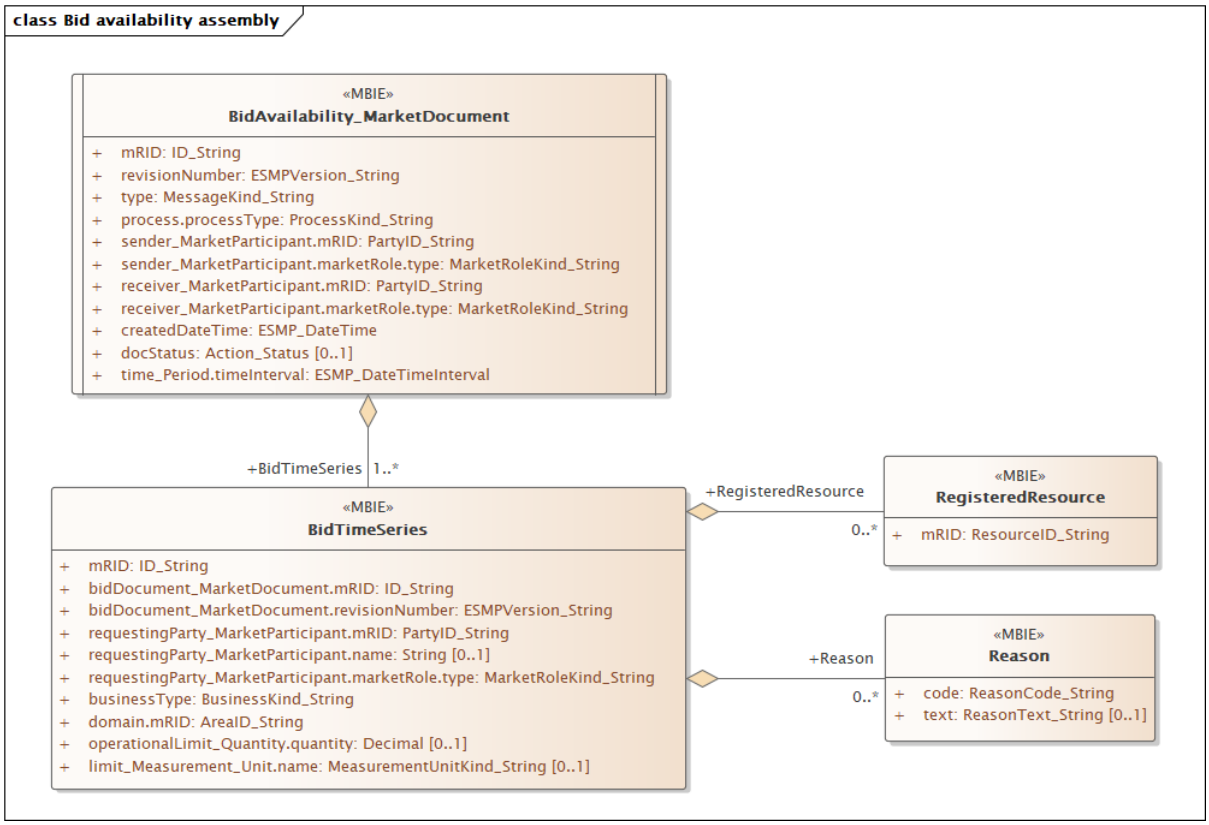
requestingParty_MarketParticipant.marketRole.type	M	**A46** – Balancing Service Provider **A49** – Transmission System Operator **A50** – Distribution System Operator
businessType	M	**C40** – Conditional bid **C41** – Thermal limit **C42** – Frequency limit **C43** – Voltage limit **C44** – Current limit **C45** – Short-circuit current limits **C46** – Dynamic stability limit ZA0 – Missing heartbeat response
domain.mRID	M	The EIC identification of the bidding zone where the resource is located **A01** – EIC coding scheme
Reason – one or multiple* instances per time series**		
Code	M	When business type = C40 the following reason apply: B16 = Tender unavailable in MOL list When business type = C42 one of the following reasons apply: B58 – Insufficiency of reserves B59 – Unavailability of reserve providing units When business type = C41, C43, C44, C45 or C46 one of the following reasons apply: B18 – Failure B46 – Internal congestion B47 – Operational security constraints B60 – Unavailability of automatic protection systems When business type = ZA0 the following reason apply: Z81 – BSP unavailable for activation For Fingrid: If Bid is associated with a secondary Bid ID, the secondary Bid ID is returned in a separate Reason-instance A95 – complementary information
text	O	May be populated to provide additional explanation in free text format

		For Fingrid: If A95 is used: • Secondary BID ID
RegisteredResource (associated with BidTimeSeries) – only when BusinessType is Thermal Limit = C41		
mrID	O	EIC code of concerned network element

*) For Fingrid, there can be multiple instances if bid is associated with secondary bid ID

**) The business types and reasons can be subject to changes due to do the development of the MARI-project.

6.3.1 BidAvailability_MarketDocument assembly model



Note: This is the MARI definition. The cardinalities indicated in the assembly model are further restricted for the implementation according to this guide, please see Attributes and dependencies table above.

6.4 Reserve allocation result document – Attributes and dependencies

The reserve allocation result will be sent from TSO to BSP after each imbalance settlement period (ISP). The report will include start time, stop time, quantity and price for every agreed activation during the ISP.

The BSP will receive an empty document with no time series if none of the bids have been selected for activation.

Allocation result for direct activation will be sent in a separate document covering two MTUs.

In cases when the TSO has to resend reports, all activations in all MTUs for a given date will be resent as part of the same document.

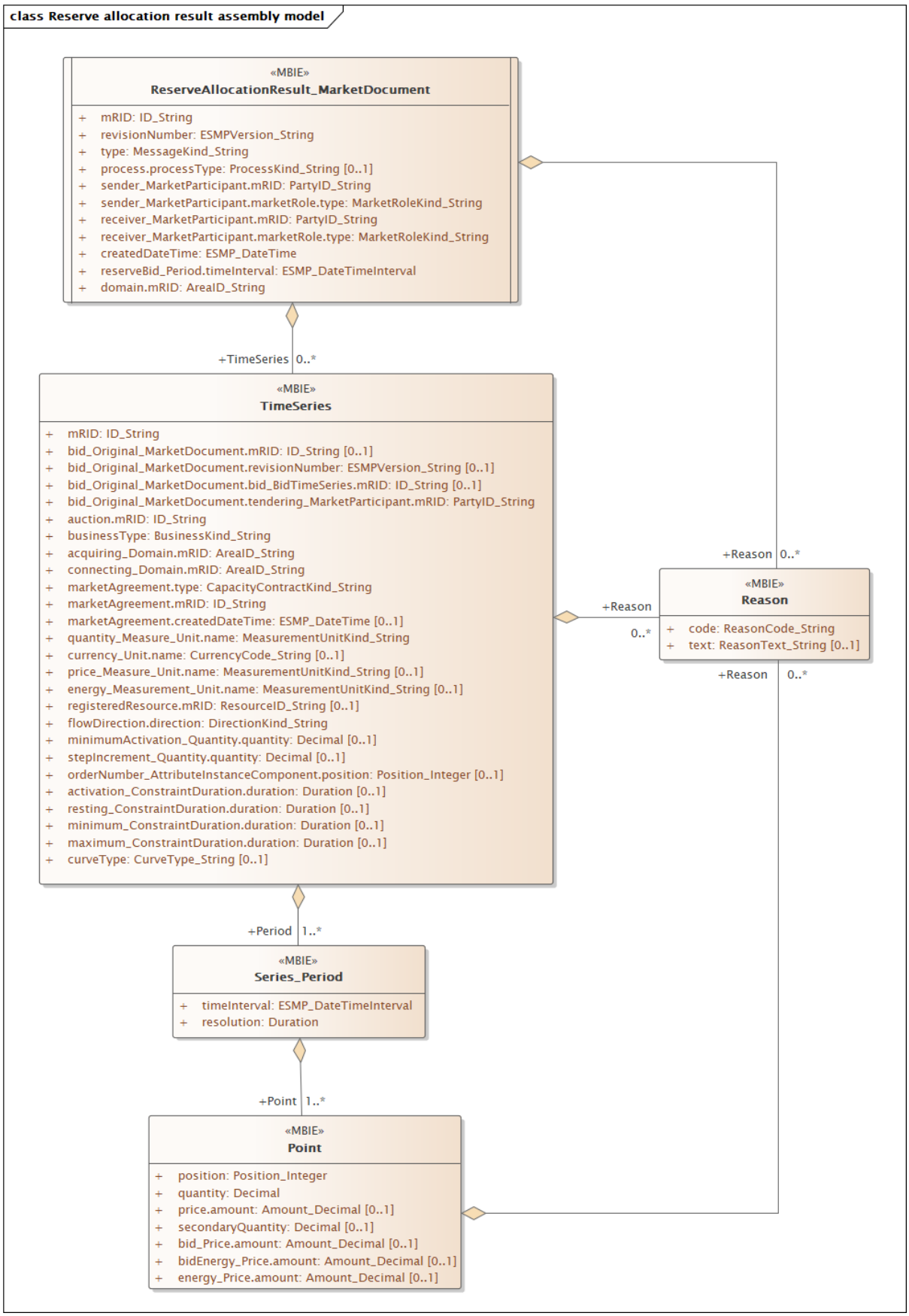
ReserveAllocationResult_MarketDocument		iec62325-451-7-reserveallocationresult.xsd –version 6.4
mRID	M	Unique identification of the document. Proper UUID is required.
revisionNumber	M	Constant value of **1**
type	M	**A38** – Reserve allocation result document
process.processType	M	**A47** – Manual frequency restoration reserve
sender_MarketParticipant.mRID	M	Identification of the party sending the document. One of: - Energinet.dk - Fingrid - Statnett - Svenska kraftnät **A01** – EIC
sender_MarketParticipant.marketRole.type	M	**A04** – System Operator
receiver_MarketParticipant.mRID	M	Identification of the party receiving the document. See 6.6 for supported coding schemes.
receiver_MarketParticipant.marketRole.type	M	**A46** – Balancing Service Provider (BSP)
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) Start: YYYY-MM-DDTHH:MMZ End: YYYY-MM-DDTHH:MMZ --- 1 MTU (Market Unit Time – 15 min) for Scheduled activation (SA).

		2 MTUs (30 min.) for Direct activation (DA).
domain.mRID	M	EIC identification of the Control Area Denmark: **10Y1001A1001A796** Finland: **10YFI-1--------U** Norway: **10YNO-0--------C** Sweden: **10YSE-1--------K** **A01** – EIC coding scheme
TimeSeries – one or more instances		
mRID	M	Unique identification of the time series
bid_Original_MarketDocument.bid_TimeSeries.mRID	M	Reference to the bid (unique bid identification)
bid_Original_MarketDocument. tendering_MarketParticipant.mRID	M	Identification of the tendering party (BSP) according to the original bid document.
auction.mRID	O	Constant value of MFRR_ENERGY_ACTIVATION_MARKET
businessType	M	**A97** – Manual frequency restoration reserve
acquiring_Domain.mRID	M	The EIC identification of the Nordic Market Area - 10Y1001A1001A91G **A01** – EIC coding scheme
connecting_Domain.mRID	M	The EIC identification of the bidding zone where the resource is located **A01** – EIC coding scheme
measurementquantity_Meaure_Unit.name	M	**MAW** – megawatt
currency_Unit.name	M	**EUR** – euro
registeredResource.mRID	O	EIC or national code for the resource (regulation object).
energyPrice_Measurement_Unit.name	M	**MWH -** Megawatt hours
flowDirection.direction	M	**A01** – Up **A02** – Down

Series_Period –one or two instances per TimeSeries (two periods for direct activations)		
timeInterval	M	The start and end date and time of the time interval of the period of activation.
Resolution	M	The time resolution is always the difference between the Time Interval End and the Time Interval Start.
Point – exactly one instance per Series_Period		
Position	M	Position is always **1**
quantity.quantity	M	Activated quantity
energy_Price.amount	M	The energy price for the activation
Reason – zero, one or multiple instances per TimeSeries		
Code	M	*Reason for activation:* **B22** – System regulation **B49** – Balancing *Type of activation:* **Z58** – Scheduled activation **Z59** – Direct activation **Z60** – Faster than standard FAT **Z61** – Earlier than standard deactivation **Z62** – Slower than standard FAT **Z63** – Period shift activation **Z74** – Disturbance reserve **Z83** – Other non-standard **Z89** – Bidless activation E.g. - for a scheduled activation for balancing purpose two reasons will be sent, B49 and Z58. - for a direct activation for system purpose two reasons will be sent, B22 and Z59. For Fingrid: If Bid is associated with a secondary Bid ID, the secondary Bid ID is returned in a separate Reason-instance

		A95 – complementary information
Text	O	May be populated to provide additional explanation in free text format If A95 is used: Secondary BID ID

6.4.1 ReserveAllocationResult_MarketDocument assembly model



Note: the cardinalities indicated in the assembly model are further restricted for the implementation according to this guide, please see Attributes and dependencies table above.

6.5 Acknowledgement document – Attributes and dependencies

Acknowledgement_MarketDocument		iec62325-451-1-acknowledgement.xsd – version 8.1
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	Identification of the party sending the document. See 6.6 for supported coding schemes.
sender_MarketParticipant.marketRole.type	M	*One of:* **A04** – System Operator **A46** – Balancing Service Provider (BSP) **A27** – Resource Provider **A34** – Reserve Allocator
receiver_MarketParticipant.mRID	M	Identification of the party receiving the document. See 6.6 for supported coding schemes.
receiver_MarketParticipant.marketRole.type	M	*One of:* **A04** – System Operator **A46** – Balancing Service Provider (BSP) **A27** – Resource Provider
received_MarketDocument.mRID	M	The unique identification of the received document.
received_MarketDocument.revisionNumber	M	The revision of the received document.
received_MarketDocument.type	M	The type of the received document.
received_MarketDocument.process.processType	M	The processType of the received document.
received_MarketDocument.createdDateTime	M	The date and time of the creation of the received document.
Reason – one or more instances		
code	M	**A01** – Message fully accepted **A02** – Message fully rejected More specific error codes may be used.

text	O	May be populated to provide additional explanation in free text format.

Reason – zero or more instances per Rejected time series		
code	M	**999** – Errors not specifically identified More specific error codes may be used.
text	O	May be populated to provide additional explanation in free text format. For rejected bids a specific reason for the rejection will be provided.

6.6 Supported coding schemes for sender/receiver identification

The following coding schemes are supported for identification of sender/receiver.

A01 – EIC

A10 – GS1

NSE – Swedish national coding scheme. If no preferred coding scheme is registered at Svk, NSE is used for activations.

7 Appendix 2 – Examples

Example messages for this implementation guide are available for download at nordicbalancingmodel.net.