**National provisions regarding the requirements for on demand connection established by Elering AS pursuant to Article 6(4) of Commission Regulation No 2016/1388**

Approved with the Competition Authority Resolution No 7-26/2019-005 of 22 February 2019

Applied as of 18 August 2019

**Article 6**

**Regulatory aspects**

4. The relevant system operator or TSO shall submit a proposal for requirements of general application, or the methodology used to calculate or establish them, for approval by the competent entity within two years of entry into force of this Regulation.

**Article 12**

**General frequency requirements**

1. Transmission-connected demand facilities, transmission-connected distribution facilities and distribution systems shall be capable of remaining connected to the network and operating at the frequency ranges and time periods specified in Annex I.

**ANNEX I**

|  |  |  |
| --- | --- | --- |
| Synchronous area | Frequency range | Time period for operation |
| Baltic | 47,5 Hz – 48,5 Hz | To be specified by each TSO, but not less than 30 minutes |
| 48,5 Hz – 49,0 Hz | To be specified by each TSO, but not less than the period for 47,5 Hz-48,5 Hz |
| 49,0 Hz – 51,0 Hz | Unlimited |
| 51,0 Hz – 51,5 Hz | To be specified by each TSO, but not less than 30 minutes |

The table shows the minimum time periods for which a transmission-connected demand facility, a transmissionconnected distribution facility or a distribution system has to be capable of operating on different frequencies, deviating from a nominal value, without disconnecting from the network.

**Explanation: the frequency ranges in the given table are the same as the settings determined nationally by the RfG (reference: Competition Authority Resolution No 7-26/2018-005 of 8 November 2018, Annex 1, Table 2).**

**Article 13**

**General voltage requirements**

1. Transmission-connected demand facilities, transmission-connected distribution facilities and transmissionconnected distribution systems shall be capable of remaining connected to the network and operating at the voltage ranges and time periods specified in Annex II.

**ANNEX II**

110 kV – 300 kV

|  |  |  |
| --- | --- | --- |
| Synchronous area | Voltage range | Time period for operation |
| Baltic | 0,90 pu-1,118 pu | Unlimited |
| 1,118 pu-1,15 pu | 20 minutes |

300 kV – 400 kV

|  |  |  |
| --- | --- | --- |
| Synchronous area | Voltage range | Time period for operation |
| Baltic | 0,90 pu-1,097 pu | Unlimited |
| 1,097 pu-1,15 pu | 20 minutit |

**Explanation: the DCC wording will not change.**

5. Where the voltage base for pu values is 400 kV, the relevant TSOs in the Baltic synchronous area may require transmission-connected demand facilities, transmission-connected distribution facilities and transmission-connected distribution systems to remain connected to the 400 kV network in the voltage ranges and for time periods that apply to the Continental Europe synchronous area.

**Article 15**

**Reactive power requirements**

1. Transmission-connected demand facilities and transmission-connected distribution systems shall be capable of maintaining their steady-state operation at their connection point within a reactive power range specified by the relevant TSO, according to the following conditions:
2. for transmission-connected demand facilities, the actual reactive power range specified by the relevant TSO for importing and exporting reactive power shall not be wider than 48 percent of the larger of the maximum import capacity or maximum export capacity (0,9 power factor import or export of active power), except in situations where either technical or financial system benefits are demonstrated, for transmission-connected demand facilities, by the transmission-connected demand facility owner and accepted by the relevant TSO.

 **Explanation: this is a directly applicable clause, Elering does not determine smaller limits. The Q limits are based on the maximum contractual power. If voltage problems arise at the grid point, the specific solution will be agreed between market participant and the TSO (smaller limits).**

1. 

Permitted Q range

P production

P consumption

1. Figure 1. Explanatory drawing on reagent limits. Pmax = maximum contractual power

b) for transmission-connected distribution systems, the actual reactive power range specified by the relevant TSO for importing and exporting reactive power shall not be wider than:

1. 48 percent (i.e. 0,9 power factor) of the larger of the maximum import capability or maximum export capability during reactive power import (consumption); and
2. (ii) 48 percent (i.e. 0,9 power factor) of the larger of the maximum import capability or maximum export capability during reactive power export (production);

except in situations where either technical or financial system benefits are proved by the relevant TSO and the transmission-connected distribution system operator through joint analysis.

**Explanation: this is a directly applicable clause, Elering does not determine smaller limits. The Q limits are based on the maximum contractual power. If voltage problems arise at the grid point, the specific solution will be agreed between market participant and the TSO (smaller limits). Same as the explanation to Figure 1.**

(d) the relevant TSO may establish the use of metrics other than power factor in order to set out equivalent reactive power capability ranges.

**Comment: Implement on the basis of Q = Mvar. The market participant and Elering will agree the specific export and import limits of reactive power according to the points and explanatory figures provided above.**

**Explanation: Similar to generating modules, Elering does not use power factor-based control in the case of demand installations.**

2. The relevant TSO may require that transmission-connected distribution systems have the capability at the connection point to not export reactive power (at reference 1 pu voltage) at an active power flow of less than 25 % of the maximum import capability. Where applicable, Member States may require the relevant TSO to justify its request through a joint analysis with the transmission-connected distribution system operator. If this requirement is not justified based on the joint analysis, the relevant TSO and the transmission-connected distribution system operator shall agree on necessary requirements according to the outcomes of a joint analysis.

**Explanation: No applied as a direct requirement, implemented on project-basis as a result of analyses where necessary.**

3. Without prejudice to point (b) of paragraph 1, the relevant TSO may require the transmission-connected distribution system to actively control the exchange of reactive power at the connection point for the benefit of the entire system. The relevant TSO and the transmission-connected distribution system operator shall agree on a method to carry out this control, to ensure the justified level of security of supply for both parties. The justification shall include a roadmap in which the steps and the timeline for fulfilling the requirement are specified.

**Explanation: Elering may only demand on the basis of a bilateral contract if the market participant provides the relevant service. Not applied as a demand. Pricing and functionality requirements are similar to the regulation of the voltage of generating modules. (This capability is not required from all new demand connections. It would only apply to the distribution facilities participating in the market that have the respective capability. This market does not exist yet and the requirements will be specified when the market of the respective system service is established in cooperation between Elering and the distribution system operator.)**

**Article 18**

**Information Exchange**

1. Transmission-connected demand facilities shall be equipped according to the standards specified by the relevant TSO in order to exchange information between the relevant TSO and the transmission-connected demand facility with the specified time stamping. The relevant TSO shall make the specified standards publicly available.

**Explanation: This will be determined with the document “Standard terms and conditions of connection to the transmission network of Elering AS” (hereinafter the Connection Conditions).**

**Comment: The IEC 60870-5-104 standard must be followed for as long as the Connection Conditions stipulate otherwise. The standard established in the effective Connection Conditions prevails. Elering will disclose the Connection Conditions and inform the public about the amendment of the Connection Conditions.**

2. Transmission-connected distribution system shall be equipped according to the standards specified by the relevant TSO in order to exchange information between the relevant TSO and the transmission-connected distribution system with the specified time stamping. The relevant TSO shall make the specified standards publicly available.

**Explanation: This will be determined in the Connection Conditions.**

**Comment: The IEC 60870-5-104 standard must be followed for as long as the Connection Conditions stipulate otherwise. The standard established in the effective Connection Conditions prevails. Elering will disclose the Connection Conditions and inform the public about the amendment of the Connection Conditions.**

3. The relevant TSO shall specify the information exchange standards. The relevant TSO shall make publicly available the precise list of data required.

**Explanation: This will be determined in the Connection Conditions.**

**Comment: The IEC 60870-5-104 standard must be followed for as long as the Connection Conditions stipulate otherwise. The standard established in the effective Connection Conditions prevails. Elering will disclose the Connection Conditions on its website and inform the public about the amendment of the Connection Conditions.**

**Article 19**

**Demand disconnection and demand reconnection**

1. All transmission-connected demand facilities and transmission-connected distribution systems shall fulfil the following requirements related to low frequency demand disconnection functional capabilities:

 (a) each transmission-connected distribution system operator and, where specified by the TSO, transmission-connected demand facility owner, shall provide capabilities that enable automatic ‘low frequency’ disconnection of a specified proportion of their demand. The relevant TSO may specify a disconnection trigger based on a combination of low frequency and rate-of-change-of-frequency.

**Explanation: Elering will determine the functioning principles of the frequency automatics as coordinated by the control centre of the distribution system operator.**

(c) the low frequency demand disconnection functional capabilities shall allow for operation from a nominal Alternating Current (‘AC’) input to be specified by the relevant system operator, and shall meet the following requirements: (i) frequency range: at least between 47-50 Hz, adjustable in steps of 0,05 Hz; (ii) operating time: no more than 150 ms after triggering the frequency setpoint; (iii) voltage lock-out: blocking of the functional capability shall be possible when the voltage is within a range of 30 to 90 % of reference 1 pu voltage; (iv) provide the direction of active power flow at the point of disconnection.

**Explanation: Elering will determine the functioning principles of the frequency automatics as coordinated by the control centre of the distribution system operator in consideration of the above conditions.**

2. With regard to low voltage demand disconnection functional capabilities, the following requirements shall apply:

(a) the relevant TSO may specify, in coordination with the transmission-connected distribution system operators, low voltage demand disconnection functional capabilities for the transmission-connected distribution facilities.

**Explanation: The functioning principles of the automatics for reducing the load according to voltage will be agreed with the distribution system operators during the connection process and they will be included in the network contract.**

(b) the relevant TSO may specify, in coordination with the transmission-connected demand facility owners, low voltage demand disconnection functional capabilities for the transmission-connected demand facilities;

 (c) based on the TSO's assessment concerning system security, the implementation of on load tap changer blocking and low voltage demand disconnection shall be binding for the transmission-connected distribution system operators;

 (d) if the relevant TSO decides to implement a low voltage demand disconnection functional capability, the equipment for both on load tap changer blocking and low voltage demand disconnection shall be installed in coordination with the relevant TSO;

(e) the method for low voltage demand disconnection shall be implemented by relay or control room initiation;

(f) the low voltage demand disconnection functional capabilities shall have the following features:

(i) the low voltage demand disconnection functional capability shall monitor the voltage by measuring all three phases;

(ii) blocking of the relays' operation shall be based on direction of either active power or reactive power flow.

3. With regard to blocking of on load tap changers, the following requirements shall apply:

(a) if required by the relevant TSO, the transformer at the transmission-connected distribution facility shall be capable of automatic or manual on load tap changer blocking;

(b) the relevant TSO shall specify the automatic on load tap changer blocking functional capability.

**Explanation: The blocking function is required. The exact settings and parameters will be determined during the connection process.**

4. All transmission-connected demand facilities and transmission-connected distribution systems shall fulfil the following requirements related to disconnection or reconnection of a transmission-connected demand facility or a transmission-connected distribution system:

(a) with regard to the capability of reconnection after a disconnection, the relevant TSO shall specify the conditions under which a transmission-connected demand facility or a transmission-connected distribution system is entitled to reconnect to the transmission system. Installation of automatic reconnection systems shall be subject to prior authorisation by the relevant TSO;

**Explanation: Demand units with distribution network connections and transmission networks with distribution network connections may be automatically reconnected if the frequency according to Article 12(1) and the voltage according to Article 13(1) of the DCC are within the limits of an unlimited interval. The specific settings and parameters will be agreed within the given ranges on the basis of the connection point.**

(b) with regard to reconnection of a transmission-connected demand facility or a transmission-connected distribution system, the transmission-connected demand facility or the transmission-connected distribution system shall be capable of synchronisation for frequencies within the ranges set out in Article 12. The relevant TSO and the transmission-connected demand facility owner or the transmission-connected distribution system operator shall agree on the settings of synchronisation devices prior to connection of the transmission-connected demand facility or the transmission-connected distribution system, including voltage, frequency, phase angle range and deviation of voltage and frequency.

**Explanation: The settings of reconnection of demand units with distribution network connections and transmission networks with distribution network connections will be approved by Elering.**

**Article 20**

**Power quality**

Transmission-connected demand facility owners and transmission-connected distribution system operators shall ensure that their connection to the network does not result in a determined level of distortion or fluctuation of the supply voltage on the network, at the connection point. The level of distortion shall not exceed that allocated to them by the relevant TSO. TSOs shall coordinate their power quality requirements with the requirements of adjacent TSOs.

**Explanation: The TSO will determined the quality requirements in the Connection Conditions. The IEC 61000-3-6/7 technical reports will be used as the basis for as long as otherwise determined by the Connection Conditions or the guidelines or annexes that are inseparable parts thereof. The quality requirements established in the effective Connection Conditions prevail, unless otherwise stipulated by effective legislation.**

**Article 21**

**Simulation models**

3. Each TSO shall specify the content and format of those simulation models or equivalent information. The content and format shall include:

 (a) steady and dynamic states, including 50 Hz component;

 (b) electromagnetic transient simulations at the connection point;

 (c) structure and block diagrams.

**Comment: Said information will only be required from demand installations whose single load exceeds 10 MW and the requirements for the model are determined according to the requirements of the model of the generating module of similar technology. For example, similar to the synchronous module in the case of a synchronous motor and to the energy park module of a load connected via a coverter.**

5. Each relevant system operator or relevant TSO shall specify the requirements of the performance of the recordings of transmission-connected demand facilities or transmission-connected distribution facilities, or both, in order to compare the response of the model with these recordings.

**Explanation: Determined with the Connection Conditions or the guidelines or annexes that are inseparable parts thereof.**

**Comment: Modelling models are required on the basis of the effective Connection Conditions only from demand installations whose single load exceeds 10 MW. (Significant impact on the system.) Data storage from the viewpoint of the validation of the model is meant in this point. This is project-based and the data storage requirements for generating modules are considered.**

**Article 28**

**Specific provisions for demand units with demand response active power control, reactive power control and transmission constraint management**

2. Demand units with demand response active power control, demand response reactive power control, or demand response transmission constraint management shall comply with the following requirements, either individually or, where it is not part of a transmission-connected demand facility, collectively as part of demand aggregation through a third party:

(e) be equipped to receive instructions, directly or indirectly through a third party, from the relevant system operator or the relevant TSO to modify their demand and to transfer the necessary information. The relevant system operator shall make publicly available the technical specifications approved to enable this transfer of information. For demand units connected at a voltage level below 110 kV, these specifications shall, prior to approval in accordance with Article 6, be subject to consultation with the relevant stakeholders in accordance with Article 9(1).

**Explanation: Elering discloses the indicators of the technical devices approved for data transmission (incl. the relevant signals) in the Connection Conditions or in the guidelines or annexes that are inseparable parts thereof.**

**Comment: The IEC 60870-5-104 standard must be followed for as long as the Connection Conditions stipulate otherwise. The standard indicators of technical equipment established in the effective Connection Conditions prevail. Elering will disclose the Connection Conditions on its website and inform the public about the amendment of the Connection Conditions.**

(k) have the withstand capability to not disconnect from the system due to the rate-of-change-of-frequency up to a value specified by the relevant TSO. With regard to this withstand capability, the value of rate-of-change-offrequency shall be calculated over a 500 ms time frame. For demand units connected at a voltage level below 110 kV, these specifications shall, prior to approval in accordance with Article 6, be subject to consultation with the relevant stakeholders in accordance with Article 9(1).

**Explanation: Speed of frequency change 2.5 Hz/s (*RoCoF*). (The same as the nationally determined RfG settings, Annex 1, Article 13.1.(b).)**

(l) where modification to the power consumption is specified via frequency or voltage control, or both, and via prealert signal sent by the relevant system operator or the relevant TSO, be equipped to receive, directly or indirectly through a third party, the instructions from the relevant system operator or the relevant TSO, to measure the frequency or voltage value, or both, to command the demand trip and to transfer the information. The relevant system operator shall specify and publish the technical specifications approved to enable this transfer of information. For demand units connected at a voltage level below 110 kV, these specifications shall, prior to approval in accordance with Article 6, be subject to consultation with the relevant stakeholders in accordance with Article 9(1).

**Explanation: Elering discloses the indicators of the technical devices approved for data transmission (incl. the relevant signals) in the Connection Conditions or in the guidelines or annexes that are inseparable parts thereof.**

**Comment: The IEC 60870-5-104 standard must be followed for as long as the Connection Conditions stipulate otherwise. The standard established in the effective Connection Conditions prevails. Elering will disclose the Connection Conditions on its website and inform the public about the amendment of the Connection Conditions.**

**Article 29**

**Specific provisions for demand units with demand response system frequency control**

2. Demand units with demand response system frequency control shall comply with the following requirements, either individually or, where it is not part of a transmission-connected demand facility, collectively as part of demand aggregation through a third party:

(b) be capable of operating across the voltage ranges specified in Article 13 if connected at a voltage level at or above 110 kV;

(d) be equipped with a control system that is insensitive within a dead band around the nominal system frequency of 50,00 Hz, of a width to be specified by the relevant TSO in consultation with the TSOs in the synchronous area. For demand units connected at a voltage level below 110 kV, these specifications shall, prior to approval in accordance with Article 6, be subject to consultation with the relevant stakeholders in accordance with Article 9(1).

**Explanation: Dead band +/-200 mHz.**

(e) be capable of, upon return to frequency within the dead band specified in paragraph 2(d), initiating a random time delay of up to 5 minutes before resuming normal operation.

The maximum frequency deviation from nominal value of 50,00 Hz to respond to shall be specified by the relevant TSO in coordination with the TSOs in the synchronous area. For demand units connected at a voltage level below 110 kV, these specifications shall, prior to approval in accordance with Article 6, be subject to consultation with the relevant stakeholders in accordance with Article 9(1).

The demand shall be increased or decreased for a system frequency above or below the dead band of nominal (50,00 Hz) respectively;

**Explanation: Maximum deviation +/- 200 mHz, response required when exceeded.**

(g) be able to detect a change in system frequency of 0,01 Hz, in order to give overall linear proportional system response, with regard to the demand response system frequency control's sensitivity and accuracy of the frequency measurement and the consequent modification of the demand. The demand unit shall be capable of a rapid detection and response to changes in system frequency, to be specified by the relevant TSO in coordination with the TSOs in the synchronous area. An offset in the steady-state measurement of frequency shall be acceptable up to 0,05 Hz.

**Explanation: Measuring accuracy 0.01 Hz. The regulation speed and extent are determined on the basis of the RfG frequency response parameters (reference: Competition Authority Resolution No 7-26/2018-005 of 8 November 2018, Annex 1, Table 5). Reaction may take place in stages in the case of consumption.**