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Date: 01 February 2024

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ANCILLARY SERVICES TO BE DELIVERED IN DENMARK - TENDER CONDITIONS

Effective from 1 February 2024

CONTENTS

0. Introduction

This document is divided into several sections, each describing the tender conditions applicable to a particular type of ancillary service. In addition to these specific conditions, the document includes a section on general commercial conditions as well as a section on the practical handling of the various services and their ranking and mutual dependencies.

There are two ways to supply ancillary services:

1. The supplier must be approved as a balance-responsible party for either generation or demand in eastern or western Denmark, cf. market regulation C1, and must also have signed a "Main agreement on the delivery of ancillary services". This option provides access to the delivery of all ancillary services covered by present Tender conditions.

2. The supplier must have signed an “Agreement on the delivery of balancing services without energy supplies”, c.f. market regulation C1. This option provides access to the delivery of FCR in western Denmark, FFR in eastern Denmark and FCR-D in eastern Denmark – i.e. ancillary services with very limited energy supplies, which do not require that the supplier has a contract with a balance responsible party.

The facilities and systems which are to supply the ancillary services must be approved by Energinet. Moreover, wind turbines and photovoltaic cells (fluctuating renewable energy sources) without back-up equipment can submit bids in the various ancillary services markets, provided that the market participants handling these energy sources in the electricity market are able to produce a forecast of sufficient quality and a precise baseline calculation. The same requirements also apply to demand facility portfolios. Approval of facilities and systems, including verification of forecasts etc., is granted subject to "Prequalification of units and aggregated portfolios", doc.no.: 13/80940-106. The document is available for download on Energinet’s website.

Requests for a “Main agreement on the delivery of ancillary services” or an “Agreement on the delivery of balancing services without energy supplies” as well as requests for approval of facilities etc. must be submitted to Energinet’s Ancillary Services department.

1. Ancillary services

In any power system, a balance must be struck at all times between generation of and demand for electricity. Changes in demand and disturbances at generation units affect the system balance and cause grid frequency deviations. Energinet buys ancillary services to ensure access at all times to such resources as are necessary to ensure the stable and reliable electricity system operation.

The ancillary services which are procured from electricity generators and electricity consumers in Denmark and in neighbouring countries are used for various purposes, and different requirements therefore apply to the supply of the various services. These requirements are regulated by the ENTSO-E Continental Europe Operation Handbook, the Joint Nordic System Operation Agreement and by Energinet's regulations for grid connection.

Requirements to be met by suppliers of ancillary services vary slightly, depending on whether the services are to be supplied in eastern Denmark, i.e. east of the Great Belt (called DK2), or in western Denmark, i.e. west of the Great Belt (called DK1). These tender conditions are therefore divided into subsections describing conditions for DK1 and DK2, respectively.

The following ancillary services to be delivered in DK1 are covered by these tender conditions:

- Primary reserve, FCR
- Secondary reserve, aFRR
- Manual reserves, mFRR
- Properties required to maintain power system stability.

The following ancillary services to be delivered in DK2 are covered by these tender conditions:

- Fast Frequency Reserve, FFR
- Frequency-controlled disturbance reserve, FCR-D upward regulation
- Frequency-controlled disturbance reserve, FCR-D downward regulation
- Frequency-controlled normal operation reserve, FCR-N
- Secondary reserve, aFRR
- Manual reserves, mFRR
- Properties required to maintain power system stability.

1.1 Primary reserve, DK1 (FCR)

In the event of frequency deviations, the primary reserve regulation must ensure that the balance between generation and demand is restored, stabilising the frequency at close to, but deviating from 50 Hz.

Primary reserve regulation is automatic and provided by generation or demand units which, by means of control equipment, respond to grid frequency deviations.

The TSOs within ENTSO-E RG Continental Europe's synchronous area are jointly responsible for ensuring the availability of sufficient primary reserves. Each TSO is obliged to provide a share of the combined need for primary reserves of the ENTSO-E RG Continental Europe grid. The combined requirement in the ENTSO-E RG Continental Europe grid is +/-3,000 MW, of which Energinet is obliged to supply a proportionate share. Energinet's share is determined by generation in western Denmark relative to total generation in ENTSO-E RG Continental Europe and is determined once a year.

Energinet procures primary reserves at daily auctions. The volume required is published on Energinet's website. In 2023, the required volume is +/-23 MW.

The rules of ENTSO-E RG Continental Europe allow for the import/export of primary reserves, which means that suppliers outside DK1 can offer these reserves and that Danish suppliers can export FCR. These rules introduce TSO-to-TSO options and are limited subject to Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation (SO GL).

Currently, Danish suppliers can export up to +/- 100 MW FCR on the Jutlandish-German border.

1.1.1 Technical conditions

1.1.1.1 Response and response time

Power frequency control must be supplied at a frequency deviation of up to +/-200 mHz relative to the reference frequency of 50 Hz. This will normally mean in the 49.8-50.2 Hz range. A deadband of +/-20 mHz is permitted.

The reserve must as a minimum be supplied linearly at frequency deviations of between 20 and 200 mHz. The first half of the activated reserve must be supplied within 15 seconds, while the last half must be supplied in full within 30 seconds at a frequency deviation of +/-200 mHz.

A delay of maximum two seconds at response start-up is allowed, but the response must then be within the permissible area.

It must be possible to maintain the regulation for minimum 4 hours.

1.1.1.2 Requirements for units with limited energy reservoirs (LERs)

Units or groups of units that cannot provide full energy supply for four consecutive hours are considered units with limited energy reservoirs.

To ensure continuity and stability in FCR deliveries from LER units/portfolios, more requirements will be made in connection with the prequalification, including:

- LER units/portfolios must have an Energy Management system consisting of a system for normal state (NEM) and one for alert state (AEM).
- LER units/portfolios must reserve at least 24 minutes of energy. The 24 minutes is based on 15 minutes of full FCR delivery, the transition to energy management systems and frequency deviations prior to the system reaching alert state.
- To ensure scope for action for the energy management system, LER units/portfolios are approved for 80% of the rated output.

The reduction requirement for rated output will not be applicable if a solution is implemented where the energy management system does not affect the rated FCR output of the LER unit/portfolio. Neither will the reduction requirement apply if the portfolio is composed in a way that allows the energy supply to be provided in full for four consecutive hours or if an installation is approved with a size that ensures that enables continuous delivery over four hours, for example a battery with 1 MW recharging/discharging and with 4 MWh storage capacity.

1.1.1.3 Accuracy of measurements

The accuracy of frequency measurements for primary regulation must be better than 10 mHz. The sensitivity of frequency measurements must be better than +/-10 mHz.

The resolution of the market participant's SCADA system must be better than 1 second, and selected signals must be able to document the facilities' response to frequency deviations. The supplier must store the signals for at least one week.

1.1.1.4 Combined deliveries

A delivery may be made up of supplies from several generation units with different properties which collectively can provide the required response within the required response time. A delivery may also be made up of supplies from several demand units with different properties which collectively can provide the required response within the required response time. Moreover, a delivery can be made up of mixed supplies from demand and generation units, if the same BRP has balance responsibility for both the demand and generation units. Any system for such combined deliveries must be verified to Energinet.

1.1.2 Daily procurement of primary reserve

Energinet procures primary reserves as one symmetric product (upward and downward regulation is procured collectively). A daily auction is held for the coming day of operation. For the purpose of the auction, the 24-hour period is divided into six equally sized blocks of four hours each:

- Block 1: 00.00 - 04.00 a.m.
- Block 2: 04.00 - 08.00 a.m.
- Block 3: 08.00 - 12.00 a.m.
- Block 4: 12.00 - 16.00 p.m.
- Block 5: 16.00 - 20.00 p.m.
- Block 6: 20.00 - 24.00 p.m.

Daily purchases are made on the common market for primary reserves, FCR Cooperation, which spans Europe. This allows Danish market participants to sell their services across national borders through the common market, just as foreign market participants can contribute to meeting Danish demand.

1.1.2.1 Participant bids

Bids for daily capacity auctions must be submitted via the internet platform www.Regel-leistung.net.

Bids must be submitted to the Regelleistung internet platform by 08:00 a.m. on the day before the day of operation. Bids received after 08:00 a.m. are rejected unless all participating bidders are otherwise notified by e-mail.

Market participants may amend bids already submitted up until 08.00. Bids received by 08.00 a.m. are binding on the bidder.

Bids must state a quantity and a price for each four-hour block. Volume is the MW quantity which the bidder is offering to make available and must be identical within each block. Price is the price per MW asked by the bidder to make the volume stated available. Price must be stated as a price per MW per 4-hour block.

The minimum size for bids entered is 1 MW, and bids must always be stated in MW without decimals, and the price must be stated in EUR/MW to two decimal points.

Each bid must be stated as a single bid for both upward and downward regulation. Both volume and price must thus always be indicated by a positive sign.

1.1.2.2 Energinet's acceptance of bids

Bids are sorted according to price per MW, and demand is covered by selecting bids by rising price.

Bids are always accepted in their entirety or not at all. In situations where the acceptance of a bid for more than 20 MW will lead to excess fulfilment of the need for reserves in the block in question, such a bid may be disregarded.

If two bids are priced the same, and only one is needed, a mechanical random generator is used to select the bid to be included in the solution. The same applies if three or more bids are priced the same.

If the number of bids received is insufficient to cover Energinet's need, Energinet has the option to send an e-mail to all market participants, asking them to submit more bids at a new auction.

1.1.2.3 Pricing and payment

As a rule, all accepted bids receive an availability payment corresponding to the price of the highest bid accepted throughout FCR Cooperation. If specific areas reach their import limit, these areas will have a local marginal price which is higher than the common marginal price.

No calculation is made of energy volumes supplied from primary reserves. Supplies of energy from primary reserves are settled as ordinary imbalances by the market participants that have the balance responsibility for the units in question.

1.1.2.4 Feedback to market participant

At 08.30 a.m. , Energinet informs the market participant of the bids accepted by Energinet and of availability payment allocated on an hour-by-hour basis. This is done via the Regelleistung internet platform.

Energinet does not send reserve activation signals during the day of operation. Activation of reserves is based on the supplier's own frequency measurements.

1.1.2.5 Obligations of market participant

For availability payment to be effected, the capacity must in fact be available. This means that availability payment is cancelled if it subsequently turns out that the capacity is not available, for example due to breakdowns, see sections 2.2 and 2.3.

In case of incidents which mean that a facility cannot supply primary reserve, the reserve must be re-established at one or more facilities capable of supplying the reserve as soon as possible and within 30 minutes of the incident at the latest. If the supplier is unable to re-establish the reserve, Energinet should be contacted within 15 minutes and informed where and when the reserve can be re-established.

1.1.3 Checking the services

The services are checked on a sample basis and in case of significant frequency deviations. Energinet's checking takes the form of requesting documentation from the market participant's SCADA system of the facilities' response to naturally occurring frequency deviations, see section 1.1.1.3.

Following an enquiry from Energinet, the market participant has up to five weekdays to provide the necessary documentation to enable Energinet to validate delivery.

1.2 Secondary reserve, DK1 (aFRR)

In the event of major system disturbances, the aFRR reserves are used to indirectly restore frequency to 50 Hz following the stabilisation of the frequency by means of power frequency control.

The secondary reserve serves two purposes. One is to release the primary reserve if this has been activated, i.e. restore the frequency to 50.00 Hz. The other purpose is to restore any imbalances on the interconnections to the agreed plan.

Secondary reserve regulation is automatic and can be provided by generation or demand units which, by means of control equipment, respond to signals received from Energinet.

In all cases, the reserve is procured as a combined, symmetrical reserve for upward and downward regulation.

1.2.1 Technical conditions

1.2.1.1 Response and response time

Secondary reserve is primarily supplied by facilities in operation. It must be possible to supply the reserve requested within 15 minutes. Alternatively, the reserve can be supplied by a combination of facilities in operation and fast-start facilities. The reserve to be supplied within any coming five-minute period must be provided by facilities in operation.

It must be possible to maintain regulation continuously.

The regulation signal is sent online as a power rating from Energinet to the balance-responsible party with reference to the bid. At the BRP's request, the regulation signal can be sent to a specific unit in the balance responsible party's portfolio, but Energinet will only send one regulation signal per BRP that will cover the market participant's total obligations.

1.2.1.2 Information/data

All generation or demand units supplying or contributing to the supply of aFRR reserves must be connected via information technology to Energinet's Control Centre in Erritsø. For each individual generation or demand unit, the control centre must generally have online access to:

- Status reports, generation or demand unit in/out
- Online measurements of generation and demand (MW)

- Currently possible reserve up (MW)
- Current max. gradient up (MW/min.)
- Current time constant for upward regulation (sec.)

- Currently possible reserve down (MW)
- Current max. gradient down (MW/min.)
- Current time constant for downward regulation (sec.)

In addition, signals for the actual regulation must be exchanged as described in 'Prequalification of units and aggregated portfolios', doc. no.: 13/80940-106. The document is available for download on Energinet's website.

Requirements and the place of delivery for reports and measurements must be agreed with Energinet.

Costs incidental to IT connections and maintenance must be borne by the supplier.

1.2.1.3 Combined deliveries

A delivery may be made up of supplies from several generation units with different properties which collectively can provide the required response within the required response time. A delivery may also be made up of supplies from several demand units with different properties which collectively can provide the required response within the required response time. Any system for such combined deliveries must be verified to Energinet.

A delivery can be made up of supplies from a mix of demand and generation units, provided that the following conditions are met:

- Balance responsibility for the demand and generation units must rest with the same BRP.
- The BRP submits a symmetrical bid for the week stating that the bid concerns a supply of combined services.
- Energinet still only sends one regulation signal to the BRP. The market participant must then ensure that the signal is sent to the relevant demand and generation units and inform Energinet of the distribution.

The specific signals are listed in "Prequalification of units and aggregated portfolios", doc. no.: 13/80940-106. The document is available for download on Energinet's website.

1.2.2 Procurement of secondary reserves

In general, Energinet's need is based on the recommendations in ENTSO-E RG Continental Europe, and currently total +/-100 MW. This volume is procured through the holding of weekly auctions. One weekly auction is held, applicable to all hours in the delivery period.

Every Tuesday by 12:00, Energinet will send an e-mail to all potential aFRR suppliers with a request for aFRR bids for the coming delivery period which runs from Friday at 00:00 to Thursday at 24:00. The volume offered will appear from this e-mail and a quotation template (spreadsheet) will be attached.

1.2.2.1 Participant bids

The market participant's bid must be stated in the quotation template and sent by email to kontrolcenterel@energinet.dk, marked 'Bid for aFRR reserves'.

Each bid must be entered for a minimum of 1 MW and a maximum of 50 MW and must be stated in MW to one decimal point. The price must be stated in DKK/MW and refers to the specified quotation volume for the entire delivery period.

Every week, bids must be submitted so that they reach Energinet by 10:00 on Wednesday. Bids received by 10.00 are binding on the market participant.

1.2.2.2 Energinet's acceptance of bids

Energinet sorts the bids by price per MW, and bids are selected in order of price until the necessary volume has been procured.

Bids are accepted in their entirety or not activated. This means that all bids are considered indivisible, the lowest bids will be selected first, and no bids will be skipped.

If two bids have the same price, and Energinet only needs one, a mechanical random generator is used to select the bid to be included in the solution. The same applies if three or more bids are priced the same.

If the number of bids received is insufficient to cover Energinet's need, Energinet will send an e-mail to all market participants asking them to submit more bids.

1.2.2.3 Pricing and payment

All accepted bids will receive payment corresponding to the price requested by the supplier (pay-as-bid).

If only one enterprise has submitted bid(s), pricing will be based on regulated price, see section 2.1.1.

1.2.2.4 Feedback to market participant

By 13:00 on the Wednesday before the delivery period, Energinet will send e-mails to the bidding market participants stating the result of the weekly auction.

All accepted bids (volume and prices) are also published in anonymized form on Energinet's website by the Thursday before the delivery period.

1.2.2.5 Obligations of market participant

For availability payment to be effected, the capacity must in fact be available. This means that availability payment is cancelled if it subsequently turns out that the capacity is not available, for example due to breakdowns, see sections 2.2 and 2.3.

In case of incidents which result in the supplier not being able to deliver the agreed service, for example due to a facility breakdown, the supplier must decide if he wants to deliver the service from other facilities in his portfolio or notify Energinet of his inability to supply the service, including the duration of the outage. The supplier must inform Energinet of any service lapse within 30 minutes of the incident. After this time, ad hoc tendering will be carried out to cover the lack of reserves.

Suppliers, who have not been able to supply the capacity which they have received availability payment for, must repay availability payment for the non-supplied capacity, including any costs relating to replacement purchases. This amount must not exceed three times the market participant's availability payment, delimited to the period during which the market participant has not been able to supply the capacity agreed.

1.2.2.6 Planning by market participant

The market participant's operational schedules prior to and during the day of operation must state the volumes of secondary upward regulation power and secondary downward regulation power which have been reserved on an hour-by-hour basis, see Regulation C3: Handling of notifications and schedules.

1.2.3 Checking the services

Regular checks are performed to ascertain that the reserves are available based on online measurements.

In case of regulation of demand facilities and fluctuating renewable energy sources, operational schedules for these must be available.

1.2.3.1 Payment for energy volumes

Supplies of energy from secondary upward regulation reserves are settled per MWh at the DK1 electricity spot price plus DKK 100/MWh; however, based at least on the regulating power price for upward regulation. Supplies of energy from secondary downward regulation reserves are settled per MWh at the DK1 electricity spot price less DKK 100/MWh; however, not exceeding the regulating power price for downward regulation.

The energy supplied is calculated on the basis of registrations in Energinet's SCADA system as an integrated value of expected activated output per quarter.

1.3 Secondary reserve, DK2 (aFRR)

The secondary reserve, aFRR (Automatic Frequency Restoration Reserves), is used to restore frequency to the normal band (49.9-50.1 Hz) after the primary regulation has stabilised the frequency.

The secondary reserve serves two purposes. One is to release the primary reserve if this has been activated, i.e. restore the frequency to 50.00 Hz. The other purpose is to restore any imbalances on the interconnections to the agreed plan.

Secondary reserve regulation is automatic and can be provided by generation or demand units which, by means of control equipment, respond to signals received from Energinet.

This reserve is procured as an asymmetrical product in a common Nordic market, which means that upward and downward regulation reserves are procured as separate products.

1.3.1 Technical conditions

1.3.1.1 Response and response time

Secondary reserve is primarily supplied by facilities in operation. It must be possible to supply the reserve offered within 5 minutes. Alternatively, the reserve can be supplied by a combination of facilities in operation and fast-start facilities.

It must be possible to maintain regulation continuously.

The regulation signal is sent online as a power rating from Energinet to the balance-responsible party with reference to the bid. At the BRP's request, the regulation signal can be sent to a specific unit in the balance responsible party's portfolio, but Energinet will only send one regulation signal per BRP that will cover the market participant's total obligations.

1.3.1.2 Information/data

All generation or demand units supplying or contributing to the supply of aFRR reserves must be connected via information technology to Energinet's Control Centre in Erritsø. For each individual generation or demand unit, the control centre must generally have:

- Online status reports on whether the generation or demand unit is aFRR active
- Online measurements of generation and demand (MW)
- Online or predefined electricity gradients (MW/min.)
- Online or predefined time constants (seconds).

In addition, signals for the actual regulation must be exchanged as described in 'Prequalification of units and aggregated portfolios', doc. no.: 13/80940-106. The document is available for download on Energinet's website.

Requirements and the place of delivery for reports and measurements must be agreed with Energinet.

Costs incidental to IT connections and maintenance must be borne by the supplier.

1.3.1.3 Combined deliveries

A delivery can be made up of supplies from several demand or generation units with different properties which collectively can provide the required response within the required response time. Any system providing this type of combined deliveries must be verified to Energinet and must meet the following prerequisites:

- Balance responsibility for the demand and generation units must rest with the same BRP.
- The BRP submits bids in the aFRR auction, stating that the bid concerns a supply of combined services.
- Energinet still only sends one regulation signal to the BRP. The market participant must then ensure that the signal is sent to the relevant demand and generation units and inform Energinet of the distribution.

The specific signals are listed in "Prequalification of units and aggregated portfolios", doc. no.: 13/80940-106. The document is available for download on Energinet's website.

1.3.2 Procurement of secondary reserves

Energinet's requirements are generally based on continuous assessments of all Nordic TSOs. The volume is procured through Nordic MMS at hourly level with separate auctions for upward and downward regulation. For a more detailed description of the Nordic platform, please see www.nordicbalancingmodel.net.

Energinet publishes the expected aFRR reserve requirement, stated in MW, continuously from the time of auction opening, with binding requirements no later than two hours before the auction ends. The requirement is published through Nordic MMS.

1.3.2.1 Participant bids

Bids for daily aFRR capacity auctions must be submitted via ECP to Nordic MMS, with bids being submitted seven days before the day of operation at the earliest and by 07:30 on the day before the day of operation at the latest.

Market participants may change submitted bids until 07:30 on the day before the day of operation. The bids are binding from this time.

Bids must be specified for each hour of the day of operation, stating the direction of the regulation and not including decimals. Bids can be specified as divisible or indivisible, which determines whether a bid may be divided or must be accepted in its entirety. Indivisible bids have a maximum bid size of 50 MW. Moreover, the market participant may use block bids and bid curves.

The aggregated bid volume must not exceed the prequalified amount approved by Energinet. The minimum bid size is 1 MW.

1.3.2.2 Energinet's acceptance of bids

Bids are selected with a view to minimising the socio-economic delivery costs. This means that upward and downward regulation bids are selected to minimise the sum total of all accepted bids, valued based on the individual bid costs, including costs of reserving transmission capacity across bidding zones. Optimisation is done using an algorithm at Nordic MMS, and this process may result in bids being skipped to minimise socio-economic costs.

1.3.2.3 Pricing and payment

All accepted bids will receive an availability payment corresponding to the highest bid accepted for the bidding area.

The energy supplied from activated aFRR is calculated on the basis of registrations in Energinet's SCADA system as an integrated value of expected activated power per quarter. Upward regulation is settled at the highest of the elspot and regulating power prices for upward regulation, while downward regulation is settled at the lowest of the elspot and regulating power prices for downward regulation.

1.3.2.4 Feedback to market participant

The auction result is published by Nordic MMS by 09:20 on the day before the day of operation, and market participants that have submitted bids will be notified of the result by Nordic MMS.

1.3.2.5 Obligations of market participant

For availability payment to be effected, the capacity must in fact be available. This means that availability payment is cancelled, and the market participant must cover any additional costs incurred in connection with cover purchases if it subsequently turns out that the capacity is not available, for example due to breakdowns, see sections 2.2 and 2.3.

In case of incidents which mean that a facility cannot supply aFRR, the reserve must be re-established at one or more facilities capable of supplying the reserve as soon as possible and within 30 minutes of the incident at the latest. If the supplier is unable to re-establish the reserve, Energinet should be contacted within 15 minutes and informed where and when the reserve can be re-established.

1.3.3 Checking the services

The services are checked on a sample basis and in case of major incidents. The check will consist of Energinet requesting documentation from the market participant's SCADA system, showing the responses of the facilities which have supplied aFRR at the given time.

Following an enquiry from Energinet, the market participant has up to five weekdays to provide the necessary documentation to enable Energinet to validate delivery.

1.4 Frequency-controlled normal operation reserve, DK2 (FCR-N)

In the event of frequency deviations, the frequency-controlled normal operation reserve ensures that the equilibrium between generation and demand is restored, keeping the frequency close to 50 Hz.

Frequency-controlled normal operation reserve is automatic regulation provided by generation or demand units which, by means of control equipment, respond to grid frequency deviations. Frequency-controlled normal operation reserve consists of both upward and downward regulation and is provided as a symmetrical reserve where upward and downward regulation reserves are procured together.

The TSOs within the Nordic synchronous area are jointly responsible for the supply of frequency-controlled normal operation reserves.

Each individual TSO contributes to the total frequency-controlled normal operation reserve in the ENTSO-E RG Nordic grid. The combined requirement in the ENTSO-E RG Nordic grid is 600 MW, of which Energinet is obliged to supply a proportionate share. The share to be supplied by Energinet is determined by generation in eastern Denmark relative to the entire ENTSO-E RG Nordic generation and is determined once a year for a calendar year at a time.

Energinet procures the frequency-controlled normal operation reserve through daily auctions in collaboration with Svenska kraftnät. The required volume is published on Energinet's website. In 2023, Energinet's share is 18 MW, while Svenska kraftnät's share is 240 MW.

1.4.1 Technical conditions

1.4.1.1 Response and response time

The normal operation reserve must be supplied at a frequency deviation of up to +/-100 mHz relative to the reference frequency of 50 Hz. This means in the 49.9-50.1 Hz range. Deliveries must be made without deadband.

The reserve must as a minimum be supplied linearly at frequency deviations of between 0 and 100 mHz. The activated reserve must supply 63% within 60 seconds and 95% within 3 minutes.

A delay of maximum 2.5 seconds at response start-up is allowed, but the response must then be within the permissible area.

It must be possible to maintain regulation continuously.

1.4.1.2 Requirements for units with limited energy reservoirs (LERs)

Units or groups of units that cannot provide full energy supply for four consecutive hours are considered units with limited energy reservoirs.

To ensure continuity and stability in FCR-N deliveries from LER units/portfolios, more requirements will be made in connection with the prequalification, including:

- LER units/portfolios must have an Energy Management system consisting of a system for normal state (NEM) and one for alert state (AEM).
- LER units/portfolios must have storage capacity of minimum 1 hour to handle long lasting frequency deviations.

- To ensure scope for action for the energy management system, LER units/portfolios must reserve 20% of the capacity for this purpose. The 20% cannot be sold on the market.

The reduction requirement for rated output will not be applicable if a solution is implemented where the energy management system does not affect the rated FCR-N output of the LER unit/portfolio. Neither will the reduction requirement apply if the portfolio is composed in a way that allows the energy supply to be provided in full for four consecutive hours or if an installation is approved with a size that ensures that enables continuous delivery over four hours, for example a battery with 1 MW recharging/discharging and with 4 MWh storage capacity.

1.4.1.3 Accuracy of measurements

The accuracy of frequency measurements for frequency-controlled normal operation reserves must be better than 10 mHz. The sensitivity of frequency measurements must be better than +/-10 mHz.

The resolution of the market participant's SCADA system must be better than 1 second, and selected signals must be able to document the facilities' response to frequency deviations. The supplier must store the signals for at least one week.

1.4.1.4 Combined deliveries

A delivery may be made up of supplies from several generation units with different properties which collectively can provide the required response within the required response time. A delivery may also be made up of supplies from several demand units with different properties which collectively can provide the required response within the required response time. Any system for such combined deliveries must be verified to Energinet.

A delivery can be made up of mixed supplies from demand and generation units, if the same BRP has balance responsibility for both the demand and generation units.

1.4.2 Daily procurement of frequency-controlled normal operation reserve

Energinet procures frequency-controlled normal operation reserve in collaboration with Svenska kraftnät. Frequency-controlled normal operation reserve is procured as a symmetrical product where the supplier must also provide upward regulation power (in case of underfrequency) and downward regulation power (in case of overfrequency). Energinet's and Svenska kraftnät's combined required volume (258 MW in 2023) is procured at daily auctions where part of the required volume is procured early on the day before the day of operation (D-1 early) and the remaining part is procured later at the day before the day of operation (D-1 late).

The supplier can submit bids hourly or as block bids. Block bids submitted at the early auction (D-1 early) may have a duration of up to six hours. Block bids submitted at the late auction (D-1 late) may have a duration of up to three hours. The market participant determines the hour at which the block bid commences. However, the block bid must end within the day of operation.

1.4.2.1 Participant bids

Bids in connection with daily capacity auctions should be submitted to Energinet via Ediel or via the Self-service portal.

Bids submitted to the early auction (D-1 early) must be submitted so that they reach Energinet no later than 00.30 a.m. the day before the day of operation. Registration is based on Energinet's automatic registration of time of receipt. Bids received after 00.30 a.m. are rejected unless all participating bidders are otherwise notified by email.

The market participant can change bids already submitted for D-1 early auction until 00.30 a.m. Bids received by Energinet by 00.30 a.m. the day before the day of operation are binding on the bidder.

Bids submitted to the late auction (D-1 late) must be submitted so that they reach Energinet no later than 6.00 p.m. on the day before the day of operation. Registration is based on Energinet's automatic registration of time of receipt. Bids received after 6.00 p.m. are rejected unless all participating bidders are otherwise notified by email.

The market participant can change bids already submitted for D-1 until 6.00 p.m. Bids already received by Energinet by 6.00 p.m. on the day before the day of operation are binding on the bidder.

The bids must state an hour-by-hour volume and a price for the day of operation. Both volume and price must always be stated with a positive sign when it comes to the market participant's sales. If the market participant wants to cancel/buy back quantities sold in the D-1 early auction, this is possible in the D-1 late auction by making a bid with a negative volume priced at zero. Generally, a bid time series must use the same price for all quantities in the time series – meaning that volumes may change from hour to hour, but the price must be fixed.

The volume stated is the number of MWs which the bidder is offering to make available. If the market participant uses block bids, the volume must be the same within each block. Price is the price per MW asked by the bidder to make the volume stated available. The price must be stated as a price per MW per hour. If the market participant uses block bids, the price must be the same for the entire block. If the market participant uses block bids and the market participant's bid states different prices or volumes for the individual hourly periods of a block, the price and volume stated for the first hour of the block will be applied.

Each bid must be entered for a minimum of 0.1 MW and must always be stated in MW to one decimal point, and the price must be stated in DKK/MW or EUR/MW to two decimal points.

If a market participant submits a bid in DKK/MW, Energinet will convert the bid to EUR/MW before forwarding it to Svenska kraftnät. Energinet always uses the latest official listed price from Nord Pool on the day the auction is held. If a market participant submits a bid in EUR/MW, Energinet will forward the bid directly to Svenska kraftnät.

1.4.2.2 Acceptance of bids

As a general rule, bids for frequency-controlled normal operation reserve are always sorted according to the price per MW, and Energinet's and Svenska kraftnät's combined required volume is covered by selecting the bids according to increasing price; however, such that the TSOs incur the least costs. This approach can cause bids below the marginal price to be skipped.

Bids are always accepted in their entirety or not at all.

If two bids are priced the same, and Energinet and Svenska kraftnät only need one, a mechanical random generator is used to select the bid to be included in the solution. The same applies if three or more bids are priced the same.

If the amount of bids submitted does not sufficiently cover Energinet's and Svenska kraftnät's required volume, Energinet will send an e-mail to all market participants asking them to submit more bids.

1.4.2.3 Transfer of supply obligation to other market participant

When it is ascertained before 6:00 p.m. on the day before the day of operation that the market player, with his portfolio, will be unable to deliver the agreed FCR service for the coming day of operation, it is expected that the player will adjust his delivery obligation via repurchases in the D-1 late auction, cf. section 1.4.2.1.

If the player recognizes after 6:00 p.m. on the day before the day of operation that he will not be able to deliver the agreed FCR service during the actual day of operation, the player has two options:

- Inform Energinet that he is not able to supply. Energinet will then initiate covering purchases via Svenska kraftnät, and the player will be set off according to the principles in section 1.4.2.4.

- The market participant may enter into an agreement with another market participant that he will take over FCR deliveries – in full or in part.

If a market participant wishes to assign its FCR delivery obligations – in full or in part – to an another maket player, he must send an email to kontrolcenterel@energinet.dk specifying 'Transfer of FCR supply obligation' in the subject field.

The message must state – hour-by-hour – the volumes in MW to be transferred to another player, and the request must be accompanied by an acceptance of the transmission from the receiving player.

Before the transfer can be effective, Energinet must approve the transfer by sending an email to the requesting player.

Transfer of FCR delivery obligations can only take place within its own bidding area, and settlement of the agreed FCR services will continue to take place to the market participant which originally committed himself to supplying the FCR services.

1.4.2.4 Pricing and payment

All accepted bids for frequency-controlled normal operation reserves receive an availability payment corresponding to the highest bid accepted (pay-as-cleared).

When buying back sold capacity in the D-1 early auction, the cost of the buyback is equal to the marginal price of the most expensive purchased bid from either the D-1 early auction or the D-1 late auction.

In the event of non-delivery during the day of operation, the set-off price is determined as the greater of the marginal prices in either the D-1 early auction, the D-1 late auction or the price for cover purchases during the day of operation.

Energy supplied from FCR-N upward regulation reserves is settled per MWh with the regulating power price for upward regulation. Energy supplied from FCR-N downward regulation reserves is settled per MWh with the regulating power price for downward regulation.

The energy supplied is calculated on the basis of registrations in Energinet's SCADA system as an integrated value of expected activated output per hour.

1.4.2.5 Feedback to market participant

For bids submitted to the auction D-1, at 00:30 a.m., Energinet will inform the market participant of the bid accepted by Energinet/Svenska kraftnät by 06.30 the day before the day of operation.

For bids submitted to the D-1 auction, at 06:00 p.m., Energinet will inform the market participant of the bid accepted by Energinet/Svenska kraftnät by 07.00 p.m. on the day before the day of operation.

In addition, Energinet/Svenska kraftnät will publish the total volumes procured at the D-1 early and D-1 late auctions, respectively, complete with average prices.

Energinet does not send reserve activation signals during the day of operation. Activation of reserves is based on the supplier's own frequency measurements.

1.4.2.6 Obligations of market participant

For availability payment to be effected, the capacity must in fact be available. This means that availability payment is cancelled, and the market participant must cover any additional costs incurred in connection with cover purchases if it subsequently turns out that the capacity is not available, for example due to breakdowns, see sections 2.2 and 2.3.

In case of incidents which mean that a facility cannot supply frequency-controlled normal operation reserve, the reserve must be re-established at one or more facilities which can supply the reserve as soon as possible and within 30 minutes of the incident at the latest. If the supplier is unable to re-establish the reserve, Energinet should be contacted within 15 minutes and informed where and when the reserve can be re-established.

1.4.3 Checking the services

The services are checked on a sample basis and in case of significant frequency deviations. Energinet's checking takes the form of requesting documentation from the market participant's SCADA system of the facilities' response to naturally occurring frequency deviations, see section 1.4.1.3.

Following an enquiry from Energinet, the market participant has up to five weekdays to provide the necessary documentation to enable Energinet to validate delivery.

1.5 Frequency-controlled disturbance reserve, DK2 (FCR-D upward regulation)

In the event of major system disturbances, the frequency-controlled disturbance reserve is a fast reserve used for regulating the frequency following substantial frequency drops resulting from the outage of major generation units or lines.

Frequency-controlled disturbance reserve is an automatic upward regulation reserve provided by generation or demand units which, by means of control equipment, respond to grid frequency deviations. The reserve is activated automatically in the event of sudden frequency drops to under 49.9 Hz and remains active until balance has been restored or until the manual reserve takes over the supply of power.

Each individual TSO contributes to the total frequency-controlled disturbance reserve in the ENTSO-E RG Nordic grid. The total volume in ENTSO-E RG Nordic is the dimensioning fault (largest nuclear power station in operation). Energinet is obliged to contribute a proportional share. Energinet' share is determined using generation and demand in eastern Denmark relative to the entire ENTSO-E RG Nordic generation and demand and is determined once a year for a calendar year.

Energinet procures FCR-D upward regulation through daily auctions in collaboration with Svenska kraftnät. The required volume is published on Energinet's website. In 2023, Energinet's total requirement was 44 MW, and Svenska kraftnät's requirement was 580 MW.

1.5.1 Technical conditions

1.5.1.1 Response and response time

Frequency-controlled disturbance reserve can be delivered in two ways: As a dynamic reserve or a static reserve.

The dynamic reserve must be able to:

- Supply inverse power at both activation and deactivation at frequencies between 49.9 and 49.5 Hz
- Deliver a response within 2.5 seconds
- Supply 86% of the response within 7.5 seconds
- Supply energy within 7.5 seconds corresponding to 3.2 seconds times the power sold.

The static reserve must be able to:

- Supply inverse power at activation at frequencies between 49.9 and 49.5 Hz
- Deliver a response within 2.5 seconds
- Supply 86% of the response within 7.5 seconds
- Supply energy within 7.5 seconds corresponding to 3.2 seconds times the volume sold
- Deactivate within 15 minutes

1.5.1.2 Requirements for units with limited energy reservoirs (LERs)

Units or groups of units that cannot provide full energy supply for two consecutive hours are considered units with limited energy reservoirs.

To ensure continuity and stability in FCR-D deliveries from LER units/portfolios, more requirements will be made in connection with the prequalification, including:

- LER units/portfolios must have an Energy Management system consisting of a system for normal state (NEM) and one for alert state (AEM).
- LER units/portfolios must have storage capacity of minimum 20 minutes to handle long lasting frequency deviations.
- To ensure scope for action for the energy management system, LER units/portfolios must reserve 20% of the capacity for this purpose. The 20% cannot be sold on the market.

The reduction requirement for rated output will not be applicable if a solution is implemented where the energy management system does not affect the rated FCR-D output of the LER unit/portfolio. Neither will the reduction requirement apply if the portfolio is composed in a way that allows the energy supply to be provided in full for two consecutive hours or if an installation is approved with a size that ensures that enables continuous delivery over two hours, for example a battery with 1 MW recharging/discharging and with 2 MWh storage capacity.

1.5.1.3 Accuracy of measurements

The accuracy of frequency measurements for frequency-controlled disturbance reserve must be better than 10 mHz. The sensitivity of frequency measurements must be better than +/-10 mHz.

The resolution of the market participant's SCADA system must be better than 1 second, and selected signals must be able to document the facilities' response to frequency deviations. The supplier must store the signals for at least one week.

1.5.1.4 Combined deliveries

A delivery can be made up of supplies from several generation units with different properties which collectively can provide the required response within the required response time. A delivery may also be made up of supplies from several demand units with different properties which collectively can provide the required response within the required response time. Moreover, a delivery can be made up of mixed supplies from demand and generation units, if the same BRP has balance responsibility for both the demand and generation units. Any system for such combined deliveries must be verified to Energinet.

1.5.2 Daily procurement of frequency-controlled disturbance reserve

Energinet procures frequency-controlled disturbance reserve as upward regulation power in collaboration with Svenska kraftnät. Energinet's and Svenska kraftnät's total requirement (approx. 624 MW in 2023) is procured at daily auctions where part of the required volume is procured early on the day before the day of operation (D-1 early) and the remaining part is procured later at the day before the day of operation (D-1 late).

The supplier can submit bids hourly or as block bids. Block bids submitted at the early auction (D-1 early) may have a duration of up to six hours. Block bids submitted at the late auction (D-1 late) may have a duration of up to three hours. The market participant determines the hour at which the block bid commences. However, the block bid must end within the day of operation.

1.5.2.1 Participant bids

Bids in connection with daily capacity auctions should be submitted to Energinet via Ediel or via the Self-service portal.

Bids submitted to the early auction (D-1 early) must be submitted so that they reach Energinet no later than 00.30 a.m. the day before the day of operation. Registration is based on Energinet's automatic registration of time of receipt. Bids received after 00.30 a.m. are rejected unless all participating bidders are otherwise notified by email.

The market participant can change bids already submitted for D-1 early auction until 00.30 a.m. Bids received by Energinet by 00.30 a.m. the day before the day of operation are binding on the bidder.

Bids submitted to the late auction (D-1 late) must be submitted so that they reach Energinet no later than 6.00 p.m. on the day before the day of operation. Registration is based on Energinet's automatic registration of time of receipt. Bids received after 6.00 p.m. are rejected unless all participating bidders are otherwise notified by email.

The market participant can change bids already submitted for D-1 until 6.00 p.m. Bids already received by Energinet by 6.00 p.m. on the day before the day of operation are binding on the bidder.

The bids must state an hour-by-hour volume and a price for the day of operation. Both volume and price must always be stated with a positive sign when it comes to the market participant's sales. If the market participant wants to cancel/buy back quantities sold in the D-1 early auction, this is possible in the D-1 late auction by making a bid with a negative volume priced at zero. Generally, a bid time series must use the same price for all quantities in the time series – meaning that volumes may change from hour to hour, but the price must be fixed.

The volume stated is the number of MWs which the bidder is offering to make available. If the market participant uses block bids, the volume must be the same within each block. Price is the price per MW asked by the bidder to make the volume stated available. The price must be stated as a price per MW per hour. If the market participant uses block bids, the price must be the same for the entire block. If the market participant uses block bids and the market participant's bid states different prices or volumes for the individual hourly periods of a block, the price and volume stated for the first hour of the block will be applied.

Each bid must be entered for a minimum of 0.1 MW and must always be stated in MW to one decimal point, and the price must be stated in DKK/MW or EUR/MW to two decimal points.

If a market participant submits a bid in DKK/MW, Energinet will convert the bid to EUR/MW before forwarding it to Svenska kraftnät. Energinet always uses the latest official listed price from Nord Pool on the day the auction is held. If a market participant submits a bid in EUR/MW, Energinet will forward the bid directly to Svenska kraftnät.

1.5.2.2 Acceptance of bids

As a general rule, bids for frequency-controlled disturbance reserve are always sorted according to the price per MW, and Energinet's and Svenska kraftnät's combined required volume is covered by selecting the bids according to increasing price; however, such that the TSOs incur the least costs. This approach can cause bids below the marginal price to be skipped.

Bids are always accepted in their entirety or not at all.

If two bids are priced the same, and Energinet and Svenska kraftnät only need one, a mechanical random generator is used to select the bid to be included in the solution. The same applies if three or more bids are priced the same.

If the amount of bids submitted does not sufficiently cover Energinet's and Svenska kraftnät's required volume, Energinet will send an e-mail to all market participants asking them to submit more bids.

1.5.2.3 Transfer of supply obligation to other market participant

When it is ascertained before 6:00 p.m. on the day before the day of operation that the market player, with his portfolio, will be unable to deliver the agreed FCR service for the coming day of operation, it is expected that the player will adjust his delivery obligation via repurchases in the D-1 late auction, cf. section 1.5.2.1.

If the player recognizes after 6:00 p.m. on the day before the day of operation that he will not be able to deliver the agreed FCR service during the actual day of operation, the player has two options:

- Inform Energinet that he is not able to supply. Energinet will then initiate covering purchases via Svenska kraftnät, and the player will be set off according to the principles in section 1.5.2.4.

- The market participant may enter into an agreement with another market participant that he will take over FCR deliveries – in full or in part.

If a market participant wishes to assign its FCR delivery obligations – in full or in part – to an another maket player, he must send an email to kontrolcenterel@energinet.dk specifying 'Transfer of FCR supply obligation' in the subject field.

The message must state – hour-by-hour – the volumes in MW to be transferred to another player, and the request must be accompanied by an acceptance of the transmission from the receiving player.

Before the transfer can be effective, Energinet must approve the transfer by sending an email to the requesting player.

Transfer of FCR delivery obligations can only take place within its own bidding area, and settlement of the agreed FCR services will continue to take place to the market participant which originally committed himself to supplying the FCR services.

1.5.2.4 Pricing and payment

All accepted bids for frequency-controlled normal operation reserves receive an availability payment corresponding to the highest bid accepted (pay-as-cleared).

When buying back sold capacity in the D-1 early auction, the cost of the buyback is equal to the marginal price of the most expensive purchased bid from either the D-1 early auction or the D-1 late auction.

In the event of non-delivery during the day of operation, the set-off price is determined as the greater of the marginal prices in either the D-1 early auction, the D-1 late auction or the price for cover purchases during the day of operation.

No calculation is made of energy volumes supplied from frequency-controlled disturbance reserves. Supplies of energy from FCR-D reserves are settled as ordinary imbalances by the market participants with balance responsibility for the units in question.

1.5.2.5 Feedback to market participant

For bids submitted to the D-1 auction at 00.30 a.m., Energinet will inform the market participant of the bid accepted by Energinet/Svenska kraftnät by 06.00 a.m. the day before the day of operation.

For bids submitted to the D-1 auction at 6:00 p.m., Energinet will inform the market participant of the bid accepted by Energinet/Svenska kraftnät by 07.00 p.m. on the day before the day of operation.

In addition, Energinet/Svenska kraftnät will publish the total volumes procured at the D-1 early and D-1 late auctions, respectively, complete with average prices.

Energinet does not send reserve activation signals during the day of operation. Activation of reserves is based on the supplier's own frequency measurements.

1.5.2.6 Obligations of market participant

For availability payment to be effected, the capacity must in fact be available. This means that availability payment is cancelled, and the market participant must cover any additional costs incurred in connection with cover purchases if it subsequently turns out that the capacity is not available, for example due to breakdowns, see sections 2.2 and 2.3.

In case of incidents which mean that a facility cannot supply FCR-D, the reserve must be re-established at one or more facilities capable of supplying the reserve as soon as possible and within 30 minutes of the incident at the latest. If the supplier is unable to re-establish the reserve, Energinet should be contacted within 15 minutes and informed where and when the reserve can be re-established.

1.5.3 Checking the services

The services are checked on a sample basis and in case of significant frequency deviations. Energinet's checking takes the form of requesting documentation from the market participant's SCADA system of the facilities' response to naturally occurring frequency deviations, see section 1.5.1.3.

Following an enquiry from Energinet, the market participant has up to five weekdays to provide the necessary documentation to enable Energinet to validate delivery.

1.6 Frequency-controlled disturbance reserve, DK2 (FCR-D downward regulation)

In the event of major system disturbances, the frequency-controlled disturbance reserve is a fast reserve used to regulate the frequency following substantial frequency increases resulting from the outage of major transmission lines.

The frequency-controlled disturbance reserve is an automatic downward regulation reserve provided by generation or demand units which, by means of control equipment, responds to grid frequency deviations. The reserve is activated automatically in the event of a sudden frequency increase of 50.1 Hz and remains active until balance has been restored or until the manual reserve takes over the supply of power.

Each individual TSO contributes to the total frequency-controlled disturbance reserve in the ENTSO-E RG Nordic grid. The total volume in ENTSO-E RG Nordic is the dimensioning fault (largest nuclear power station in operation). Energinet is obliged to contribute a proportional share. Energinet' share is determined using generation and demand in eastern Denmark relative to the entire ENTSO-E RG Nordic generation and demand and is determined once a year for a calendar year.

Energinet procures the frequency-controlled disturbance reserve through daily auctions in collaboration with Svenska kraftnät. The required volume is published on Energinet's website. In 2023, Energinet's total share is 43 MW and Svenska kraftnät's requirement is currently 275 MW.

1.6.1 Technical conditions

1.6.1.1 Response and response time

Frequency-controlled disturbance reserve can be delivered in two ways: As a dynamic reserve or a static reserve.

The dynamic reserve must be able to:

- Supply inverse power at both activation and deactivation at frequencies between 50.1 and 50.5 Hz
- Deliver a response within 2.5 seconds
- Supply 86% of the response within 7.5 seconds
- Supply energy within 7.5 seconds corresponding to 3.2 seconds times the volume sold

The static reserve must be able to:

- Supply inverse power at activation at frequencies between 50.1 and 50.5 Hz
- Deliver a response within 2.5 seconds
- Supply 86% of the response within 7.5 seconds
- Supply energy within 7.5 seconds corresponding to 3.2 seconds times the volume sold
- Deactivate within 15 minutes

1.6.1.2 Requirements for units with limited energy reservoirs (LERs)

Units or groups of units that cannot provide full energy supply for two consecutive hours are considered units with limited energy reservoirs.

To ensure continuity and stability in FCR-D deliveries from LER units/portfolios, more requirements will be made in connection with the prequalification, including:

- LER units/portfolios must have an Energy Management system consisting of a system for normal state (NEM) and one for alert state (AEM).
- LER units/portfolios must have storage capacity of minimum 20 minutes to handle long lasting frequency deviations.
- To ensure scope for action for the energy management system, LER units/portfolios must reserve 20% of the capacity for this purpose. The 20% cannot be sold on the market.

The reduction requirement for rated output will not be applicable if a solution is implemented where the energy management system does not affect the rated FCR-D output of the LER unit/portfolio. Neither will the reduction requirement apply if the portfolio is composed in a way that allows the energy supply to be provided in full for two consecutive hours or if an installation is approved with a size that ensures that enables continuous delivery over two hours, for example a battery with 1 MW recharging/discharging and with 2 MWh storage capacity.

1.6.1.3 Accuracy of measurements

The accuracy of frequency measurements for frequency-controlled disturbance reserve must be better than 10 mHz. The sensitivity of frequency measurements must be better than +/-10 mHz.

The resolution of the market participant's SCADA system must be better than 1 second, and selected signals must be able to document the facilities' response to frequency deviations. The supplier must store the signals for at least one week.

1.6.1.4 Combined deliveries

A delivery may be made up of supplies from several generation units with different properties which collectively can provide the required response within the required response time. A delivery may also be made up of supplies from several demand units with different properties which collectively can provide the required response within the required response time. Moreover, a delivery can be made up of mixed supplies from demand and generation units, if the same BRP has balance responsibility for both the demand and generation units. Any system for such combined deliveries must be verified to Energinet.

1.6.2 Daily procurement of frequency-controlled disturbance reserve

Energinet procures FCR-D downward regulation in collaboration with Svenska kraftnät. Energinet's and Svenska kraftnät's total requirement (318 MW in Q3, 2023) is procured at daily auctions where part of the required volume is procured early the day before the day of operation (D-1 early) and the remaining part is procured later on the day before the day of operation (D-1 late).

The supplier can submit bids hourly or as block bids. Block bids submitted at the early auction (D-1 early) may have a duration of up to six hours. Block bids submitted at the late auction (D-1 late) may have a duration of up to three hours. The market participant determines the hour at which the block bid commences. However, the block bid must end within the day of operation.

1.6.2.1 Participant bids

Bids in connection with daily capacity auctions should be submitted to Energinet via Ediel or via the Self-service portal.

Bids submitted to the early auction (D-1 early) must be submitted so that they reach Energinet no later than 00.30 a.m. the day before the day of operation. Registration is based on Energinet's automatic registration of time of receipt. Bids received after 00.30 a.m. are rejected unless all participating bidders are otherwise notified by email.

The market participant can change bids already submitted for D-1 early auction until 00.30 a.m. Bids received by Energinet by 00.30 a.m. the day before the day of operation are binding on the bidder.

Bids submitted to the late auction (D-1 late) must be submitted so that they reach Energinet no later than 6.00 p.m. on the day before the day of operation. Registration is based on Energinet's automatic registration of time of receipt. Bids received after 6.00 p.m. are rejected unless all participating bidders are otherwise notified by email.

The market participant can change bids already submitted for D-1 until 6.00 p.m. Bids already received by Energinet by 6.00 p.m. on the day before the day of operation are binding on the bidder.

The bids must state an hour-by-hour volume and a price for the day of operation. Both volume and price must always be stated with a positive sign when it comes to the market participant's sales. If the market participant wants to cancel/buy back quantities sold in the D-1 early auction, this is possible in the D-1 late auction by making a bid with a negative volume priced at zero. Generally, a bid time series must use the same price for all quantities in the time series – meaning that volumes may change from hour to hour, but the price must be fixed.

The volume stated is the number of MWs which the bidder is offering to make available. If the market participant uses block bids, the volume must be the same within each block. Price is the price per MW asked by the bidder to make the volume stated available. The price must be stated as a price per MW per hour. If the market participant uses block bids, the price must be the same for the entire block. If the market participant uses block bids and the market participant's bid states different prices or volumes for the individual hourly periods of a block, the price and volume stated for the first hour of the block will be applied.

Each bid must be entered for a minimum of 0.1 MW and must always be stated in MW to one decimal point, and the price must be stated in DKK/MW or EUR/MW to two decimal points.

If a market participant submits a bid in DKK/MW, Energinet will convert the bid to EUR/MW before forwarding it to Svenska kraftnät. Energinet always uses the latest official listed price from Nord Pool on the day the auction is held. If a market participant submits a bid in EUR/MW, Energinet will forward the bid directly to Svenska kraftnät.

1.6.2.2 Acceptance of bids

As a general rule, bids for frequency-controlled dsiturbance reserve are always sorted according to the price per MW, and Energinet's and Svenska kraftnät's combined required volume is covered by selecting the bids according to increasing price; however, such that the TSOs incur the least costs. This approach can cause bids below the marginal price to be skipped.

Bids are always accepted in their entirety or not at all.

If two bids are priced the same, and Energinet and Svenska kraftnät only need one, a mechanical random generator is used to select the bid to be included in the solution. The same applies if three or more bids are priced the same.

If the amount of bids submitted does not sufficiently cover Energinet's and Svenska kraftnät's required volume, Energinet will send an e-mail to all market participants asking them to submit more bids.

1.6.2.3 Transfer of supply obligation to other market participant

When it is ascertained before 6:00 p.m. on the day before the day of operation that the market player, with his portfolio, will be unable to deliver the agreed FCR service for the coming day of operation, it is expected that the player will adjust his delivery obligation via repurchases in the D-1 late auction, cf. section 1.6.2.1.

If the player recognizes after 6:00 p.m. on the day before the day of operation that he will not be able to deliver the agreed FCR service during the actual day of operation, the player has two options:

- Inform Energinet that he is not able to supply. Energinet will then initiate covering purchases via Svenska kraftnät, and the player will be set off according to the principles in section 1.6.2.4.

- The market participant may enter into an agreement with another market participant that he will take over FCR deliveries – in full or in part.

If a market participant wishes to assign its FCR delivery obligations – in full or in part – to an another market player, he must send an email to kontrolcenterel@energinet.dk specifying 'Transfer of FCR supply obligation' in the subject field.

The message must state – hour-by-hour – the volumes in MW to be transferred to another player, and the request must be accompanied by an acceptance of the transmission from the receiving player.

Before the transfer can be effective, Energinet must approve the transfer by sending an email to the requesting player.

Transfer of FCR delivery obligations can only take place within its own bidding area, and settlement of the agreed FCR services will continue to take place to the market participant which originally committed himself to supplying the FCR services.

1.6.2.4 Pricing and payment

All accepted bids for frequency-controlled normal operation reserves receive an availability payment corresponding to the highest bid accepted (pay-as-cleared).

When buying back sold capacity in the D-1 early auction, the cost of the buyback is equal to the marginal price of the most expensive purchased bid from either the D-1 early auction or the D-1 late auction.

In the event of non-delivery during the day of operation, the set-off price is determined as the greater of the marginal prices in either the D-1 early auction, the D-1 late auction or the price for cover purchases during the day of operation.

No calculation is made of energy volumes supplied from frequency-controlled disturbance reserves. Supplies of energy from FCR-D reserves are settled as ordinary imbalances by the market participants with balance responsibility for the units in question.

1.6.2.5 Feedback to market participant

For bids submitted to the D-1 auction at 00.30 a.m., Energinet will inform the market participant of the bid accepted by Energinet/Svenska kraftnät by 06.00 a.m. the day before the day of operation.

For bids submitted to the D-1 auction at 6:00 p.m., Energinet will inform the market participant of the bid accepted by Energinet/Svenska kraftnät by 07.00 p.m. on the day before the day of operation.

In addition, Energinet/Svenska kraftnät will publish the total volumes procured at the D-1 early and D-1 late auctions, respectively, complete with average prices.

Energinet does not send reserve activation signals during the day of operation. Activation of reserves is based on the supplier's own frequency measurements.

1.6.2.6 Obligations of market participant

For availability payment to be effected, the capacity must in fact be available. This means that availability payment is cancelled, and the market participant must cover any additional costs incurred in connection with cover purchases if it subsequently turns out that the capacity is not available, for example due to breakdowns, see sections 2.2 and 2.3.

In case of incidents which mean that a facility cannot supply FCR-D, the reserve must be re-established at one or more facilities capable of supplying the reserve as soon as possible and within 30 minutes of the incident at the latest. If the supplier is unable to re-establish the reserve, Energinet should be contacted within 15 minutes and informed where and when the reserve can be re-established.

1.6.3 Checking the services

The services are checked on a sample basis and in case of significant frequency deviations. Energinet's checking takes the form of requesting documentation from the market participant's SCADA system of the facilities' response to naturally occurring frequency deviations, see section 1.5.1.3.

Following an enquiry from Energinet, the market participant has up to five weekdays to provide the necessary documentation to enable Energinet to validate delivery.

1.7 Fast Frequency Reserve, DK2 (FFR)

In the event of major system disturbances in low inertia situations, the Fast Frequency Reserve (FFR) is a fast reserve used to regulate the frequency in case of substantial frequency drops resulting from the outage of major generation units or lines. FFR is necessary in situations with low inertia as frequency-controlled disturbance reserves (FCR-D) in the Nordic synchronous area cannot by itself maintain frequency above the specified threshold values in these situations in the event of major outages.

FFR is an automatic upward regulation reserve provided by generation or demand units which, by means of control equipment, respond to grid frequency deviations. The reserve is activated automatically at frequency dips below 49.7/49.6/49.5 Hz and remains active until FCR-D has been fully activated.

Each individual TSO contributes to the total FFR in the ENTSO-E RG Nordic grid. The total volume in ENTSO-E RG Nordic is inversely proportional to system inertia, and proportional to the largest incident. The total volume is dynamic due to the proportionality to system inertia, which changes hourly. Energinet is obliged to contribute a proportional share. Energinet' share is determined using generation and demand in eastern Denmark relative to the entire ENTSO-E RG Nordic generation and demand and is determined once a year for a calendar year.

Energinet procures FFR per hour at daily auctions on a national market. The required volume is published on Energinet's website. In 2020, Energinet's total share was 0-45 MW. System inertia is high in winter months and low in summer months. Therefore, the need for FFR is often non-existent in the winter months, and it is highest on summer weekend nights.

1.7.1 Technical conditions

1.7.1.1 Response and response time

FFR must be activated and delivered at under frequencies of 300, 400 or 500 mHz relative to the 50 Hz reference frequency, i.e. at either 49.7, 49.6 or 49.5 Hz. It is possible to choose freely between these three options.

The reserve is activated when the specified threshold value for frequency deviation is crossed. The maximum activation time for activation at 49.7 Hz is 1.3 seconds. For 49.6 Hz it is 1.0 seconds. For 49.5 Hz it is 0.7 seconds. It must be possible to continue regulation until the majority of the frequency-controlled disturbance reserve (FCR-D) is fully activated. This means that regulation must be kept up for at least 5 seconds, followed by maximum deactivation of 20% per second, or 30 seconds where there are no deactivation requirements.

The reserve must be restored 15 minutes after activation.

1.7.1.2 Accuracy of measurements

The accuracy of frequency measurements for FFR must be higher than 10 mHz.

The resolution of the market participant's SCADA system must be better than 1 second, and selected signals must be able to document the facilities' response to frequency deviations. The supplier must store the signals for at least one week.

1.7.1.3 Combined deliveries

A delivery may be made up of supplies from several generation units with different properties which collectively can provide the required response within the required response time. A delivery may be made up of supplies from several demand units with different properties which collectively can provide the required response within the required response time. A delivery may also be made up of supplies from several generation and demand units with different properties which collectively can provide the required response within the required response time. Any system for such combined deliveries must be verified to Energinet.

1.7.2 Daily procurement of FFR

Energinet procures FFR upward regulation power (in case of underfrequency). A daily auction is held for the coming day of operation. The auction day is per hour, and the market participant submits bids per hour.

1.7.2.1 Participant bids

Bids in connection with daily capacity auctions should be submitted to Energinet via ECP or via the Self-service portal.

Bids must be submitted so that they reach Energinet by 15.00 p.m. on the day before the day of operation. Registration is based on Energinet's automatic registration of time of receipt. Bids received after 15.00 p.m. are rejected unless all participating bidders are otherwise notified by email.

Market participants may amend bids already submitted up until 15.00 p.m. Bids received by Energinet by 15.00 p.m. are binding on the bidder.

The bids must state an hour-by-hour volume and a price for the following day of operation. The volume stated is the number of MWs which the bidder is offering to make available. Price is the price per MW per hour asked by the bidder to make the volume in question available.

Each bid must be entered for a minimum of 0.3 MW and must always be stated in MW to one decimal point, and the price must be stated in DKK/MW/h or EUR/MW/h to two decimal points.

1.7.2.2 Energinet's acceptance of bids

Energinet sorts the bids according to price per MW and covers its need by selecting bids according to increasing price.

Bids are always accepted in their entirety or not at all. In situations where the acceptance of a bid for more than 5 MW will lead to excess fulfilment of the need for reserves in the block in question, Energinet may disregard such bids.

If two bids have the same price, and Energinet only needs one, a mechanical random generator is used to select the bid to be included in the solution. The same applies if three or more bids are priced the same.

If the number of bids received is insufficient to cover Energinet's need, Energinet will send an e-mail to all market participants asking them to submit more bids.

1.7.2.3 Pricing and payment

All bids for upward regulation accepted will receive an availability payment corresponding to the price of the highest bid for upward regulation accepted (marginal price).

If only one enterprise has submitted bid(s), pricing will be based on regulated price, see section 2.1.1.

No calculation is made of energy volumes supplied from primary reserves. Supplies of energy from primary reserves are settled like ordinary imbalances.

1.7.2.4 Feedback to market participant

At 15.30, Energinet informs the market participant of the bids which Energinet has accepted and of availability payment allocated on an hour-by-hour basis.

Energinet does not send reserve activation signals during the day of operation. Activation of reserves is based on the supplier's own frequency measurements.

1.7.2.5 Obligations of market participant

For availability payment to be effected, the capacity must in fact be available. This means that availability payment is cancelled if it subsequently turns out that the capacity is not available, for example due to breakdowns, see sections 2.2 and 2.3.

In case of incidents which mean that a facility cannot supply FFR, the reserve must be re-established at one or more facilities capable of supplying the reserve as soon as possible and within 30 minutes of the incident at the latest. If the supplier is unable to re-establish the reserve, Energinet should be contacted within 15 minutes and informed where and when the reserve can be re-established.

1.7.3 Checking the services

The services are checked on a sample basis and in case of significant frequency deviations. Energinet's checking takes the form of requesting documentation from the market participant's SCADA system of the facilities' response to naturally occurring frequency deviations, see section 1.1.1.3.

1.8 Manual reserve, DK1 + DK2 (mFRR)

Manual reserve is a manual upward and downward regulation reserve which is activated by Energinet's Control Centre. The reserve is activated by manually ordering upward and downward regulation from the relevant suppliers. Energinet only buys upward regulation reserves. The reserve relieves the aFRR and the frequency-controlled normal operation reserve in the event of minor imbalances and ensures balance in the event of outages or restrictions affecting generation units and interconnections.

These reserves are offered at daily auctions and monthly auctions. Manual reserves are requested in DK1 and DK2 to meet demand in each specific hour. In DK1, the full required volume is offered at daily auctions, while DK2 offers at least 40 per cent of the required volume at daily auctions and up to 60 per cent of the required volume at monthly auctions.

The manual reserve is used to restore system balance. The reserve is activated from Energinet's Control Centre Electricity in Erritsø, Denmark, via the regulating power market.

1.8.1 Terms and conditions for daily auctions

1.8.1.1 Response and response time

The manual reserve must be supplied in full within 15 minutes of activation.

1.8.1.2 Activation

The reserve is activated by amending operational schedules or demand forecasts following the prior exchange of schedules between Energinet and the supplier.

1.8.1.3 Information/data

Each individual generation or demand unit supplying manual reserve must be connected via information technology to Energinet's Control Centre in Erritsø. The Control Centre must at least have online access to:

- Status reports concerning generation or demand unit in/out
- Measurements of the generation or demand unit's
  - Net generation or demand at the point of connection
  - Net generation by balance responsible parties.

Requirements and the place of delivery for reports and measurements must be agreed with Energinet.

Costs incidental to IT connections and maintenance must be borne by the supplier.

1.8.1.4 Combined deliveries

A delivery may be made up of supplies from several generation units with different properties which collectively can provide the required response within the required response time. A delivery may also be made up of supplies from several demand units with different properties which collectively can provide the required response within the required response time. Moreover, a delivery can be made up of mixed supplies from demand and generation units, if the same BRP has balance responsibility for both the demand and generation units. Any system for such combined deliveries must be verified to Energinet.

1.8.2 Daily procurement of manual reserve

Energinet procures two types of manual reserve at daily auctions in DK1 and DK2, i.e. upward regulation power and downward regulation power[1]. An auction is held once a day for each of the hours of the coming day of operation, see, however, section 1.8.3.

Energinet announces the expected reserve need, stated in MW, seven days ahead of the day of operation. Energinet can change the reserve need until deadline for submitting bids, i.e. D-1 at 07:30 a.m.

Under certain conditions, a special optimization method will be used which integrates the needs of the two areas. The optimization method aims to minimize Energinet's total costs for the purchase of manual reserves in DK1 and DK2.

The method will only be initiated for the coming operating day if one or more of the following three conditions are met:

- There is information that block 22 of Kyndbyværket will not be fully accessible during the coming day of operation.
- The remaining capacity in the DK2 auction for the current day has been less than 50 MW for one or more hours.
- The difference in marginal price between the DK1 and DK2 auctions for the current day without using the procedure would have been DKK 500/MWh or more.

There are a few additional conditions that must be met in order for the procedure to be initiated:

- The import capacity on the Øresund connection must be at least 650 MW.
- There must be no single rail operation in the 400 kV station Bjæverskov.
- The forecast for flow on the Great Belt must leave free capacity in the eastbound direction (ie from DK1 to DK2), and only in the hours when this is the case will the procedure be carried out. The maximum exchange of mFRR reserves across the Great Belt connection will in any case be limited to 200 MW.

1.8.2.1 Participant bids

Bids in connection with daily capacity auctions must be submitted to the Nordic platform Fifty Nordic MMS via ECP or via Fifty Nordic MMS web user interface. Communication with Fifty Nordic MMS is described in further detail in the "Implementation Guide mFRR capacity market – BSP"[2].

Bids may be submitted for a period starting from midnight, seven days before the day of operation. The deadline for submitting bids is 07:30 a.m. on the day before the day of operation. The time limit refers to Fifty Nordic MMS's automatic registration of time of receipt. Bids received after 07:30 a.m. the day before the day of operation, will be rejected.

Players may amend bids already submitted up until 7.30 a.m. The bids received by Fifty Nordic MMs by 7.30 a.m. is binding on the bidder.

[1] Since 2010, Energinet has only procured downward regulation power in exceptional cases.

[2] The Implementation Guide can be found here: https://nordicbalancingmodel.net/implementation-guides/

The bids must state an hour-by-hour volume and a price for the following day of operation. As volume is stated the number of MWs which the bidder is offering to make available during the hour in question. The price is the price per MW asked by the bidder to make the volume stated available during the hour in question.

Each bid must be entered for a minimum of 1 MW. The market participant must indicate whether bids are divisible or indivisible. Bids are considered divisible unless the market participant has stated that they are indivisible. For divisible bids the maximum size is 999 MW and for indivisible bids the maximum size is 50 MW.

Bids must always be stated in full MW and steps of 1 MW. The price must be stated in DKK/MW or EUR/MW with two decimal points.

Bids are indicated in the same way for upward and downward regulation, with a distinction being made between upward and downward regulation by means of product codes ("flow direction"). Both volume and price must thus always be indicated by a positive sign.

In the event that there are not enough bids to cover the need in the individual bid zone, Energinet may decide to extend the deadline for procuring mFRR capacity or reopen the auction. If the deadline for procuring mFRR capacity is extended, bids must be submitted so that they are received by Fifty Nordic MMS no later than 8.00 a.m. the day before the day of operation. If the auction is reopened, this will take place at 8.15 a.m. the day before the day of operation, with a new deadline for entering bids no later than 8.30 the day before the day of operation. In both cases, Energinet will announce this to the market participants.

1.8.2.2 Bid structure

The option to link bids is described in more detail in the "Implementation Guide mFRR capacity market - BSP".

The different bid couplings that are permitted are the following:

1. Simple bids: Combinations of price/volume per hour that can be chosen independently of each other.
2. Block bid: Bid with the same volume, direction and price that is valid for a number of alternate following hours. This means that all hours are either accepted or rejected together. Block bids can be divisible, but the same volume must be selected for all hours upon acceptance.
3. Mutually exclusive bid groups: Bids for the same hour in the same direction can be entered in an exclusive bid group, so that only one bid per hour can be selected from this group.
4. Exclusive bid groups across markets: Capacity bids between markets can be linked, so that if the bid is accepted on one capacity market, the bid will automatically be removed from the other capacity market, and thus cannot be selected there in the same hour. Bids must be indicated on each market, and there is separate pricing on the capacity markets. The markets are cleared in a specific clearing order (aFRR capacity market - it is cleared before the mFRR capacity market).

There are restrictions on the combination of bid types. The following bids cannot be combined:

- Block bids and Mutually exclusive bid groups

- Block bids and Exclusive bid groups across markets

1.8.2.3 Exchange of bids between DK1 and DK2

Energinet can reserve up to 10% of the capacity on the Great Belt connection for the exchange of mFRR-capacity between DK1 and DK2. In the event that there are not enough bids to cover the need in DK1 or DK2, the size of the exchange between DK1 and DK2 can be increased from 10% to a maximum of 20%.

The assessment of whether a reservation can be made follows the method in 'Methodology for the market-based allocation process of cross-zonal capacity for the exchange of balancing capacity for the Nordic CCR'.

The socio-economic assessment of whether a reservation should be made on the Great Belt link is done hour by hour, based on the submitted bids for mFRR capacity and a forecast for the spot prices in the two bidding zones.

1.8.2.4 Energinet's acceptance of bids

Bid selection is done by minimizing the total delivery costs. Fifty Nordic MMS uses an algorithm that optimizes the selection of the mFRR bids in DK1 and DK2, taking into account the available reserved capacity between DK1 and DK2. Bids can be skipped if the total delivery costs are thereby minimized. There is no set limit on the size of bids that can be skipped.

The relevant inputs to the optimization algorithm are:

- mFRR the need in DK1 and DK2 bid zone hour-by-hour, and
- Submitted bids in DK1 and DK2, sorted by price.

The algorithm minimizes the total delivery costs in the following objective function:

$$\sum_d \sum_t \sum_i (bid\ price_i \times bid\ volume_i \times bid\ selection_i)_{td}$$

Where:

- t indicates the hour
- d indicates the direction
- Bid price indicates the mFRR bid price for mFRR bid i
- Bid volume indicates the bid size for mFRR bids i
- Bid selection specifies a dummy variable that describes whether the mFRR bid is accepted or not (assumes the value 0 or 1).

Output from the optimization algorithm is:

- Accepted mFRR capacity bids for respectively DK1 and DK2 (quantity and price)
- The size of the capacity exchange between DK1 and DK2.

If the price of two bids is the same and Energinet only needs one, a mechanical randomness generator is used to select the bid to be included in the solution. The same applies for three or more bids with the same price.

In the event that the special optimization method has to be used, the above bid selection process is used for bids in the daily auction from DK1 and DK2 together based on a consideration

of minimizing Energinet's total costs for the purchase of mFRR in DK1 and DK2 under the condition of, that a maximum of 200 MW can be exchanged from DK1 to DK2.

1.8.2.5 Pricing

mFRR capacity is settled at marginal price (pay-as-cleared) in each hour for each bidding zone, determined by the highest accepted bid price. One marginal price for DK1 and one marginal price for DK2 is therefore set for each hour. If there is no bottleneck between DK1 and DK2, the marginal price in the two areas will be the same. It may happen that bids with a bid price below the marginal price will not be accepted if the acceptance of this bid will increase the total delivery costs.

Block bids cannot normally set the price, but can result in a higher price being set for one or more hours, so that the block bid becomes profitable in its entirety. The total payment of the market price for the entire block must be equal to or greater than the amount that would have been paid for the accepted volume at the bid price.

If only one enterprise has submitted bid(s), pricing will be based on regulated price, see section 2.1.1.

1.8.2.6 Feedback to market participant

The result of the auction will be published no later than 08:10 a.m. the day before the day of operation. The result is published at Fifty Nordic MMS, NUCS and directly via ECP communication to the participating market players.

In the event that the special optimization procedure has been applied, the market participants will be informed about which flow forecast formed the basis, the need in MW per hour per region before the procedure was implemented as well as the actual purchase in MW per hour per region after the procedure has been implemented. This information will be published on Energinet's website.

1.8.2.7 Obligations of market participant

For availability payment to be effected,

1) the market participant must subsequently submit a bid for activating all the capacity for which an availability payment is obtained.
2) the capacity must in fact be available.

The obligation mentioned under 1) concerns only those hours for which the market participant receives availability payment. The market participant is welcome to submit bids for the activation of capacity in excess of the capacity for which availability payment is obtained.

The obligation under 2) means that availability payment is cancelled if it subsequently turns out that the capacity is not available, for example due to breakdowns, see sections 2.2 and 2.3.

In case of incidents which mean that a facility cannot supply manual reserves, the reserve must be re-established at one or more facilities capable of supplying the reserve as soon as possible and within 30 minutes of the incident at the latest. If the supplier is unable to re-establish the reserve, Energinet should be contacted within 15 minutes and informed where and when the reserve can be re-established.

1.8.2.8 Payment for energy volumes

The calculation of the energy volumes supplied (regulating power) from manual reserves and the settlement of regulating power are based on Market Regulation C2 – The balancing market and balance settlement.

1.8.2.9 Checking the services

The services are checked on a sample basis. Energinet's checking takes the form of analysing the response from suppliers in connection with activations.

In case of regulation of demand facilities and *fluctuating renewable energy sources*, operational schedules for these must be available.

1.8.2.10 Procurement of additional manual reserves

In the event that Energinet needs to purchase more manual reserves than those purchased in the morning, Energinet will conduct an additional auction in the afternoon. The auction is similar to the auction that is run in the morning; however bids are exchanged on separate bid IDs linked to this auction.

Any additional auctions will only be held in the bidding zone where additional mFFF-capacity is assessed to be needed, and capacity will not be reserved between bidding zones.

The deadlines applying to afternoon auctions of manual reserves are as follows:

- The market participants are notified directly of the need for additional manual reserves no later than 2.30 p.m.
- On days when the required volume is not zero, an e-mail stating the required volume is sent to the market participants.
- The market participants must submit their bids to Fifty Nordic MMS no later than 3.00 p.m.
- Fifty Nordic MMS completes the auction and notifies the participants of the result by 3.30 p.m.

1.8.3 Terms and conditions for monthly auctions

1.8.3.1 Response and response time

At monthly auctions, Energinet buys up to 300 MW with a response time of up to 90 minutes. Any required volume greater than 300 MW must be supplied by facilities with response times of maximum 15 minutes.

1.8.3.2 Activation

The reserve is activated by amending operational schedules or demand forecasts following the prior exchange of schedules between Energinet and the supplier.

1.8.3.2.1 Information/data

Each individual generation or demand unit supplying manual reserve must be connected via information technology to Energinet's Control Centre in Erritsø. The Control Centre must at least have online access to:

- Status reports concerning generation or demand unit in/out
- Measurements of the generation or demand unit's

- Net generation or demand at the point of connection
- Net generation by balance responsible parties.

Requirements and the place of delivery for reports and measurements must be agreed with Energinet.

Costs incidental to IT connections and maintenance must be borne by the supplier.

1.8.3.3 Combined deliveries

A delivery may be made up of supplies from several generation units with different properties which collectively can provide the required response within the required response time. A delivery may also be made up of supplies from several demand units with different properties which collectively can provide the required response within the required response time. Moreover, a delivery can be made up of mixed supplies from demand and generation units, if the same BRP has balance responsibility for both the demand and generation units.

Furthermore, a delivery may be made up of facilities with response times of up to 90 minutes or of facilities with response times of maximum 15 minutes. Deliveries may not be up of facilities with response times over and less than 15 minutes, respectively.

1.8.3.4 Monthly procurement of manual reserves

Energinet procures manual reserves at monthly auctions in DK2 for upward regulation capacity. An auction is held once a month, covering all hours of the month.

Energinet publishes the expected reserve need, stated as MW, for the coming month on its website no later than at 10.00 a.m. on the 25th of each month for the following month. The expected reserves need is also e-mailed to approved suppliers. The e-mail includes the quotation template to be used when submitting bids.

1.8.3.5 Participant bids

Bids for the monthly capacity auction must be submitted to the Energinet by e-mail to mfrr@energinet.dk in the specified quotation template.

In this template, the participant must state whether the facility has a response time of more than 15 minutes. This is done by ticking the 'Slow' column.

The participant must state one price in DKK/MW and one quantity in MW that apply to all hours of the full month. The price is the price per MW asked by the bidder to make the volume stated available for the full month.

Bids must be submitted so that they reach Energinet by 10.00 a.m. at the latest at on the 26th of each calendar month prior to the coming month. Bids received after 10.00 a.m. on the 26th of each calendar month prior to the coming month will be rejected unless otherwise stated by email to all participating market participants.

The market participant may change already submitted bids up until 10.00 a.m. on the 26th of each calendar month prior to the coming month. The bids received by Energinet at 10.00 a.m. on the 26th of each calendar month prior to the coming month are binding on the market participant.

Each bid entered must be minimum 5 MW and maximum 100 MW and must always be stated in MW to one decimal point, and the price must be stated in DKK/MW to two decimal points.

Immediately after the monthly auction, market participants that have offered both fast and slow reserves will have the option to possibly replace fast reserves accepted at the monthly auction with slow reserves not accepted at the monthly auction.

To be considered, the market participant must submit a request to Energinet by e-mail by 10:00 on the 27th of the calendar month, stating how many MW of fast reserves that the market participant would like to be able to replace with slow reserves in the coming month.

1.8.3.6 Energinet's acceptance of bids

Energinet sorts the bids by price per MW, and bids are selected in order of price until the necessary volume has been procured.

Bids are accepted in their entirety or not activated. This means that all bids are considered indivisible, and no bids will be skipped.

Energinet procures maximum 60 per cent of the required volume at the monthly auction. This means that if a bid results in the procurement exceeding 60 per cent of the volume required, the most expensive bids will be deselected until the procurement makes up maximum 60 per cent of the volume required.

If two bids have the same price, and Energinet only needs one, a mechanical random generator is used to select the bid to be included in the solution. The same applies if three or more bids are priced the same.

If the number of bids received is insufficient to cover Energinet's need, Energinet will send an e-mail to all market participants asking them to submit more bids. Bids submitted cannot be changed, meaning that only additional bids can be submitted to the auction.

1.8.3.7 Pricing

All bids for upward regulation accepted will receive an availability payment corresponding to the price of the highest bid for upward regulation accepted.

If only one enterprise has submitted bid(s), pricing will be based on regulated price, see section 2.1.1.

1.8.3.8 Feedback to market participant

Energinet shall not later than at 15.00 p.m. on the 26th of each calendar month prior to the coming month inform the market participant of the bids Energinet have accepted and of availability payment obtained on an hour-by-hour basis. Feedback is sent by e-mail to the same e-mail address from which the participant's bid was submitted.

If a market participant, following the completion of the monthly auction, has asked to replace fast reserves with slow reserves, Energinet will inform the market participant how many MW the market participant can replace by 12:00 on the 27th of each calendar month. Energinet's

criterion is that a maximum of 300 MW slow reserves can be supplied. If the market participants' total requests exceed 300 MW, rights are granted on a pro rata basis.

1.8.3.9 Obligations of market participant

For availability payment to be effected,

1) the market participant must subsequently submit a bid for activating all the capacity for which an availability payment is obtained.
2) the capacity must in fact be available.

The obligation in item 1) applies to all hours of the month.

The obligation under 2) means that availability payment is cancelled if it subsequently turns out that the capacity is not available, for example due to breakdowns, see sections 2.2 and 2.3.

In case of a breakdown of a facility in the delivery period, the BRP must decide if he wants to deliver the service from other facilities in his portfolio or notify Energinet of his inability to supply the service, including the duration of the outage etc. The BRP must notify Energinet of any service lapse within 30 minutes of the incident.

Based on the balance-responsible party's report on outage, Energinet procures the missing MWs by increasing the volume bought at the daily auction. If the fault-affected facility proves ready for operation earlier than determined in talks between Energinet and the balance-responsible party, the fault-affected facility may first resume MFRR supply at the expiry of the extraordinary procurement at the daily auction.

Market participants, which have not been able to supply the capacity that they received availability payment for at the monthly auction, shall repay availability payment for the capacity that could not be supplied, including any costs for replacement purchases; however, not exceeding three times availability payment obtained at the monthly auction.

As for other delivery non-conformities that cannot be attributed to a specific faulty facility, the set-off price per hour for cancelling the availability payment is determined as the weighted average of the marginal price at the monthly auction and the marginal price at the daily auction. Weightings include the market participant's obligations in the two auctions during the hour in question.

1.8.3.10 Payment for energy volumes

The calculation of the energy volumes supplied (regulating power) from manual reserves and the settlement of regulating power are based on Market Regulation C2 – The balancing market and balance settlement.

1.8.3.11 Planning by market participant

Regulating power orders must be included in the market participant's operational schedules prior to and during the day of operation, see Regulation C3.

1.8.3.12 Checking the services

The services are checked on a sample basis. Energinet's checking takes the form of analysing the response from suppliers in connection with activations.

In case of regulation of demand facilities and *fluctuating renewable energy sources*, operational schedules for these must be available.

1.9 Properties required to maintain power system stability, DK1 and DK2

Properties required to maintain power system stability consist primarily of short-circuit power, inertia, reactive reserves, and voltage control. These are services which all contribute to ensuring stable and safe operation of the electricity system.

Every day, just after the first operational schedules have been received towards the end of the afternoon, Energinet checks:

- Load flow
- Short-circuit power
- N-1 situations
- Reactive reserves.

If changes occur during the day of operation, these checks must be performed again.

Properties required to maintain power system stability are demanded only from central facilities because these facilities are connected to the high-voltage grid.

1.9.1 Securing properties required to maintain power system stability in the transmission grid

Energinet may choose to advertise the procurement of properties required to maintain power system stability at different notices and durations:

a. On a monthly basis
b. On a weekly basis
c. Very early on the previous day
d. After closing of the spot market, before auctioning of frequency-controlled services
e. Concurrently with auctioning of frequency-controlled services
f. After receipt of first operational schedule
g. During the day of operation if required.

If capacity featuring these properties is insufficient, the power system operator/balance operator will take measures to establish a sufficient level of system security. This may lead to special regulation and/or forced operation and will be handled by Energinet's operator by telephone.

Where the notice permits it, bids will be obtained from alternative suppliers of properties required to maintain power system stability. In special operating situations, the market participants may be required to submit bids at very short notice.

Forced operation (remedial measure) will be settled using the cost-plus methodology. As far as possible, bids or alternative ways of resolving the problem will be obtained. Market participants may thus be asked to place their bids at relatively short notice.

There will be no separate payment for the actual energy supply in connection with properties required to maintain power system stability, for example delivered or absorbed MVAr.

See also section 3.5 concerning the ordering of reactive reserve/voltage control.

1.9.2 Tendering of properties required to maintain power system stability in the transmission grid

In connection with the tendering of properties required to maintain power system stability, Energinet will follow the procedure outlined below. When announcing a specific tender, Energinet may, however, stipulate terms for the award of the contract. In that case, the terms will be stated in the conditions for the tender in question.

1..2.1 Award criterion

Tenderers are asked to submit prices for the delivery of properties required to maintain power system stability. Tenders will be evaluated using the lowest price award criterion.

1.9.3 Bids on a monthly or weekly basis or on request

Bids submitted on a monthly or weekly basis or on request should be sent to:

Energinet
Tonne Kjærsvej 65
7000 Fredericia, Denmark
E-mail: kontrolcenterel@energinet.dk

1.9.4 Pricing

All accepted bids will receive payment corresponding to the price requested by the supplier (pay-as-bid).

If only one enterprise has submitted bid(s), pricing will be based on regulated price, see section 2.1.1.

Energinet will send an order for the services in the form of a purchase order.

If remedial measures are implemented, settlement will use cost plus, see section 2.1.2.

1.9.5 Obligations of market participant

Energinet pays the supplier to keep facilities in operation. Payment is conditional on the facilities being in operation, and payment is cancelled if it subsequently turns out that the facilities are not available, see sections 2.2 and 2.3. However, section 2.3.1 on covering purchases does not apply in case of the breakdown of facilities supplying short-circuit power, reactive reserves, and voltage control in DK1 and DK2. In case of breakdowns, Energinet assumes the risk by covering the costs of starting up another unit.

2. Commercial terms

2.1 Payment

All expenses, including grid tariffs etc. for energy supplies, are paid by the supplier.

Payment for the services purchased at daily auctions (fast frequency reserve, primary reserve, frequency-controlled normal operation reserve, frequency-controlled disturbance reserve, secondary reserve in DK2, and manual reserve in DK1 and DK2) is settled weekly with the supplier by eSett.

Payment for services purchased at weekly auctions (secondary reserve in DK1) is settled monthly by the Energinet on the 25th of a month. Prior to settlement, Energinet reserves the right to effect a set-off of such payment if it is found that the supplier has not fulfilled/is not fulfilling its obligations, see sections 2.2 and 2.3. The monthly settlement includes payment for the weeks for which settlement calculations have been finalised (including any set-off).

Payment for the services purchased on a monthly or ad hoc basis (short-circuit power, reactive reserves, and voltage control) is settled based on the invoice issued by the supplier with the due date being the 25th day of the month following the current settlement month. If this is not a business day, the due date is the following business day.

Prior to effecting the monthly payments, Energinet reserves the right to withhold payment and to effect a set-off of such payment if it turns out that the supplier has not fulfilled/is not fulfilling its obligations under this Agreement, see sections 2.2 and 2.3.

2.1.1 Settlement with only one bidder

If there is only one bidder for one of Energinet's ancillary service products, this bidder will be settled at regulated price. Regulated price is defined as a historical price for a comparable service during a comparable period of time in a market with competitive bids. If there is no historical price, settlement will instead be based on cost-plus. For further information on regulated price, see Energinet's website.

2.1.2 Settlement with cost plus

The cost plus settlement methodology is used to settle remedial measures (orders) implemented to ensure the security of supply.

The cost plus methodology will also be used if Energinet asks for bids, and there are no bidders for the service in question, and Energinet therefore has to implement remedial measures.

Certain stipulations in the cost plus methodology also form the basis for the payment obtainable with the regulated price methodology. Thus, the regulated price cannot be lower than the verifiable costs of supplying the service which are determined using certain stipulations in the cost plus methodology.

Finally, certain stipulations in the cost plus methodology are used as the basis for a regulated price when there is no historical price that can be used to set a regulated price.

For further information on cost plus, see Energinet's website.

2.2 Breach of contract

2.2.1 Non-delivery/delivery of non-conforming services

In case of non-delivery of the service, including non-availability of the service and delivery of a non-conforming service, the payment made to the supplier is reduced proportionally, corresponding to the period of non-delivery of a conforming service. The period is calculated per commenced hour relative to the total number of hours in the contract period.

In case of non-delivery of the service, including non-availability of the service and delivery of a non-conforming service, Energinet may also quarantine the supplier to allow the supplier time to remedy the situation prior to resuming deliveries. The quarantine period stipulated by Energinet may be from two days and up to 30 days, depending on the nature and scope of the breach, previous instances of breach and the information provided by the supplier to Energinet prior to the breach, see below – last paragraph.

During the quarantine period, the supplier is precluded from taking part in the daily auction to which the non-available services relate.

In case of breach, Energinet notifies the supplier of the quarantine as soon as possible, with indication of the start date and the duration of the quarantine period.

The supplier is obliged to keep Energinet informed at all times of incidents which will lead to non-delivery of the service as defined in the first paragraph.

In the event of breach by the supplier, Energinet is obliged to complain to the supplier no later than three weekdays after the day of operation during which the breach took place. Otherwise, Energinet is no longer entitled to take action for breach of contract.

2.2.2 Non-conformities/remedial action

In case of the supply of non-conforming services during the term of this Agreement, the supplier is entitled and obliged to remedy the situation without undue delay.

In the event that the supplier does not take such remedial action as is required within a reasonable deadline stipulated by Energinet, Energinet is entitled to arrange for such remedial action to be taken at the supplier's expense.

2.2.3 Cancellation

Either party may, subject to two days' notice, cancel the main agreement in case of material breach of contract by the other party.

2.3 Compensation

2.3.1 Covering purchases

Energinet may demand that any additional expenses incurred in connection with performing covering purchases to replace non-deliveries be paid by the supplier in breach. However, special terms and conditions apply to aFRR, c.f. section 1.3.2.5, and the monthly mFRR auction, c.f. section 1.7.2.2.5.

2.3.2 Compensation

In the event of cancellation of the agreement by one of the parties due to breach on the part of the other party, the other party is liable in damages in accordance with the general rules of Danish law. The parties are not liable for operating losses, loss of profit or other indirect losses unless caused by gross negligence or premeditation.

2.4 Force majeure

Neither party is liable for matters outside their control which the parties should not have taken into account when concluding the agreement and which the party should not reasonably have avoided or overcome. Examples of force majeure include war, terrorism, natural disasters etc.

The first paragraph in section 2.2.1 also applies to non-deliveries due to force majeure.

Energinet does not accept breakdowns, lawful strikes, or lockouts as force majeure.

2.5 Expert appraisal

In the event of disputes or where necessary in order to preserve the state of the evidence, the parties may request an expert appraisal in respect of the service.

The expert is appointed by the Danish Institute of Arbitration (Danish Arbitration).

2.6 Mediation

Any disputes arising out of this Agreement which cannot be settled between the parties through negotiation must first be attempted to be settled through mediation. The mediation takes place according to the applicable mediation rules under the Danish Institute of Arbitration.

2.7 Arbitration and governing law

This Agreement is governed by Danish law.

Any dispute arising out of this Agreement which cannot be resolved through the procedure described in section 2.6 must be settled in accordance with the arbitration rules of the Danish Institute of Arbitration (Danish Arbitration). Each party appoints one arbitrator, whereas the chairperson of the arbitration tribunal is appointed by the Institute. If one of the parties has not appointed an arbitrator within 30 days of having submitted or received information about the request for arbitration, such arbitrator is appointed by the Institute according to the above-mentioned rules.

In connection with disputes concerning amounts of less than DKK 500,000, the arbitration tribunal, however, consists of one member to be appointed by the Council of the Danish Institute of Arbitration.

The arbitration tribunal must make a decision on the allocation of legal costs, including lawyers' fees, in its award. The award of the arbitration tribunal is final and binding on the parties.

2.8 Amendments

Throughout the term of the Agreement, Energinet is entitled to amend the technical conditions for the services if such amendments are founded on changing requirements with regard to security of supply and the efficient use of the electricity supply system as a whole. Amendments are subject to one month's written notice to all suppliers. The announcement of amendments must state the reasons for such amendments and include a list of the amendments made.

2.9 Publication

Energinet is entitled to publish the results of the individual auctions on its website.

2.10 Approval by authorities

These tender conditions have been registered with the Danish Utility Regulator under the provisions of the Danish Electricity Supply Act (*Elforsyningsloven*).

Any complaints about the tender conditions can be lodged with the Danish Utility Regulator, Torvegade 10, 3300 Frederiksværk, Denmark.

3. Practical requirements with regard to services

3.1 Organisational requirements

The supplier must state a place of contact or a contact person who can be contacted by Energinet's Control Centre 24 hours a day.

The place of contact/the contact person is responsible for the supplier's generation or demand unit which is used to supply the service tendered.

The supplier must provide information about the current staffing.

Communication between Energinet's Control Centre and the place of contact or the contact person is by telephone.

3.2 Reporting obligation

The supplier must immediately inform Energinet if the supplier is unable to supply the contractually agreed service in full.

3.3 Prioritisation of ancillary services

In case of insufficient ancillary services, the services should usually be prioritised as follows:

1. Primary reserve in DK1 and frequency-controlled disturbance reserve in DK2, respectively
2. aFRR reserve in DK1/DK2 and frequency-controlled normal operation reserve in DK2, respectively
3. Manual reserves.

3.4 Approval procedure

Prior to delivery, the supplier must, through documentation and testing, prove that the technical requirements are met. The approval is done in accordance with "Prequalification of units and aggregated portfolios", doc.nr: 13/80940-106.

3.4.1 Conversion or modification of facilities

If facility conversions or similar modifications of a more permanent nature result in changes to facility data, the supplier must immediately inform Energinet of this if the changed data have a bearing on the supply of ancillary services.

3.5 Remedial measures for the procurement of reactive reserve/voltage control

Energinet is responsible for ensuring that voltage control of the facilities is adjusted to the reactive balance in the entire system on Zealand and in the Jutland and Funen areas.

The reactive power varies as a function of grid voltage. The set-point value is only relevant at the time of setting and should not be adjusted until a new voltage set-point value is announced by Energinet.

In case of changes to the reactive balance, and thereby the voltage distribution in the system, the facilities automatically adjust reactive generation. Using passive reactive components, Energinet balances the voltage in the 132 kV and 400 kV grids to ensure that the facilities' generation of/demand for reactive power is within acceptable values. If this does not bring generation/demand within acceptable values, Energinet will implement remedial measures by ordering the supplier to change the reactive generation/demand until acceptable levels are achieved.

Remedial measures in DK2:
Remedial measures are implemented using the production telegraph between Energinet and the supplier.

Energinet initially orders as follows:

1. Facility name
2. Requested reactive power Q (Mvar with sign).

Remedial measures which Energinet wants effected immediately must be carried out directly by the supplier. If necessary, several remedial measures may be implemented at the same time for parallel activation at several facilities, as necessary.

The reactive power supplied may be any reactive power value within the facilities' capacity.

Once the remedial measure request has been given to the power station, the supplier acknowledges receipt of the order.

Remedial measures in DK1:
Remedial measures are implemented using the production telegraph between Energinet and the supplier.

Remedial measures which Energinet wants effected immediately must be carried out directly by the supplier. If necessary, several remedial measures may be implemented at the same time for parallel activation at several facilities, as necessary.

The reactive power supplied may be any reactive power value within the facilities' capacity.

Once the remedial measure request has been given to the power station, the supplier acknowledges receipt of the order.