Application for the provision of Frequency Containment Reserve (FCR) and reporting of test results

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| --- |
| Summary |
| Date (yyyy-mm-dd) |  |
| Name of unit/group*Please note that the name should be chosen independently from BSP name, capacities and other constraints that might change over time.* |  |
| Bidding area | [ ]  SE1 [ ]  SE2 [ ]  SE3 [ ]  SE4 |
| Background to the application | [ ]  New application [ ]  Periodic reassessment[ ]  Substantial change | Describe any substantial change |  |
| Company details |
|  | Applicant company  | Subcontractor (if applicable) |
| Company name |  |  |
| Corporate ID number |  |  |
| Ediel ID |  | N/A |
| Address |  |  |
| Contact person name |  |  |
| Contact person tel. |  |  |
| Contact person e-mail |  |  |
| Information on reserve |
| Specify the type of reserve | ☐ Unit[[1]](#footnote-1) ☐ Group[[2]](#footnote-2)  |
| Type of installation | ☐ Production ☐ Consumption ☐ Energy storage |
| Specify the type of energy reserve | ☐ Unlimited energy reserve ☐ Limited energy reserve (LER) |
| Control | ☐ Local ☐ Central |
| Security classification  | [ ]  Category A [ ]  Category B [ ]  N/A (Local control) |
| Regulation | ☐ Linear ☐ Stepwise |
| Voltage level for grid connection  | [ ]  Low voltage grid (400/230 V) [ ]  Medium voltage grid (10–50 kV)[ ]  High voltage grid (70-130 kV) |
| Transmission grid/Network area([www.natomraden.se](http://www.natomraden.se)) | [ ]  Connected to the transmission grid [ ]  Network area:  |
| If the unit or group is covered by the RfG: are the requirements for power generation modules according to RfG 13.1.a.i and 13.1.b fulfilled? | [ ]  Yes [ ]  No [ ]  Not applicable |
| Indicate whether the application is for a new unit to be added to a group. | [ ]  No  | [ ]  Yes, expansion of static FCR-D group[[3]](#footnote-3)[ ]  Yes, addition of stand-alone unit[[4]](#footnote-4) |
| Capacities applied for |
|  | Applied for | Requested maximum capacity (MW) | Requested minimum capacity (MW) |
| FCR-N | [ ]  |  |  |
| Dynamic FCR-D up | [ ]  |  |  |
| Static FCR-D up  | [ ]  |  |  |
| Dynamic FCR-D down  | [ ]  |  |  |
| Static FCR-D down  | [ ]  |  |  |
| Indicate which of the any of the ancillary services FCR-N, FCR-D up and FCR-D down that are already prequalified by the BSP. [[5]](#footnote-5) | [ ]  FCR-N[ ]  FCR-D upwards[ ]  FCR-D downwards |

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| Information about confidentiality |
| All information submitted to a government agency is treated in accordance with the principle of public access to official documents. This means that anyone can request a copy of the information submitted to Svenska kraftnät, unless it is classified. It is likely that information in this application will be requested. Any applicant company that is of the opinion that information it has provided in the prequalification application fulfils the conditions for commercial confidentiality (Chapter 31, Section 16 of the Public Access to Information and Secrecy Act (2009:400) on business and operating relationships) must clearly provide a request for confidentiality. Such a request must specify the information covered by the request for confidentiality and the harm that would be caused to the requesting company if the information were to be disclosed. Svk always performs a confidentiality assessment in connection with a request for information, but cannot guarantee that a request for confidentiality will not lead to disclosure of the document. A confidentiality decision may also be subject to judicial review. The applicant company does not have the right to review the confidentiality flags prior to each disclosure. Also note that the application evaluation will partially be done according to common Nordic requirements and that Svenska kraftnät may therefore need to discuss interpretations of rules and development of new requirements with their Nordic counterparts. The same confidentiality assessment will apply in the Nordic collaboration. |
| The applicant company requests that parts of the application be subject to confidentiality: | [ ]  Yes [ ]  No |
| Specify the information and data deemed sensitive that the applicant company wishes to be subject to confidentiality. Refer clearly to specific paragraphs, bullet points, etc., in application documents and appendices. |
|  |
| Give reasons for and describe the harm that may result from the disclosure of the information specified above. |
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| Description of the unit/group  |
| Indicate the resource(s) included in the unit or group in Table 1. If more than 3 separate units are included, please attach a separate unit list containing the information requested below. |
| Table 1. | Unit 1 | Unit 2  | Unit 3 |
| Name |  |  |  |
| Unit owner |  |  |  |
| Facility-ID[[6]](#footnote-6) |  |  |  |
| Balance responsible party (BRP) at the delivery point |  |  |  |
| Rated power[[7]](#footnote-7) [MW] |  |  |  |
| Provide a description of the unit/group, including information on the production type, consumption type or energy storage type.  |
|  |
| Specify any technical information that may be significant for Svk when assessing the application. The following are examples of such information. The corresponding technical information must be provided for other types of resources than those listed below. |
| Turbine rated power [MW] |  |
| Turbine inertia constant H [MWs/MVA] |  |
| Hydro power plant: hydraulic head [m] |  |
| Converter connected unit: Converter type (DFIG, full power converter etc.) |  |
| Nominal wind speed of the wind turbine [m/s] |  |
| Maximum, Pmax, and minimum, Pmin, possible power output [MW] |  |
| Upper and lower limits for energy storage (state of charge) [MWh] |  |
| Nominal apparent power [MWA] |  |
| Please provide any other technical information relevant to the application. |
|  |
| Aggregation |
| If the application is for a group or an aggregated unit (consisting of several smaller units behind different or the same grid connection point), describe the aggregation system (note that changing the aggregation of units within a group must be approved by Svenska kraftnät). |
|  |
| State whether the application is for a unit type to be type-qualified [[8]](#footnote-8). If **Yes**, describe:- the units to be type-qualified- the control system (is it the same as for the initial capacity that is prequalified in this application?) - response for type-qualified capabilities when the units deliver ancillary services- if the additions will be placed behind different or the same grid connection point (is it the same as for the initial capacity that is prequalified?). | [ ]  Yes [ ]  No |
|  |
| Specify whether any flexibility within the aggregated group is used for prequalification or operation[[9]](#footnote-9). |
| [ ]  Prequalification static, operation static[ ]  Prequalification dynamic, operation static | [ ]  Prequalification static, operation dynamic[ ]  Prequalification dynamic, operation dynamic |
| Describe how the option(s) above are applied, and give reasons as to why. |
|  |
| Activation and deactivation of FCR |
| Are there any delays in activation or deactivation? Are there any artificial delays? If **Yes**, what are these caused by?  | [ ]  Yes [ ]  No |
|  |
| Indicate whether the following takes place locally or centrally (note that control should be done locally if possible). |
| Frequency measurement | [ ]  Local [ ]  Central |
| Calculation of setpoint for FCR | [ ]  Local [ ]  Central |
| If activation takes place via a central function, attach a detailed description of IT security as described in the document “IT security requirements for central control of FCR”[[10]](#footnote-10). Provide reasons below on why central control is used rather than local control.  |
|  |
| If the application relates to the provision of static FCR-D, describe how the activation, deactivation and recovery of the resource takes place. |
|  |
| Is the settings of the device or group such that it continues to provide FCR as long asthe frequency deviation remains unless the energy reserve is depleted either in a positive or negative direction? |
|  |
| Limitations in energy reservoir | Are there limitations of the energy reservoir? | [ ]  Yes [ ]  No |
| Describe and give reasons for limitations of the energy reservoir for the unit or group providing the FCR (e.g. duration, recovery time, and any SOC limits), in accordance with Article 156(12) of Regulation (EU) 2017/1485[[11]](#footnote-11).  |
|  |
| Has endurance been calculated according to equation 20-21 in [1]? If **No**, describe how endurance has been calculated. | [ ]  Yes [ ]  No |
|  |
| Describe the implementation of the energy recovery functions NEM and AEM specified in [1], or equivalent energy recovery function for units that do not recover directly from the grid. Also describe the bidding strategy. |
|  |
| Does the energy reserve meet the requirements for recovery? (For FCR-N charging speed of 34-50%, for FCR-D fully recharged within 2h and charging speed of 20-34%, see 3.5.1 i [1] in the technical requirements.) | FCR-D ☐ Yes ☐ NoFCR-N ☐ Yes ☐ No |
|  |
| Describe how energy reserve limitations are taken into account when bidding for multiple FCR products in the same delivery period. |
|  |
| Control system  |
| Describe how the FCR setpoint is calculated from measured frequency. Include, for example, computational algorithms and signal processing. |
|  |
| Provide a technical description and block diagram of the governor/relay structure, including controller parameter settings. Include power measurement and frequency measurement in the block diagram and explain the designations introduced. * If more ancillary services are provided from the reserve, include a general description of how the other ancillary services are controlled.
 |
|  |
| Describe how the dynamic behaviour of the controller is maintained under varying droop settings (see example in section 5.1.1 of [1]). |
|  |
| Indicate any limitations in the ability to activate linearly to the frequency deviation. If the unit or group is activated stepwise, include in the description of the control system how it is ensured that the activation takes place in accordance with the blue field and the mandatory target range for the response for the product in question in [1].  |
|  |
| Is any frequency protection set in such a way that the resource(s) can maintain grid connection and delivery of FCR at the following grid frequencies? This section only applies to resources covered by RfG, see [Connecting to the grid | Svenska kraftnät](https://www.svk.se/en/stakeholders-portal/electricity-market/connecting-to-the-grid/) |
| 30 minutes within frequency range 47.5–49.0 Hzunlimited within frequency range 49.0–51.0 Hz 30 minutes within frequency range 51.0–51.5 Hz | [ ]  Yes [ ]  No[ ]  Yes [ ]  No[ ]  Yes [ ]  No[ ]  Frequency protection is not used |
| Is any frequency protection set in such a way that the resource(s) can maintain grid connection and delivery of FCR at a frequency change rate of up to +/-2Hz/s? | [ ]  Yes [ ]  No[ ]  Frequency protection is not used |
| How is a smooth transition of the FCR delivery ensured when the unit/group is no longer procured? See the description for FCR-N and FCR-D in section 3.7 of [1].  |
|  |
| Indicate whether and how variations in operating conditions, such as variations in ambient temperature or fuel composition, may affect the delivery of the FCR and how these are taken into account in bidding. |
|  |
| If the application is for FCR-D, indicate whether the unit/group uses mode shifting. If **Yes**, describe how this is done. When does the controller switch to high performance parameters, and after how long will the mode change back to high stability? | [ ]  Yes [ ]  No |
|  |
| Does the unit or group have the capacity to provide several ancillary services simultaneously (e.g. FCR, FFR, FRR, FSM, LFSM)? If **Yes**: describe how the combined delivery is managed on the basis of the questions below. | [ ]  Yes [ ]  No |
| Describe how the transfer, if any, between control parameters for the different ancillary services takes place, and whether there is any delay in the transition between control parameters |  |
| Describe the ability to switch individual deliveries on and off |  |
| Describe the method of ensuring that capacity is available for all procured ancillary services |  |
| Describe whether Limited Frequency Sensitivity Mode (LFSM) is provided by the unit and how this is implemented in the control system. |  |
| Calculation of capacity  |
| Does the calculation of theoretical steady state capacity follow example 1 (steady state capacity calculation) given in Appendix 1 of [1]? If **No**, describe the methodology used to calculate the theoretical steady state power response to frequency change. | [ ]  Yes [ ]  No |
|  |
| Describe how available capacity (included in the real-time data exchange and data that can be requested retrospectively) is calculated, including input variables. See example calculations 22, 23 and 24 in section 3.9.1 of [1]. |
|  |
| Describe how the activated FCR (included in the data that can be requested retrospectively) is calculated from the measured frequency deviation and the FCR capacity that the unit/group is set to deliver.  |
|  |
| Describe how any reduction factor is applied to convert the theoretical power response into prequalified capacity. |
|  |
| Specify how reduction factors are used. |
| FCR-N FCR-D up FCR-D down[ ]  [ ]  [ ]  None[ ]  [ ]  [ ]  Constant[ ]  [ ]  [ ]  Interpolation between high and low droop[ ]  [ ]  [ ]  Interpolation between high and low load[ ]  [ ]  [ ]  Interpolation with respect to both droop and load |
| Calculation of power baseline and forecast bidding capacity (this section only applies to variable resources) | Does the power from the unit or group vary depending on ambient conditions or other external factors? If **No**, go to 3.7. | [ ]  Yes [ ]  No |
| Is the “freezing method” for variable resources used? | [ ]  Ja [ ]  Nej |
| Describe what causes the power variations and how they vary over time[[12]](#footnote-12). |
|  |
| Describe how the power variations of the unit or group are managed during bidding to ensure sufficient capacity. This description must include a clear explanation of why bidding took place during certain hours and not others, which can be substantiated in the data submitted.* What forecasts are used?
* How accurate are the forecasts?
* What margin is used?
 |
|  |
| Describe how the power fluctuations of the unit or group are managed during operation:* Describe in detail how the power baseline is calculated.
* Whether there are periods when the power baseline is more or less accurate, etc. How is this handled?
* Indicate whether any method is used to improve the power baseline and how it is implemented.
* Describe whether any power baseline reduction factor is used and how it is calculated.
 |
|  |
| Registration of measurements  |
| Describe how power and frequency are measured and if there are factors that affect the measurements. Report the entire measurement chain including time delays and any limitations on the recording of measurement values.  |
|  |
| Enter values for recording and measurement of data according to Table 2, and also attach supporting documentation. Calibration logs and data sheets are examples of such documentation. |
| Table 2. | Accuracy | Resolution | Sampling time logged data  | Sampling time data recording |
| Instantaneous active power | % | MW | s | s |
| Measured frequency | mHz | mHz | s | s |
| Describe the time source on which measurement time stamps are based.  |
|  |
| Specify which reference source is used for synchronization and how the synchronization is performed. |
|  |
| Specify the time zone used for time stamping when measurements are logged | [ ]  UTC [ ]  CET/CEST  | Specify any other time zone |  |

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| Test result reporting  |
| Specify the date of the tests |  | Specify the time of the tests |  |
| Specify the location for the tests |  |
| Describe the general operating conditions at the time of the tests, and include a brief description of how the operating conditions can be expected to have affected the test results. |
|  |
| Information on staff involved in testing:  |
| Name | Function | Organisation |
|  |  |  |
|  |  |  |
|  |  |  |
| Test method  |
| Describe the test method |
|  |
| Has Svenska kraftnät approved any exceptions related to the implementation of the tests?* If Yes, describe the exception.
 | [ ]  Yes [ ]  No |
|  |
| Specify the time zone of the logged data for testing |  |
| Has internal software been used to generate the test signals? If **Yes**, enter the time constant for the frequency measurement ($T\_{FME}$). See examples of how the time constant can be calculated in 4.4 of [1]. * If a separate test of the frequency measurement equipment has been performed (i.e. Method 1), the results of the test should be reported in the application form Appendix.
 | [ ]  Yes [ ]  No |
|  |
| Indicate the settings and control parameters applied during the tests in Table 3: |
| Table 3. | Reference power at start of test [MW] | Droop setting | Regulating strength MW/Hz (theoretical) |
| FCR-N  | Test set 1 (high load, high droop) |  |  |  |
| Test set 2 (high load, low droop)  |  |  |  |
| Test set 3 (low load, high droop) |  |  |  |
| Test set 4 (low load, low droop) |  |  |  |
| FCR-D up  | Test set 1 (high load, high droop) |  |  |  |
| Test set 2 (high load, low droop)  |  |  |  |
| Test set 3 (low load, high droop) |  |  |  |
| Test set 4 (low load, low droop) |  |  |  |
| FCR-D down | Test set 1 (high load, high droop) |  |  |  |
| Test set 2 (high load, low droop)  |  |  |  |
| Test set 3 (low load, high droop) |  |  |  |
| Test set 4 (low load, low droop) |  |  |  |
| Has special equipment been used for the tests? If **Yes**: describe the equipment.  | [ ]  Yes [ ]  No |
|  |
| Enter information for the measuring instruments used during the tests in Table 4. Cells containing the same values as those in Table 3 can be marked with a line (-). |
| Table 4. | Accuracy | Resolution | Sampling time |
| Instantaneous active power | % | MW | s |
| Available capacity | N/A | MW | s |
| Measured frequency | mHz | mHz | s |
| Applied frequency signal | mHz | mHz | s |
| Test result |
| Enter calculated steady state response, measured steady state response and reduction factors in Table 5. Fields not used can be omitted.  |
| Table 5. | Calculated steady state capacity [MW] | Measured steady state capacity [MW] | Reduction factor static$: K\_{red,ss}$ | Reduction factor dynamic: $K\_{red,dyn}$ |
| FCR-N | High load, high droop |  |  |  |  |
| FCR-D up | High load, high droop |  |  |  |  |
| High load, low droop |  |  |  |  |
| Low load, high droop |  |  |  |  |
| Low load, low droop |  |  |  |  |
| FCR-D down | High load, high droop |  |  |  |  |
| High load, low droop |  |  |  |  |
| Low load, high droop |  |  |  |  |
| Low load, low droop |  |  |  |  |
| Simultaneous delivery of FCR-N and FCR-D |
| For units delivering both FCR-N and FCR-D, the ramp response test for FCR-D at high static must be performed with FCR-N enabled. The following quota must be calculated from the results of the ramp response test and reported in the fields below.For more information, see 3.1.2 in [1]. |
| $$Ratio\_{\left\{FCR-D up/FCR-N\right\}}$$ | High load, high droop |  |
| Low load, high droop |  |
| $$Ratio\_{\left\{FCR-D down/FCR-N\right\}}$$ | High load, high droop |  |
| Low load, high droop |  |

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| Real time telemetry setup |
| Describe how real time values are communicated to Svenska kraftnät. |
|  |
| Indicate whether any of the signals have a slower underlying refresh rate than the real-time reporting. |
|  |
| Specify how often the capacity calculation is updated. |
|  |
| Specify the point number (ID) used in the real time measurement reporting setup in Table 6, if applicable.Table 6. Signals for reporting real time measurements |
| **Signal** | **ID** |
| Measured grid frequency [Hz]  |  |
| Status indicating if FCR-N is on or off |  |
| Status indicating if FCR-D up is on or off |  |
| Status indicating if FCR-D down is on or off |  |
| Instantaneous active power [MW] |  |
| Reference active power [MW] |  |
| Maximum power[MW] |  |
| Minimum power [MW] |  |
| Maintained capacity FCR-N [MW] |  |
| Maintained capacity FCR-D up [MW] |  |
| Maintained capacity FCR-D down [MW] |  |
| Regulating strength FCR-N [MW/Hz]  |  |
| Regulating strength FCR-D up [MW/Hz] |  |
| Regulating strength FCR-D down [MW/Hz] |  |
| Remaining endurance FCR-N (minutes)11 |  |
| Remaining endurance FCR-D up (minutes)11 |  |
| Remaining endurance FCR-D down (minutes)11  |  |
| Regulating mode for FCR-N |  |
| Regulating mode for FCR-D up |  |
| Regulating mode for FCR-down |  |
| Remaining endurance FCR-N (minutes) |  |
| Remaining endurance FCR-N (minutes) |  |
| Remaining endurance FCR-N (minutes) |  |
| NEM instantaneous active power [MW][[13]](#footnote-13) |  |
| AEM active (on/off) 11 |  |

## References

|  |  |
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| [1]  | *Technical Requirements for Frequency Containment Reserve Provision in the Nordic Synchronous Area, May 2023*.  |

 [2] *Rapportering av FCR-data,* 2024-01-08.

 [3] *Tekniska villkor för FCR,* 2023-12-20.

## Appendix

*If a separate test of the frequency measurement equipment has been performed in order to estimate the frequency meter time constant TFME, the test result must be reported below.*

*Additional information that may be relevant to the application, such as equations, control systems or descriptions of the reserve, can be included below.*

1. See the definition of a unit providing reserves indicated in Article 3 of Regulation (EU) 2017/1485. [↑](#footnote-ref-1)
2. See the definition of a group providing reserves indicated in Article 3 of Regulation (EU) 2017/1485. [↑](#footnote-ref-2)
3. See the definition in section 3.11 of [1] under the heading “Simplified extension of static FCR-D groups”. [↑](#footnote-ref-3)
4. See the definition in section 3.11 of [1] under the heading “Stand-alone units”. [↑](#footnote-ref-4)
5. In order to be able to deliver reserves as a BSP, you also need to be responsible for the balance in the delivery point (input and/or withdrawal point) that is intended to be used to deliver the reserve, and thus have a valid Agreement on balance responsibility for electricity. [↑](#footnote-ref-5)
6. Information on facility-ID is found on each electricity grid invoice and is used to identify the facility. [↑](#footnote-ref-6)
7. Highest power potential [↑](#footnote-ref-7)
8. For more information on type qualification, see the Svenska kraftnät website [Förkvalificering | Svenska kraftnät (svk.se)](https://www.svk.se/aktorsportalen/bidra-med-reserver/forkvalificering/). [↑](#footnote-ref-8)
9. See section 3.11 of [1] for a description of flexibility. [↑](#footnote-ref-9)
10. For the document “IT security requirements for central control of FCR”, see the Svenska kraftnät website [Förkvalificering | Svenska kraftnät (svk.se)](https://www.svk.se/aktorsportalen/bidra-med-reserver/forkvalificering/). [↑](#footnote-ref-10)
11. The provider of the frequency containment reserve must specify in the prequalification process the limits of the energy reserve in its units or groups providing frequency containment reserves. [↑](#footnote-ref-11)
12. This includes all variable resources. [↑](#footnote-ref-12)
13. Applies to Limited Energy Reserve (LER) units and groups only. [↑](#footnote-ref-13)