**Baltic CNC group working plan**

All Connection Network Codes (RfG, DCC and HVDC) Articles with non-exhaustive requirements, of which national choices have impact on regional level, i.e. adjacent countries, and some characteristics are widely shared such as frequency topics may require coordination across a synchronous area. Others such as voltage related characteristics may benefit from coordination at a Regional or immediate neighboring country level.

This Baltic CNC group-working plan will aim to coordinate CNC parameters before the public consultations and providing to NRA no later than:

For RfG NC (EU) 2016/631 until 17/05/2018

For DCC NC (EU) 2016/1388 until 7/09/2018

For HVDC NC (EU) 2016/1447 until 28/09/2018

The tables with Parameters for TSO coordination for implementation CNC explicitly or reasonably required are provided in ANNEX1.

**General Connection code implementation plan**

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| --- | --- | --- | --- | --- |
|  |  | **2017** | **2018** | **2019** |
| **Q3** | **Q4** | **Q1** | **Q2** | **Q3** | **Q4** | **Q1** | **Q2** | **Q3** | **Q4** | **Q1** | **Q2** | **Q3** |
| **RfG NC (EU) 2016/631 entry in force 17/05/2016**  | **Definition of requirements at national level and coordination with adjacent TSO** | **Public consultation** | **NRA approval** | **National law amendment** |  |
| **DCC NC (EU) 2016/1388 entry in force 7/09/2016** |  | **Definition of requirements at national level and coordination with adjacent TSO** | **Public consultation** | **NRA approval** | **National law amendment** |
| **HVDC NC (EU) 2016/1447 entry in force 28/09/2016**  |  | **Definition of requirements at national level and coordination with adjacent TSO** | **Public consultation** | **NRA approval** | **National law amendment** |

**Detailed Connection code coordination plan**

|  |  |  |  |
| --- | --- | --- | --- |
| **Meeting Place** | **Meeting time** | **NC and article for coordination** | **Requirement** |
| Tallinn | 19th of October 2017 | RfG 13 (7) | Frequency ranges of automatic connection and gradient of active power increase |
| RfG 14 (4) (a) | Automatic reconnection after an incidental disconnection |
| RfG 15 (5) (c) (iii) | Quick re-synchronisation |
| DCC 20  | Power quality |
| Vilnius | November (week 48) | RfG 15 (6) (e) | Maximum limits on rates of change of active power output |
| DCC 29 (2)d | DSR- SFC |
| DCC 29 (2)e | DSR- SFC  |
| DCC 29 (2)g | DSR- SFC  |
| Riga | January 2018 (week 4) | DCC 37 (5) | Compliance tests for disconnection and reconnection for distribution |
| DCC Whereas (2); (4); (14); (15); (17). | DCC common understanding on general requirements on system security, E@R, on frequency, Voltage ranges |
| 19 (1) a | Demand disconnection trigger |
| Tallinn | March 2018 (week \_\_) | 28 (2) k | RoCoF withstand capability |
| 30 (2) b | DSR – very fast APC |
| Annexe 1 | Frequency range time periods |
| Riga | April 2018 (week \_\_) | The main outcomes of Litgrid study for selection of the parameters and SBA. Finalization of Baltic CNC explanatory document. Final decision on non-coordinated RfG parameters. |
| Vilnius | June 2018 (week \_\_) | HVDC Preamble (9), (11) | HVDC common understanding on Frequency related requirements, Voltage ranges |
| 13 (3) | Automatic remedial actions |
| 17 (1) | Loss of active power |
| 17 (2) | Loss of active power in two or more control areas |
| 18 (1) | Reference 1 pu voltage |
| 18 (4) | Voltages not included in scope |
| 18 (5) | Voltage ranges and time periods |
| Tallinn | August 2018 (week \_\_) | 77 (4) | Assess request for derogation |
| 78 (2)(f) | Analysis of CBA |
| Final decision on non-coordinated DCC and HVDC parameters Finalization of explanatory document.  |

**ANNEX1**

**1.1 NC RfG – TSO coordination for implementation explicitly required**

| **Article** | **Requirement** | **Text** | **Coordination status** |
| --- | --- | --- | --- |
| Preamble (23) | Voltage Ranges | **Voltage ranges should be coordinated between interconnected systems** because they are crucial to secure planning and operation of a power system within a synchronous area. Disconnections because of voltage disturbances have an impact on neighbouring systems. Failure to specify voltage ranges could lead to widespread uncertainty in planning and operation of the system with respect to operation beyond normal operating conditions.*Remark: Articles 15 (3), 16(2) and 25 cover the definition of voltage ranges, no further coordination is required beyond these specifications.* | YES |
| 5 (3) | Capacity thresholds for generators | Proposals for maximum capacity thresholds for types B, C and D power generating modules shall be subject to approval by the relevant regulatory authority or, where applicable, the Member State. **In forming proposals the relevant TSO shall coordinate with adjacent TSOs and DSOs** and shall conduct a public consultation in accordance with Article 10. A proposal by the relevant TSO to change the thresholds shall not be made sooner than three years after the previous proposal. | YES |
| 13 (2) | LFSM-O parameters | With regard to the limited frequency sensitive mode — overfrequency (LFSM-O), the following shall apply, **as determined by the relevant TSO for its control area in coordination with the TSOs of the same synchronous area** to ensure minimal impacts on neighbouring areas:1. the power generating module shall be capable of activating the provision of active power frequency response according to figure 1 at a frequency threshold and droop settings specified by the relevant TSO;
2. instead of the capability referred to in paragraph (a), the relevant TSO may choose to allow within its control area automatic disconnection and reconnection of power generating modules of Type A at randomised frequencies, ideally uniformly distributed, above a frequency threshold, as determined by the relevant TSO where it is able to demonstrate to the relevant regulatory authority, and with the cooperation of power generating module owners, that this has a limited cross-border impact and maintains the same level of operational security in all system states;
3. the frequency threshold shall be between 50.2 Hz and 50.5 Hz inclusive;
4. the droop settings shall be between 2 % and 12 %;
5. the power generating module shall be capable of activating a power frequency response with an initial delay that is as short as possible. If that delay is greater than two seconds, the power generating facility owner shall justify the delay, providing technical evidence to the relevant TSO;
6. the relevant TSO may require that upon reaching minimum regulating level, the power generating module be capable of either:
	1. continuing operation at this level; or
	2. further decreasing active power output;
7. the power generating module shall be capable of operating stably during LFSM-O operation. When LFSM-O is active, the LFSM-O setpoint will prevail over any other active power setpoints.
 | YES |
| 15 (2) (c) (i) | LFSM-U parameters | In addition to paragraph 2 of Article 13, the following requirements shall apply to type C power generating modules with regard to limited frequency sensitive mode – underfrequency (LFSM-U):(i) the power generating module shall be capable of activating the provision of active power frequency response at a frequency threshold and with a droop **specified by the relevant TSO in coordination with the TSOs of the same synchronous area** as follows:* the frequency threshold specified by the TSO shall be between 49.8 Hz and 49.5 Hz inclusive;
* the droop settings specified by the TSO shall be in the range 2 – 12 %.

This is represented graphically in Figure 4; | YES |

**1.2 NC RfG – TSO coordination for implementation reasonably required**

| **Article** | **Requirement** | **Recommendation** | **Coordination status** |
| --- | --- | --- | --- |
| 13 (1) (a) | Frequency Ranges | With regard to frequency ranges:(i) a power generating module shall be capable of remaining connected to the network and operate **within the frequency ranges and time periods specified in Table 2**;*Coordination on synchronous area level of time period for operation for those frequency ranges, where Table 2 requires specifications by each TSO.* | YES |
| 13 (1) (b) | RoCoF withstand capability | With regard to the rate of change of frequency withstand capability, a power generating module shall be capable of staying connected to the network and **operate at rates of change of frequency up to a value specified by the relevant TSO**, unless disconnection was triggered by rate-of-change-of-frequency-type loss of mains protection. The relevant system operator, in coordination with the relevant TSO, shall specify this rate-of-change-of-frequency-type loss of mains protection.*Coordination on synchronous area level on RoCoF value to be withstood. Minimum RoCoF is to be defined on synchronous level without the prejudice to define by each TSO higher RoCoF on national level if needed to ensure safety of the system in case of asynchronous operation or islanding.*  | YES |
| 13 (4) | Admissible active power reduction at low frequencies | The relevant TSO shall **specify admissible active power reduction from maximum output with falling frequency in its control area as a rate of reduction falling within the boundaries, illustrated by the full lines in Figure 2:**1. below 49 Hz falling by a reduction rate of 2 % of the maximum capacity at 50 Hz per 1 Hz frequency drop;
2. below 49.5 Hz falling by a reduction rate of 10 % of the maximum capacity at 50 Hz per 1 Hz frequency drop.

*Coordination on synchronous area level on the frequency-dependent admissible active power reduction taking into account technology limitations.* | In progress |
| 13 (7) | Frequency ranges of automatic connection and gradient of active power increase | The relevant TSO shall specify the conditions under which a power generating module is capable of connecting automatically to the network. Those conditions shall include:**a) frequency ranges within which an automatic connection is admissible, and a corresponding delay time; and****b) maximum admissible gradient of increase in active power output.**Automatic connection is allowed unless specified otherwise by the relevant system operator in coordination with the relevant TSO.*Coordination on synchronous area level of these ranges and gradients* | In progress |
| 14 (4) (a) | Automatic reconnection after an incidental disconnection | Type B power generating modules shall fulfil the following requirements relating to system restoration:1. the relevant TSO **shall specify the conditions under which a power generating module is capable of reconnecting to the network after an incidental disconnection caused by a network disturbance;** and

*Coordination on synchronous area level of conditions for reconnection* | In progress |
| 15 (2) (d) | FSM parameters | in addition to point (c) of paragraph (2), the following shall apply cumulatively when frequency sensitive mode ('FSM') is operating:1. the power generating module shall be capable of providing active power frequency response in accordance **with the parameters specified by each relevant TSO within the ranges shown in Table 4.**
2. …
3. in the event of a frequency step change, the power generating module shall be capable of activating full active power frequency response, at or above the full line shown in Figure 6 **in accordance with the parameters specified by each TSO (which shall aim at avoiding active power oscillations for the power generating module) within the ranges given in Table 5.** The combination of choice of the parameters specified by the TSO shall take possible technology-dependent limitations into account;
4. …
5. the power generating module shall be capable of **providing full active power frequency response for a period of between 15 and 30 minutes as specified by the relevant TSO**. In specifying the period, the TSO shall have regard to active power headroom and primary energy source of the power generating module;
6. …
7. …

*Coordination on synchronous area level of parameters of Tables 5, and of duration of active power frequency response provision. The methodology of selecting of static parameters specified in Table 4 for FSM will be proposed through this coordination to ensure proper overall Control Block active power frequency response* | YES |
| 15 (5) (c) (iii) | Quick re-synchronisation | power generating modules shall be capable of continuing operation following tripping to houseload, irrespective of any auxiliary connection to the external network. **The minimum operation time shall be specified by the relevant system** operator in coordination with the relevant TSO, taking into consideration the specific characteristics of prime mover technology*Coordination on synchronous area level of minimum operation time* | In progress |
| 15 (6) (e) | Maximum limits on rates of change of active power output | the relevant system operator shall specify, in coordination with the relevant TSO, **minimum and maximum limits on rates of change of active power output (ramping limits) in both an up and down direction of change of active power output for a power generating module**, taking into consideration the specific characteristics of prime mover technology;*Coordination on synchronous area level of rate of change of active power output Ramp rate ranges need to be defined taking into account technology constraints (within these ranges TSOs will specify the needed ramp rates during the implementation process )* | In progress |
| 21 (2) | Synthetic inertia | Type C power park modules shall fulfil the following additional requirements in relation to frequency stability: * + - 1. the relevant TSO shall have the right to specify that power park modules **be capable of providing synthetic inertia** during very fast frequency deviations;

*Coordination on synchronous area level of provision of synthetic inertia. Minimum inertia is to be defined on synchronous level without the prejudice to define higher inertia on national level by each TSO if needed to ensure safety of the system in case of asynchronous operation or islanding.* | After additional studies |

**2.1 NC DCC – TSO coordination for implementation explicitly required**

| **Article** | **Requirement** | **Text** | **Coordination status** |
| --- | --- | --- | --- |
| 20 | Power Quality | **TSOs shall coordinate their power quality requirements with the requirements of adjacent TSOs.** |  |
| 29 (2)d | DSR- SFC  | …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** |  |
| 29 (2)e | DSR- SFC  | **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** |  |
| 29 (2)g | DSR- SFC  | 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** |  |
| 37 (5) | Compliance tests for disconnection and reconnection for distribution | With regard to the low frequency demand disconnection test, the transmission-connected distribution facility's technical capability of low frequency demand disconnection **of a percentage of demand to be specified by the relevant TSO, in coordination with adjacent TSOs,** where equipped as provided for in Article 19, shall be demonstrated. |  |

**2.2 NC DCC – TSO coordination for implementation reasonably required**

| **Article** | **Requirement** | **Recommendation** | **Coordination status** |
| --- | --- | --- | --- |
| Whereas (2) | General on system security | In order to provide system security within the interconnected transmission system, it is essential **to establish a common understanding of the requirements** for grid connection applicable to demand facilities and distribution systems, including closed distribution systems. Those requirements that contribute to maintaining, preserving and restoring system security in order to facilitate proper functioning of the internal electricity market within and between synchronous areas, and to achieve cost efficiencies, should be regarded as cross-border network issues and market integration issues. |  |
| Whereas (4) | General on E&R | **Regular coordination at the level of the transmission and distribution networks** and adequate performance of the equipment connected to the transmission and distribution networks with sufficient robustness to cope with disturbances and to help to prevent any major disruption or to facilitate restoration of the system after a collapse are fundamental prerequisites. |  |
| Whereas (14) | General on frequency | …this Regulation should aim at **the same frequency- related requirements** for all voltage levels**, at least within a synchronous area.** |  |
| Whereas (15) | General on Voltage Ranges | **Voltage ranges should be coordinated between interconnected systems** because they are crucial to secure planning and operation of a power system **within a synchronous area** |  |
| Whereas (17) | General on development of requirements | The regulatory authorities, Member States and **system operators should** **ensure that**, in the process of developing and approving the requirements for network connection, they are **harmonised to the extent possible**, in order to ensure full market integration. |  |
| 19 (1) a | Demand disconnection trigger | The **relevant TSO may specify a disconnection trigger** based on a combination of low frequency and rate-of-change-of-frequency; |  |
| 28 (2) k | RoCoF withstand capability | have the capability to not disconnect from the system due to the rate-of-change-of-frequency up to **a value specified by the relevant TSO.** The value of rate-of-change-of-frequency shall be calculated as the average of a 500 ms time frame. |  |
| 30 (2) b | DSR – very fast APC | The contract …. shall specify …**the operating principle of this control system and the associated performance parameters;** |  |
| Annexe 1 | Frequency range time periods | The table shows the **minimum time periods** for which a transmission-connected demand facility, a transmission-connected 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.** |  |

**3. NC HVDC – TSO coordination for implementation**

| **Article** | **Requirement** | **Text** | **Coordination status** |
| --- | --- | --- | --- |
| Preamble (9) | Frequency-related requirements | Due to its cross-border impact, this Regulation should aim at the **same frequency-related requirements for all voltage levels, at least within a synchronous area**. That is necessary because, within a synchronous area, a change in frequency in one Member State would immediately impact frequency and could damage equipment in all other Member States. |  |
| Preamble (11) | Voltage ranges | Voltage ranges **should be coordinated between interconnected** systems because they are crucial to secure planning and operation of a power system within a synchronous area. Disconnections because of voltage disturbances have an impact on neighbouringsystems. Failure to specify voltage ranges could lead to widespread uncertainty in planning and operation of the system with respect to operation beyond normal operating conditions. |  |
| 13 (3) | Automatic remedial actions | If specified by **a relevant TSO, in coordination with adjacent TSOs**, the control functions of an HVDC system shall be capable of taking automatic remedial actions including, but not limited to, stopping the ramping and blocking FSM, LFSM-O, LFSM-U and frequency control. The triggering and blocking criteria shall be specified by relevant TSO and subject to notification to the regulatory authority. The modalities of that notification shall be determined in accordance with the applicable national regulatory framework. |  |
| 17 (1) | Loss of active power | An HVDC system shall be configured in such a way that its loss of active power injection in a synchronous area shall be limited to a value **specified by the relevant TSOs** for their respective load frequency control area, based on the HVDC system's impact on the power system. |  |
| 17 (2) | Loss of active power in two or more control areas | Where an HVDC system connects two or more control areas, the **relevant TSOs shall consult each other** in order to set a coordinated value of the maximum loss of active power injection as referred to in paragraph 1, taking into account common mode failures. |  |
| 18 (1) | Reference 1 pu voltage | Without prejudice to Article 25, an HVDC converter station shall be capable of staying connected to the network and capable of operating at HVDC system maximum current, within the ranges of the network voltage at the connection point, expressed by the voltage at the connection point related to reference 1 pu voltage, and the time periods specified in Tables 4 and 5, Annex III. The establishment of the **reference 1 pu voltage shall be subject to coordination between the adjacent relevant system operators.** |  |
| 18 (4) | Voltages not included in scope | For connection points at reference 1 pu AC voltages not included in the scope set out in Annex III, the relevant system operator, **in coordination with relevant TSOs,** shall specify applicable requirements at the connection points. |  |
| 18 (5) | Voltage ranges and time periods | Notwithstanding the provisions of paragraph 1, the **relevant TSOs in the Baltic synchronous area may, following consultation with relevant neighboring TSOs**, require HVDC converter stations to remain connected to the 400 kV network in the voltage ranges and for time periods that apply in the Continental Europe synchronous area. |  |
| 77 (4) | Asess request for derogation | The **relevant system operator shall, in coordination with the relevant TSO and any affected adjacent DSO or DSOs,** assess the request for a derogation and the provided cost-benefit analysis, taking into account the criteria determined by the regulatory authority pursuant to Article 76. |  |
| 78 (2)(f) | Analysis of CBA | a cost-benefit analysis pursuant to the requirements of Article 66. If applicable, the cost-benefit analysis shall be carried out in **coordination with the relevant TSO and any adjacent DSOs.** |  |