

Version 1.2.1

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IMPLEMENTATION GUIDE - MFRR EAM

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1. Revision history

Version	Date	Changed by	Comments
1.0.0	20.06.2022	Tage Søndergaard Larsen (TSL)	First published version of the guide
1.0.1	25.01.2023	Tage Søndergaard Larsen (TSL)	<p>Added:</p> <ul style="list-style-type: none"> - Added revision history chapter - Added short paragraph on slower resources in chapter 4.1.1. - Added min (5 MW) and max (50 MW) limits in the description of attribute quantity.quantity. <p>Changed:</p> <ul style="list-style-type: none"> - Moved energy_Price.amount to after minimum_Quantity.quantity in ReserveBid_MarketDocument - Changed maximum price from 5.000 EUR/MW to 10.000 EUR/MW in the bid characteristics table in chapter 4.1.1. - Changed allowed minimum quantity for divisible bids from 0 MW to 5 MW (in attribute minimum_Quantity.quantity) - quantity_Measurement_Unit.name - Changed go-live date from «12th of April 2023» to «April 2023». <p>Corrected:</p> <ul style="list-style-type: none"> - Corrected spelling error in attribute measurement_Unit.name.
1.1.0	16.03.2023	Tage Søndergaard Larsen (TSL)	<p>Added:</p> <ul style="list-style-type: none"> - Added section 4.2 which details the changes to the activation report to the BRPs.
1.2.0	04.09.2023	Tage Søndergaard Larsen (TSL)	<p>Added:</p> <ul style="list-style-type: none"> - Added support for mandatory geotags <p>Changed:</p> <ul style="list-style-type: none"> - Updated the timeline in chapter 4 to reflect the changed nordic go-live date for NBM mFRR EAM. - Small change to the definition of MTU in chapter 3.
1.2.1	11.09.2023	Tage Søndergaard Larsen (TSL)	<p>Changed:</p> <ul style="list-style-type: none"> - Added 400kV and 220kV substations to the description of the attribute registeredResource.mRID in ReserveBid_MarketDocument.

2. Scope

This document aims to clarify and describe the business processes for submitting bids and receiving activation orders for the mFRR Energy Activation Market for balance responsible parties (BRPs) operating in the Danish electricity market.

The processes in this guide will be valid from April 2023 and represents the first step towards the NBM mFRR Energy Activation Market – which will be fully implemented in October/November 2023.

3. Terms and definitions

Acronym	Term	Definition
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.
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.
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. MTU is always 60 minutes in this document.
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.

4. Business context

When NBM mFRR EAM is fully implemented in Q1 2025 bid submission and bid activation will be in 15 minutes resolution. At the same time complex bid attributes will be introduced, all messages will be in ENTSO-E CIM format and ECP will be used for message delivery. This is a major change to the mFRR Energy Activation Market and therefore the change will be introduced in 2 steps as shown below.

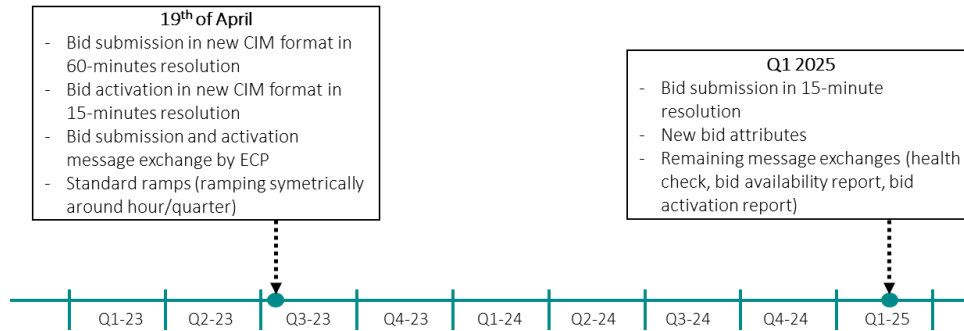


Figure 1: Stepwise implementation plan

This guide describes the changes introduced in April 2023. The full set of changes introduced when NBM mFRR EAM goes live in Q1 2025 is described in the common Nordic Implementation guide for mFRR EAM which can be found at the NBM homepage <https://nordicbalancingmodel.net/>.

4.1 Business processes

The two relevant business processes described in this guide is *Bid submission in 60-minutes resolution* and *Bid activation in 15-minutes resolution* as shown in the use case diagram below.

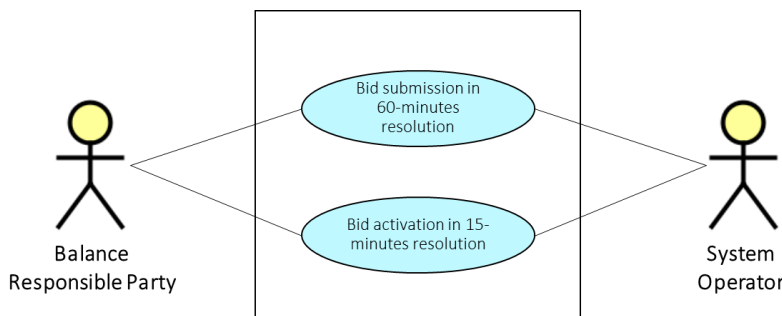


Figure 2: Use case diagram

Sequence diagram for the message flow is shown in figure 2. The System Operator receives the bids in 60 minutes resolution from the BRPs. The bids are then split into 15 minutes resolution before they are added to the Merit Order List. An activation is for a 15-minute period and must only continue into the next quarter if the BRP receives a new activation message. The balancing timeframe is still 60 minutes so the BRP will in most cases be activated for all quarters in a given hour – but situations will occur, where activations will be for only one, two or three quarters in the hour. The bid submission and bid activation processes will be further detailed in the next two sections.

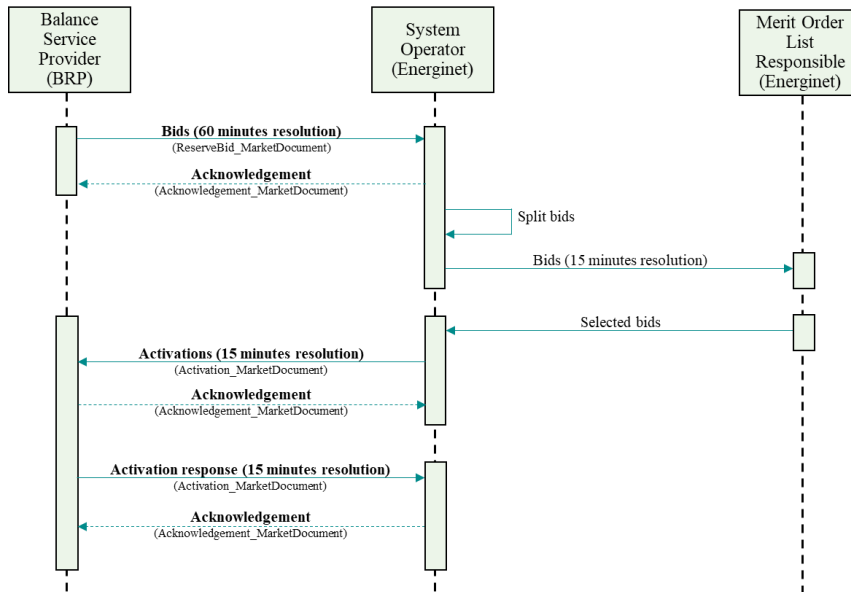


Figure 3: Sequence diagram

4.1.1 Bid submission in 60-minutes resolution

Gate closure for bid submission is 45 minutes before the hour. EUR is the only currency accepted – all other bid characteristics will remain unchanged. They are shown below for easy reference:

Currency	EUR
Maximum price	10.000 EUR/MWh
Price granularity	0.01 EUR
Minimum bid size	5 MW
Maximum bid size	50 MW
Bid granularity	1 MW
Activation granularity	1 MW
Bid time resolution	60 minutes

Bid submission will use the ENTSO-E CIM *ReserveBid_MarketDocument* and will be in 60-minutes resolution.

Each bid must be identified by a globally unique identifier (*mRID*). Two bids are not allowed to share the same bid ID. Bids can be either divisible or indivisible (governed by the *Divisible* attribute). An indivisible bid must be fully activated while a divisible bid can be activated partly (lower bound is set by the attribute *minimum_Quantity.quantity*).

The FAT¹ is described by the attribute *activation_ConstraintDuration.duration* and is expected to be symmetrical around the hour shift². *Start gradient*, *stop gradient* and *dead time* will no longer be used and will not be supported in the new CIM format. A FAT longer than 15 minutes indicates a bid - delivered by a so called slower resource - that does not fulfill the standard requirements for mFRR EAM bids.

So called *geotags* will be mandatory from 1st of December 2023. A geotag refers to a 400kV, 220kV, 150kV (DK1) or 132kV (DK2) substation and is used by the BRP to indicate where the bid feeds into the grid. If a bid feeds into a substation on a lower

¹ Full Activation Time. Includes time for both preparation and ramping.

² Quarter shift in the case of a 15-minute activation.

voltage level (50kV/60kV) the corresponding 150kV/132kV substation must be used as geotag.

Geotags are used by the TSO when handling local congestions in the grid. A bid must have at least one geotag but can have as many geotags as needed – to support portfolio-based bidding. Adding geotags to a bid is done by providing a comma separated list of substations in the attribute *registeredResource.mRID*. A complete list of valid substations will be available as download together with this guide.

Description of all the attributes used in the bid submission message can be found in section 5.1.

4.1.1.1 Update and cancellation of bids

To update or cancel bids previously sent a new ReserveBid_MarketDocument 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

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.

When updating or cancelling bids 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.

4.1.1.2 Bid acknowledgement

When a BRP 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, 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.

4.1.2 Bid activation in 15-minutes resolution

Each 60-minute bid submitted by the BRP is split into four 15 minutes bids by the System Operator.

7½ minutes before the quarter hour the BRP receives an activation order with activated bids for the next quarter. Each activation contains a reference to the original 60-minute bid. The BRP is then expected to ramp to full activation in less than 15 minutes (including preparation time) and with a symmetrical ramp around the quarter hour shift.

Figure 4 shows two different examples of possible activations of a 60-minute bid.

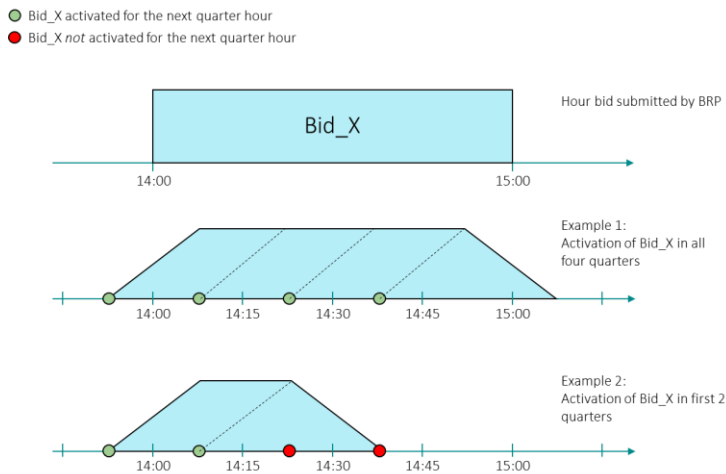


Figure 4: Examples of bid activation

In the first example Bid_X is activated for all 4 quarters. The BRP receives an activation message with a reference to Bid_X in all four quarters. In the second example Bid_X is only activated for the first two quarters of the hour.

4.1.2.1 Activation message

The TSO orders activation of bids by sending an `Activation_MarketDocument` to the BRP. An activation document may contain activation orders for multiple bids. The BRP sends an `Acknowledgement_MarketDocument` to the TSO to confirm that the activation order document has been received.

Description of all the attributes used in the activation message can be found in section 5.2.

4.1.2.2 Activation response message

The BRP 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* attribute must be set to "Activated". If an activation order time series cannot be fulfilled the *Status* must be "Unavailable" and a reason should be provided in the *Reason*-element.

The BRP 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 – as shown in figure 5.

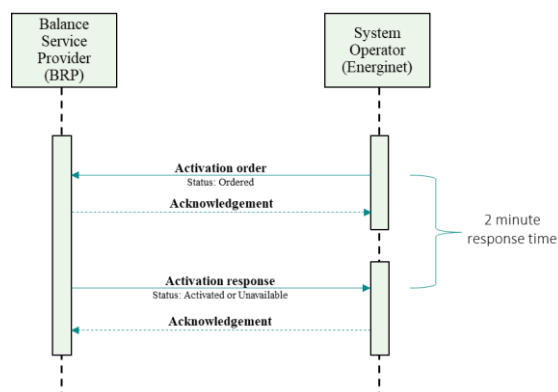


Figure 5: Activation message flow

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

If the TSO receives an activation response message with status "Unavailable" within the response time limit and the reason for unavailability is acceptable, the BRP is not accountable for the activation.

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

If the TSO receives an activation response later than the required 2 minutes, the response will be rejected by a negative Acknowledgement. If late responses happen regularly, the BRP must take measures to improve the timeliness of activation responses to comply with the response time requirement.

The BRP is accountable for the activation unless the BRP has responded with status "Unavailable" within the response time limit.

Description of all the attributes used in the activation response message can be found in section 5.3.

4.2 Activation report

In the current mFRR energy activation market, Energinet sends a message containing all activations for the previous day to the BRP, for settlement purposes³. The BRP will continue to receive that message also after the April release. The message will be unchanged – apart from the following:

1. The activation prices will change from DKR to EURO. DKR will no longer be supported.
2. EIC codes will be used for SenderIdentification and ReceiverIdentification. GLN codes will no longer be supported.

The message will continue to be in hourly resolution, so the 15 minute activations will be summarized per hour in the message.

BRService will continue to be the communication mechanism (ECP will not be used), and the BRPs receiving the message in PDF format will continue to do so after the April release.

4.3 Energy Communication Platform

Apart from the activation report described in section 4.2 all messages described in this implementation guide will use the Energy Communication Platform (ECP).

Information about ECP – including implementation guides – can be found here <https://energinet.dk/El/Elmarkedet/Saadan-kommer-du-i-gang-med-ECP>.

³ Business transaction "BT-106: Fremsendelse af regulerkraftopgørelse"

5. Document attributes and dependencies

This chapter provides the attributes and dependencies for the documents discussed in this guide.

The following classification is used for the attributes:

- M – Must be used
- D – Must be used if a defined condition is met
- O – Optional, can be used

5.1 Bid document – Attributes and dependencies

ReserveBid_MarketDocument		urn:ediel.org:7:reservebiddocument:7:4
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	EIC code of the BRP sending the document.
sender_MarketParticipant.market-Role.type	M	A46 - Balancing Service Provider (BSP) (The BRP act as BSP and must use the BSP role)
receiver_MarketParticipant.mRID	M	10X1001A1001A248 (EIC code for Energinet)
receiver_MarketParticipant.market-Role.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 10Y1001A1001A796 (Denmark)
subject_MarketParticipant.mRID	M	EIC code of the BRP sending the document.
subject_MarketParticipant.market-Role.type	M	A46 - Balancing Service Provider (BSP) (The BRP act as BSP and must use the BSP role)
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	EIC identification of market area. 10Y1001A1001A91G (Nordic Market Area)
connecting_Domain.mRID	M	The EIC identification of the bidding zone where the resource is located. 10YDK-1-----W (DK1)

		10YDK-2-----M (DK2)
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. When bid is divisible minimum_Quantity.quantity must be set to indicate the minimum allowed bid size. A02 = No - no reduction possible on the quantity, the bid is indivisible.
Status	M	A06 – Available
registeredResource.mRID	M	List of geotags indicating where the bid feeds into the grid. Comma separated list of 400kV, 220kV, 150kV (DK1) or 132kV (DK2) substations. At least one substation must be provided, but 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 situated in the same bidding zone as the bid itself.
flowDirection.direction	M	A01 – Up A02 – Down
energyPrice_Measure_Unit.name	M	MWH - Megawatt hours.
activation_ConstraintDuration.duration	M	Activation time - time for full activation of the physical resource including preparation time and ramping time. E.g. PT15M – if full activation time is 15 minutes. PT10M -if full activation time is 10 minutes.
standard_MarketProduct.marketProductType	M	A05 – Standard mFRR product eligible for scheduled activation only.
mktPSRType.psrType	M	Production type B16 - Solar B18 – Wind Offshore B19 – Wind Onshore B20 - Other
Series_Period – exactly one instance per BidTimeSeries		
timeInterval	M	Period covered (in ISO 8601 UTC format). Must be exactly 60 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	The time resolution – must be PT60M
Point – exactly one instance per Series_Period		
Position	M	Position is always 1
quantity.quantity	M	Offered quantity – must be between 5 and 50 MW (or 0 if bid is canceled)

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 cannot be less than 5 MW. Not allowed for indivisible bids.
energy_Price.amount	M	The price of the product offered

5.2 Activation document – Attributes and dependencies

Document used by the TSO to send activation orders to the BRPs.

NOTICE: The Activation Response message is also using the Activation_MarketDocument. See section 5.3 for details on the Activation Response message.

Activation_MarketDocument		ec62325-451-7-activationdocument – version 6.2
mRID	M	Unique identification of the document. Proper UUID is required.
revisionNumber	M	Constant value of 1
Type	M	A39 – SATCR activation (Scheduled activation)
process.processType	M	A47 – Manual frequency restoration reserve
sender_MarketParticipant.mRID	M	10X1001A1001A248 (EIC code for Energinet)
sender_MarketParticipant.market-Role.type	M	A04 – System Operator
receiver_MarketParticipant.mRID	M	EIC code of the BRP receiving the document.
receiver_MarketParticipant.market-Role.type	M	A46 - Balancing Service Provider (BSP) (The BRP act as BSP and must use the BSP role)
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 Period covered must be 15 minutes.
domain.mRID	M	EIC identification of the Control Area 10Y1001A1001A796 (Denmark)
subject_MarketParticipant.mRID	M	EIC code of the BRP receiving the document.
subject_MarketParticipant.market-Role.type	M	A46 - Balancing Service Provider (BSP) (The BRP act as BSP and must use the BSP role)
order_MarketDocument.mRID	M	Unique identification (proper UUID) of the activation order. The same order id is used in the request and the response.
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.
resourceProvider_MarketParticipant.mRID	M	EIC code of the BRP receiving the document.
businessType	M	A97 – Manual frequency restoration reserve.
acquiring_Domain.mRID	M	EIC identification of market area. 10Y1001A1001A91G (Nordic Market Area)

connecting_Domain.mRID	M	The EIC identification of the bidding zone where the resource is located. 10YDK-1-----W (DK1) 10YDK-2-----M (DK2)
measurement_Unit.name	M	MAW – megawatt
flowDirection.direction	M	A01 – Up A02 – Down
marketObjectStatus.status	M	A10 – Ordered
registeredResource.mRID	M	Comma separated list of substations (see description of attribute in chapter 5.1)
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. Interval must be 15 minutes. 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. PT15M – 15 minutes.
Point – exactly one instance per Series_Period		
Position	M	Position is always 1
quantity.quantity	M	Activated quantity
Reason		
Code	O	B22 – System regulation B49 – Balancing
Text	O	Reason text

5.3 Activation Response document – Attributes and dependencies

Document used by the BRP to accept or decline activations.

NOTICE: The Activation message is also using the Activation_MarketDocument. See section 5.2 for details on the Activation message.

Activation_MarketDocument		ec62325-451-7-activationdocument – version 6.2
mRID	M	Unique identification of the document. Proper UUID is required.
revisionNumber	M	Constant value of 1
Type	M	A41 – Activation response
process.processType	M	A47 – Manual frequency restoration reserve
sender_MarketParticipant.mRID	M	EIC code of the BRP sending the document.
sender_MarketParticipant.marketRole.type	M	A46 - Balancing Service Provider (BSP) (The BRP act as BSP and must use the BSP role)
receiver_MarketParticipant.mRID	M	10X1001A1001A248 (EIC code for Energinet)
receiver_MarketParticipant.marketRole.type	M	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 Period covered must be 15 minutes.
domain.mRID	M	EIC identification of the Control Area 10Y1001A1001A796 (Denmark)
subject_MarketParticipant.mRID	M	EIC code of the BRP sending the document.
subject_MarketParticipant.marketRole.type	M	A46 - Balancing Service Provider (BSP) (The BRP act as BSP and must use the BSP role)
order_MarketDocument.mRID	M	Unique identification (proper UUID) of the activation order. The same order id is used in the request and the response.
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.
resourceProvider_MarketParticipant.mRID	M	EIC code of the BRP receiving the document.
businessType	M	A97 – Manual frequency restoration reserve.
acquiring_Domain.mRID	M	EIC identification of market area. 10Y1001A1001A91G (Nordic Market Area)

connecting_Domain.mRID	M	The EIC identification of the bidding zone where the resource is located. 10YDK-1-----W (DK1) 10YDK-2-----M (DK2)
measurement_Unit.name	M	MAW – megawatt
flowDirection.direction	M	A01 – Up A02 – Down
marketObjectStatus.status	M	A07 – Activated (confirmation that the quantity in the time series will be activated) A11 – Unavailable (the quantity in the time series will <u>not</u> be activated)
registeredResource.mRID	M	Comma separated list of substations (see description of attribute in chapter 5.1).
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. Interval must be 15 minutes. 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. PT15M – 15 minutes.
Point – exactly one instance per Series_Period		
Position	M	Position is always 1
quantity.quantity	M	Activated quantity
Reason		
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
Text	D	For activation response with status Unavailable a reason for the unavailability should be provided in free text format.

5.4 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	EIC identification of the party sending the document.
sender_MarketParticipant.marketRole.type	M	<i>One of:</i> A04 – System Operator A46 – Balancing Service Provider (BSP)
receiver_MarketParticipant.mRID	M	EIC identification of the party receiving the document.
receiver_MarketParticipant.marketRole.type	M	<i>One of:</i> A04 – System Operator A46 – Balancing Service Provider (BSP)
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.