

Recommendation DR NC

Annex 4 - Amended DC Network Code

COMMISSION REGULATION (EU) .../...

of ...

establishing a Network Code on Demand Connection

(Text with EEA relevance)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (recast) ⁽¹⁾, and in particular Article 59 (13) thereof,

Whereas:

- (1) The swift completion of a fully functioning and interconnected internal energy market is crucial to maintaining security of energy supply, increasing competitiveness and ensuring that all consumers can purchase energy at affordable prices.
- (2) Regulation (EU) 2019/943 sets out non-discriminatory rules governing access to the network for cross-border exchanges in electricity with a view to ensuring the proper functioning of the internal market in electricity. In addition Article 3 of Directive (EU) 2019/944 of the European Parliament and of the Council ⁽²⁾ requires that Member States should ensure, inter alia, a level playing field where electricity undertakings are subject to transparent, proportionate and non-discriminatory rules, fees and treatment. Where requirements constitute terms and conditions for connection to national networks, Article 59(7) of the same Directive requires regulatory authorities to be responsible for fixing or approving at least the national methodologies used to calculate or establish them. 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.
- (3) Harmonised rules for grid connection for demand facilities and distribution systems should be set out in order to provide a clear legal framework for grid connections, facilitate Union-wide trade in electricity, ensure system security, facilitate the integration of renewable electricity sources, increase competition, and allow more efficient use of the network and resources, for the benefit of consumers.
- (4) System security cannot be ensured independently from the technical capabilities of all users. Historically, generation facilities have formed the backbone of providing technical capabilities. However, in this regard, demand facilities are expected to play a more pivotal role in the future. 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.

- (5) As secure system operation is important, the demand facility owners in close cooperation with system operators will apply the requirements provided in this Regulation in such a way to ensure effective operability of the network.
- (6) Regulatory authorities should consider the reasonable costs effectively incurred by system operators in the implementation of this Regulation when fixing or approving transmission or distribution tariffs or their methodologies or when approving the terms and conditions for connection and access to national networks in accordance with Article 59(1) and (7) of Directive (EU) 2019/944 and with Article 18 of Regulation (EU) 2019/943.
- (7) Different synchronous electricity systems in the Union have different characteristics which need to be taken into account when setting the requirements for demand connection. It is therefore appropriate to consider regional specificities when establishing network connection rules as required by Article 59(1) and (2) of Regulation (EU) 2019/943.
- (8) In view of the need to provide regulatory certainty, the requirements of this Regulation should apply to new transmission-connected demand facilities, new transmission-connected distribution facilities, new distribution systems, new V1G electric vehicles and associated V1G electric vehicle supply equipment, new heat-pumps, and new power-to-gas demand units. The requirements of this Regulation should not apply to existing transmission-connected demand facilities, existing transmission-connected distribution facilities, existing distribution systems and existing demand units. The requirements of this Regulation also should not apply to new or existing demand facilities connected at the distribution level. However, the requirements of this Regulation should apply in case the relevant regulatory authority or Member State decides otherwise based on the evolution of system requirements and a full cost-benefit analysis, or in case a substantial modernisation or replacement of equipment impacting the technical capabilities of an existing transmission-connected demand facility, an existing transmission-connected distribution facility, an existing distribution system, or an existing demand unit within a demand facility or a closed distribution system connected at a voltage level above 1000 V has been performed.
- (9) Similarly, the requirements under Commission Regulation (EU) 2016/1388 should continue to apply to the facilities, systems and units which exist at the entry into force of this Regulation and fall within the scope of Commission Regulation (EU) 2016/1388.
- (**1) Transmission-connected demand facilities, transmission-connected distribution facilities, new distribution systems, V1G electric vehicles and associated V1G electric vehicle supply equipment, heat-pumps, and power-to-gas demand units are subject to the requirements of this Regulation regardless of whether they are part of a citizen energy community or a renewable energy community as defined in Directive (EU) 2019/944 and Directive (EU) 2018/2001 respectively, another entity, or a form of system users aggregation, unless such energy communities, another entity, or a form of system users aggregation constitutes an off-grid system.

- (10) The requirements should be based on the principles of non-discrimination and transparency as well as on the principle of optimisation between the highest overall efficiency and lowest total cost for all involved parties. TSOs and distribution system operators ('DSOs') including CDSOs can take those elements into account when defining the requirements in accordance with the provisions of this Regulation, whilst recognising that the thresholds which determine whether a system is a transmission system or a distribution system are established at the national level.
- (11) The requirements applicable to a demand facility connected to a transmission system should set out the capabilities at their interfaces and the necessary automated responses and data exchange. These requirements aim at ensuring the operability of the transmission system, and the capacity to utilise the generation and demand response embedded in these networks over system operational ranges and critical events.
- (12) The requirements applicable to a distribution system connected to a transmission system or another distribution system should set out the operational range of these systems and the necessary automated responses and data exchange. These requirements should ensure the effective development and operability of the transmission system, and the capacity to utilise the generation and demand response embedded in these networks over system operational ranges and critical events.
- (13) 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.
- (14) Frequency-related requirements should support the stable operation of the energy system which is being transformed to accommodate the green transition. In the future, the effectiveness of existing low frequency demand disconnection (LFDD) schemes is expected to be reduced due to the increased penetration of distributed generation. Therefore, a new limited frequency sensitive mode for various demand units (LFSM-UC) is being introduced to account for these changes. Furthermore, V1G electric vehicles and associated V1G electric vehicle supply equipment, such as V1G, power-to-gas demand units and heat-pumps are usually technically capable to fulfil such a requirement without negative consequences for the grid user.

LFSM-UC should support the frequency in an emergency case so that LFDD schemes in the best case are not even triggered and no critical demand would be disconnected.
- (15) Rapidly increasing penetration of large demand facilities and converter-based technologies into European synchronous systems has presented new challenges in ensuring overall system security. To the extent that an adequate contribution to the dynamically transforming system depends partly on advanced capabilities, demand facilities should be able to support the system robustness by fulfilling appropriate withstand and robustness requirements.
- (16) 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.
- (17) Appropriate and proportionate compliance testing should be introduced so that system operators can ensure operational security. In accordance with Article 59(1)(b) of Directive (EU) 2019/944, regulatory authorities are responsible for ensuring that system operators are compliant with this Regulation.
 - (18) 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. Established technical standards should be taken into particular consideration in the development of connection requirements.
 - (19) System operators should not specify technical requirements for equipment that hinder the free movement of goods in the internal market. Where system operators make technical specifications resulting in requirements for the placing on the market of equipment, the respective Member State should follow the procedure referred to in Articles 5 and 6 of Directive (EU) 2015/1535 of the European Parliament and of the Council ⁽³⁾.
 - (20) A process for derogating from the rules should be set out in this Regulation to take into account local circumstances where exceptionally, for example, compliance with those rules could jeopardise the stability of the local network or where the safe operation of a transmission-connected demand facility, a transmission-connected distribution facility, or a distribution system might require operating conditions that are not in line with this Regulation.
 - (21) Subject to approval by the relevant regulatory authority, or other authority where applicable in a Member State, demand facility owners and relevant system operators should be allowed to propose derogations for certain classes of transmission-connected demand facilities, transmission-connected distribution facilities, distribution systems and demand units.
 - (22) According to Article 38 of Directive (EU) 2019/944, Member States may provide for the classification of a system which distributes electricity as a closed distribution system in certain circumstances. The provisions of this Regulation should apply to closed distribution systems only where Member States have so provided according to Article 38 of Directive (EU) 2019/944.
 - (23) This Regulation has been adopted on the basis of Regulation (EU) 2019/943 which it supplements and of which it forms an integral part. References to Regulation (EU) 2019/943 in other legal acts should be understood as also referring to this Regulation.
 - (24) The measures provided for in this Regulation are in accordance with the opinion of the Committee referred to in Article 67(1) of Regulation (EU) 2019/943.

HAS ADOPTED THIS REGULATION:

TITLE I
GENERAL PROVISIONS

Article 1

Subject matter

1. This Regulation establishes a network code which lays down the requirements for grid connection of:
 - (a) transmission-connected demand facilities;
 - (b) transmission-connected distribution facilities;
 - (c) distribution systems, including closed distribution systems;
 - (d) V1G electric vehicles and associated V1G electric vehicle supply equipment, heat-pumps and power-to-gas demand units.
2. This Regulation helps to ensure fair conditions of competition in the internal electricity market, to ensure system security and the integration of renewable electricity sources, and to facilitate Union-wide trade in electricity.
3. This Regulation lays down the obligations for ensuring that system operators make appropriate use of the demand facilities' and distribution systems' capabilities in a transparent and non-discriminatory manner to provide a level playing field throughout the Union.

Article 2

Definitions

For the purposes of this Regulation, the definitions in Article 2 of Directive 2012/27/EU of the European Parliament and of the Council ⁽⁴⁾, Article 2 of Regulation (EU) 2019/943, Article 2 of Commission Regulation (EU) 2015/1222 ⁽⁵⁾, Article 2 of Commission Regulation (EU) 2016/631 ⁽⁶⁾, Article 2 of Commission Regulation (EU) No 543/2013 ⁽⁷⁾ and Article 2 of Directive (EU) 2019/944 shall apply.

In addition, the following definitions shall apply:

- (1) 'demand facility' means a facility which consumes electrical energy and is connected at one or more connection points to the transmission or distribution system. A distribution system and/or auxiliary supplies of a power generating module do not constitute a demand facility;
- (2) 'transmission-connected demand facility' means a demand facility which has a connection point to a transmission system;
- (3) 'transmission-connected distribution facility' means a part of a distribution system and equipment used at the site of the connection point to the transmission system;
- (4) 'demand unit' means an indivisible set of installations containing equipment which can be actively controlled by a demand facility owner or by a CDSO, either individually or commonly as part of demand aggregation through a third party or is a V1G electric vehicle and associated V1G electric vehicle supply equipment, power-to-gas demand unit or heat-pump.
- (5) 'V1G electric vehicle' means the vehicle that is powered, fully or in part, with electricity and can only withdraw electricity from the network over a V1G electric vehicle supply equipment.

- (6) 'V1G electric vehicle supply equipment' means the infrastructure necessary to safely conduct electrical energy from the electricity supply network to the electric vehicle with demand-only behaviour. Electrical wirings are not deemed part of an electric vehicle supply equipment.
- (7) 'closed distribution system' means a distribution system classified pursuant to Article 38 of Directive (EU) 2019/944 as a closed distribution system by national regulatory authorities or by other competent authorities, where so provided by the Member State, which distributes electricity within a geographically confined industrial, commercial or shared services site and does not supply household customers, without prejudice to incidental use by a small number of households located within the area served by the system and with employment or similar associations with the owner of the system;
- (8) 'main demand equipment' means at least one of the following equipment: motors, transformers, high voltage equipment at the connection point and at the process production plant;
- (9) 'transmission-connected distribution system' means a distribution system connected to a transmission system, including transmission-connected distribution facilities;
- (10) 'maximum import capability' means the maximum continuous active power that a transmission-connected demand facility or a transmission-connected distribution facility can consume from the network at the connection point, as specified in the connection agreement or as agreed between the relevant system operator and the transmission-connected demand facility owner or transmission-connected distribution system operator respectively;
- (11) 'maximum export capability' means the maximum continuous active power that a transmission-connected demand facility or a transmission-connected distribution facility, can feed into the network at the connection point, as specified in the connection agreement or as agreed between the relevant system operator and the transmission-connected demand facility owner or transmission-connected distribution system operator respectively;
- (12) 'low frequency demand disconnection' means an action where demand is disconnected during a low frequency event in order to recover the balance between demand and generation and restore system frequency to acceptable limits;
- (13) 'low voltage demand disconnection' means a restoration action where demand is disconnected during a low voltage event in order to recover voltage to acceptable limits;
- (14) 'on load tap changer' means a device for changing the tap of a winding, suitable for operation while the transformer is energised or on load;
- (15) 'on load tap changer blocking' means an action that blocks the on load tap changer during a low voltage event in order to stop transformers from further tapping and suppressing voltages in an area;
- (16) 'control room' means a relevant system operator's operation centre;
- (17) 'block loading' means the maximum step active power loading of reconnected demand during system restoration after black-out;
- (18) 'demand unit document' (DUD) means a document, issued either by the demand facility owner or the CDSO to the relevant system operator for demand units which are V1G

electric vehicles and associated V1G electric vehicle supply equipment, power-to-gas demand units or heat-pumps and connected at a voltage level above 1000 V, which confirms the compliance of the demand unit with the technical requirements set out in this Regulation and provides the necessary data and statements, including a statement of compliance.

- (**1) ‘power-to-gas demand unit’ means a demand unit that converts electricity to gases (such as hydrogen or, with subsequent methanation, synthetic methane or other gases).
- (**2) ‘heat pump’ means a heat pump as defined in point (18) of Article 2 of Directive 2010/31/EU;
- (**3) ‘minimum technical operating level’ is the operation level of active power where the demand unit can operate without negative influence on the inherent process of its work, such as charging or electrolysis;
- (**4) ‘limited frequency sensitive mode — underfrequency consumption’ (LFSM-UC) means an operating mode which will result in active power consumption decrease in response to a change in system frequency below a certain value.

Article 3

Scope of application

1. This Regulation shall apply to:

- (a) new transmission-connected demand facilities;
- (b) new transmission-connected distribution facilities;
- (c) new distribution systems, including new closed distribution systems;
- (d) new V1G electric vehicles and associated V1G electric vehicle supply equipment, heat-pumps and power-to-gas demand units, with maximum consumption capacity of 0,8 kW or more at any voltage level.

The relevant system operator shall refuse to allow the connection of a new transmission-connected demand facility, a new transmission-connected distribution facility, or a new distribution system, a new V1G electric vehicle and associated V1G electric vehicle supply equipment, a new power-to-gas demand unit, or a new heat-pump, which does not comply with the requirements set out in this Regulation and which is not covered by a derogation granted by the regulatory authority, or other authority where applicable in a Member State pursuant to Article 50. The relevant system operator shall communicate such refusal, by means of a reasoned statement in writing, to the demand facility owner, DSO, or CDSO and, unless specified otherwise by the regulatory authority, to the regulatory authority.

2. This Regulation shall not apply to:

- (a) demand facilities and distribution systems connected to the transmission system and distribution systems, or to parts of the transmission system or distribution systems, of islands of Member States of which the systems are not operated synchronously with either the Continental Europe, Nordic, Ireland and Northern Ireland or Baltic synchronous area;
- (b) electricity storage modules and pump-storage power generating modules that have both generation and charging/pumping mode;

- (c) demand facilities that operate in frequencies other than 50 Hz (e. g. 16,7 Hz power supply systems) or of DC system ;
- (d) demand facilities that are part of an off-grid system.

3. In case of demand facilities or closed distribution systems with more than one demand unit, these demand units shall together be considered as one demand unit if they cannot be operated independently from each other or can reasonably be considered in a combined manner.

Article 4

Application to existing transmission-connected demand facilities, existing transmission-connected distribution facilities, existing distribution systems and existing demand units

1. Transmission-connected demand facilities, transmission-connected distribution facilities, distribution systems and demand units existing at the entry into force of this Regulation, are not subject to the requirements of this Regulation, except where:

- (a) an existing transmission-connected demand facility, an existing transmission-connected distribution facility, an existing distribution system, or an existing demand unit within a demand facility at a voltage level above 1000 V or a closed distribution system connected at a voltage level above 1000 V, has been subject to a significant modernisation in accordance with the proposal developed according to Article 4a; or ;
- (b) a regulatory authority or, where applicable, a Member State decides to make an existing transmission-connected demand facility, an existing transmission-connected distribution facility, an existing distribution system, or an existing demand unit subject to all or some of the requirements of this Regulation, following a proposal from the relevant TSO in accordance with paragraphs 3, 4 and 5.

2. For the purposes of this Regulation, a transmission-connected demand facility, a transmission-connected distribution facility, a distribution system, or a demand unit, shall be considered as existing at the entry into force of this Regulation if:

- (a) it is already connected to the network on the date of entry into force of this Regulation; or
- (b) the demand facility owner, DSO, or CDSO has concluded a final and binding contract for the purchase of the main demand equipment or the demand unit by two years after the entry into force of the Regulation. The demand facility owner, DSO, or CDSO must notify the relevant system operator and relevant TSO of the conclusion of the contract within 30 months after the entry into force of the Regulation.

The notification submitted by the demand facility owner, DSO, or CDSO to the relevant system operator and the relevant TSO shall at least indicate the contract title, its date of signature and date of entry into force, and the specifications of the main demand equipment or the demand unit to be constructed, assembled or purchased.

A Member State may provide that in specified circumstances the regulatory authority may determine whether the transmission-connected demand facility, the transmission-connected distribution facility, the distribution system, or the demand unit is to be considered existing or new.

3. Following a public consultation in accordance with Article 9 and in order to address significant factual changes in circumstances, such as the evolution of system requirements

including penetration of renewable energy sources, smart grids, distributed generation or demand response, the relevant TSO may propose to the regulatory authority concerned, or where applicable, to the Member State to extend the application of this Regulation to existing transmission-connected demand facilities, existing transmission-connected distribution facilities, existing distribution systems, or existing demand units.

For that purpose a sound and transparent quantitative cost-benefit analysis shall be carried out, in accordance with Article 48 and Article 49. The analysis shall indicate:

- (a) the costs, in regard to existing transmission-connected demand facilities, existing transmission-connected distribution facilities, existing distribution systems and existing demand units, of requiring compliance with this Regulation;
- (b) the socioeconomic benefit resulting from applying the requirements set out in this Regulation; and
- (c) the potential of alternative measures to achieve the required performance.

4. Before carrying out the quantitative cost-benefit analysis referred to in paragraph 3, the relevant TSO shall:

- (a) carry out a preliminary qualitative comparison of costs and benefits;
- (b) obtain approval from the relevant regulatory authority or, where applicable, the Member State.

5. The relevant regulatory authority or, where applicable, the Member State shall decide on the extension of the applicability of this Regulation to existing transmission-connected demand facilities, existing transmission-connected distribution facilities, existing distribution systems, or existing demand units, within six months of receipt of the report and the recommendation of the relevant TSO in accordance with paragraph 4 of Article 48. The decision of the regulatory authority or, where applicable, the Member State shall be published.

6. The relevant TSO shall take account of the legitimate expectations of demand facility owners, DSOs and CDSOs as part of the assessment of the application of this Regulation to existing transmission-connected demand facilities, existing transmission-connected distribution facilities, existing distribution systems, or existing demand units.

7. The relevant TSO may assess the application of some or all of the provisions of this Regulation to existing transmission-connected demand facilities, existing transmission-connected distribution facilities, existing distribution systems, or existing demand units, every three years in accordance with the requirements and process set out in paragraphs 3 to 5.

Article 4a

Significant modernisation

1. Proposals for defining significant modernisation of transmission-connected demand facilities, transmission-connected distribution facilities and distribution systems, and the requirements applicable in those cases shall be subject to approval by the relevant regulatory authority or, where applicable, the Member State.

In developing the proposals, the relevant TSO shall coordinate with relevant DSOs and conduct a public consultation in accordance with Article 9.

2. The definition of significant modernisation shall take into account at least the following criteria:

- (a) In the case of a transmission-connected demand facility and a transmission-connected distribution facility:
 - (i) a percentage increase above the existing maximum import or export capability;
 - (ii) a percentage increase in the short-circuit current contribution;
 - (iii) an increase in the range of reactive power exchange; or
 - (iv) a change of components/assets apart from maintenance and repair activities and spare parts.
- (b) In the case of a distribution system (including closed distribution systems), the replacement of a percentage of the equipment comprising that distribution system.

In the proposal, the relevant TSO can propose additional criteria defining a significant modernisation.

3. For each criterion listed in paragraph 2 above, the relevant TSO's proposal shall specify the requirements of this Regulation that shall apply to the entire modernised facility, unit or distribution system or only to the modernised part of the facility, unit or distribution system.

Article 5

Application to industrial sites

In the case of industrial sites with an embedded power generating module, the system operator of an industrial site, the demand facility owner, the power generating facility owner and the relevant system operator to whose system the industrial site is connected, may agree, in coordination with the relevant TSO, on conditions for disconnection of critical loads from the relevant system. The objective of the agreement shall be to secure production processes of the industrial site in case of disturbed conditions in the relevant system.

Article 6

Regulatory aspects

1. Requirements of general application to be established by relevant system operators or TSOs under this Regulation shall be subject to approval by the entity designated by the Member State and be published. The designated entity shall be the regulatory authority unless otherwise provided by the Member State.

2. For site specific requirements to be established by relevant system operators or TSOs under this Regulation, Member States may require approval by a designated entity.

3. When applying this Regulation, Member States, competent entities and system operators shall:

- (a) apply the principles of proportionality and non-discrimination;
- (b) ensure transparency;

- (c) apply the principle of optimisation between the highest overall efficiency and lowest total costs for all parties involved;
 - (d) respect the responsibility assigned to the relevant TSO in order to ensure system security, including as required by national legislation;
 - (e) consult with relevant DSOs and take account of potential impacts on their system;
 - (f) take into consideration agreed European standards and technical specifications.
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 designated entity within two years of entry into force of this Regulation. The Member State may provide for a shorter time period for all or parts of the requirements or the methodologies. In this case, the Member State shall communicate the shorter time period to the European Union Agency for the Cooperation of Energy Regulators (ACER).
5. Where this Regulation requires the relevant system operator, relevant TSO, demand facility owner, power generating facility owner, DSO and/or CDSO to seek agreement, they shall endeavour to do so within six months after a first proposal has been submitted by one party to the other parties. If no agreement has been found within this time frame, each party may request the relevant regulatory authority to issue a decision within six months.
6. Competent entities shall take decisions on proposals for requirements or methodologies within six months following the receipt of such proposals.
7. If the relevant system operator, TSO or relevant regulatory authority or designated entity deems an amendment to requirements or methodologies as provided for and approved under paragraph 1 and 2 to be necessary, the requirements provided for in paragraphs 3 to 8 shall apply to the proposed amendment. System operators, TSOs or relevant regulatory authority or designated entity proposing an amendment shall take into account the legitimate expectations, if any, of demand facility owners, DSOs, CDSOs, equipment manufacturers and other stakeholders based on the initially specified or agreed requirements or methodologies.
8. Any party having a complaint against a relevant system operator or a TSO in relation to that relevant system operator's or TSO's obligations under this Regulation may refer the complaint to the regulatory authority which, acting as dispute settlement authority, shall issue a decision within two months after receipt of the complaint. That period may be extended by two months where additional information is sought by the regulatory authority. That extended period may be further extended with the agreement of the complainant. The regulatory authority's decision shall have binding effect unless and until overruled on appeal.
9. Where the requirements under this Regulation are to be established by a relevant system operator that is not a TSO, Member States may provide that instead the TSO be responsible for establishing the relevant requirements.

Article 7

Multiple TSOs

1. Where more than one TSO exists in a Member State, this Regulation shall apply to all those TSOs.

2. Member States may, under the national regulatory regime, provide that the responsibility of a TSO to comply with one or some or all obligations under this Regulation is assigned to one or more specific TSOs.

Article 8

Recovery of costs

1. The costs borne by system operators subject to network tariff regulation and stemming from the obligations laid down in this Regulation shall be assessed by the relevant regulatory authorities. Costs assessed as reasonable, efficient and proportionate shall be recovered through network tariffs or other appropriate mechanisms.
2. If requested by the relevant regulatory authorities, system operators referred to in paragraph 1 shall, within three months of the request, provide the information necessary to facilitate assessment of the costs incurred.

Article 9

Public consultation

1. Relevant system operators and relevant TSOs shall carry out a consultation with stakeholders, including the competent authorities of each Member State on:
 - (a) proposals to extend the applicability of this Regulation to existing transmission-connected demand facilities, existing transmission-connected distribution facilities, existing distribution systems and existing demand units in accordance with Article 4(3);
 - (b) the report prepared in accordance with Article 48(3);
 - (c) the cost-benefit analysis undertaken in accordance with Article 53(2).

The consultation shall last at least for a period of one month.

2. The relevant system operators or relevant TSOs shall duly take into account the views of the stakeholders resulting from the consultations, prior to the submission of the draft proposal, the report, the cost-benefit analysis, or the requirements for demand units, for approval by the regulatory authority, competent entity or, if applicable, the Member State. In all cases, a sound justification for including or not the view of the stakeholders shall be provided and published in a timely manner before, or simultaneously with, the publication of the proposal, the report and the cost-benefit analysis.

Article 10

Stakeholder involvement

ACER, in close cooperation with the European Network of Transmission System Operators for Electricity (ENTSO for Electricity) and the entity of distribution system operators in the Union (the EU DSO Entity), shall organise stakeholder involvement, regarding the requirements for the grid connection of transmission-connected demand facilities, transmission-connected distribution facilities, distribution systems, V1G electric vehicles and associated V1G electric vehicle supply equipment, power-to-gas demand units, new heat-pumps and other aspects of the implementation of this Regulation. This shall include regular meetings with stakeholders

to identify problems and propose improvements notably related to the requirements for grid connection of transmission-connected demand facilities, transmission-connected distribution facilities, distribution systems and demand units.

Article 11

Confidentiality obligations

1. Any confidential information received, exchanged or transmitted pursuant to this Regulation shall be subject to the conditions of professional secrecy laid down in paragraphs 2, 3 and 4.
2. The obligation of professional secrecy shall apply to any persons, regulatory authorities, or entities subject to the provisions of this Regulation.
3. Confidential information received by the persons, regulatory authorities, or entities referred to in paragraph 2 in the course of their duties may not be divulged to any other person or authority, without prejudice to cases covered by national law, the other provisions of this Regulation or other relevant Union law.
4. Without prejudice to cases covered by national or Union law, regulatory authorities, entities, or persons who receive confidential information pursuant to this Regulation may use it only for the purpose of carrying out their duties under this Regulation.

TITLE II

CONNECTION OF TRANSMISSION-CONNECTED DEMAND FACILITIES, TRANSMISSION-CONNECTED DISTRIBUTION FACILITIES AND DISTRIBUTION SYSTEMS

CHAPTER 1

General requirements

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.
2. The transmission-connected demand facility owner or the DSO may agree with the relevant TSO on wider frequency ranges or longer minimum times for operation. If wider frequency ranges or longer minimum times for operation are technically feasible, the consent of the transmission-connected demand facility owner or DSO shall not be unreasonably withheld.

Article 13

General voltage requirements

1. Transmission-connected demand facilities, transmission-connected distribution facilities and transmission-connected distribution systems shall be capable of remaining connected to the network and operating at the voltage ranges and time periods specified in Annex II.
2. Equipment of distribution systems connected at the same voltage as the voltage of the connection point to the transmission system shall be capable of remaining connected to the network and operating at the voltage ranges and time periods specified in Annex II.
3. The voltage range at the connection point shall be expressed by the voltage at the connection point related to reference 1 per unit (pu) voltage. For the 400 kV grid voltage level (or alternatively commonly referred to as 380 kV level), the reference 1 pu value is 400 kV, for other grid voltage levels the reference 1 pu voltage may differ for each system operator in the same synchronous area.
4. Where the voltage base for pu values is from 300 kV to 400 kV included, the relevant TSO in Spain may require transmission-connected demand facilities, transmission-connected distribution facilities and transmission-connected distribution systems to remain connected in the voltage range between 1,05 pu-1,0875 pu for an unlimited period.
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.
6. If required by the relevant TSO, a transmission-connected demand facility, a transmission-connected distribution facility, or a transmission-connected distribution system shall be capable of automatic disconnection at specified voltages. The terms and settings for automatic disconnection shall be agreed between the relevant TSO and the transmission-connected demand facility owner or the DSO.
7. With regard to transmission-connected distribution systems with a voltage below 110 kV at the connection point, the relevant TSO shall specify the voltage range at the connection point that the distribution systems connected to that transmission system shall be designed to withstand. DSOs shall design the capability of their equipment, connected at the same voltage as the voltage of the connection point to the transmission system, to comply with this voltage range.

Article 14

Short-circuit requirements

1. Based on the rated short-circuit withstand capability of its relevant transmission network elements, the relevant TSO shall specify the maximum short-circuit current at the connection point that the transmission-connected demand facility or the transmission-connected distribution system shall be capable of withstanding.
2. The relevant TSO shall deliver to the transmission-connected demand facility owner or the transmission-connected distribution system operator an estimate of the minimum and maximum short-circuit current contribution to be expected at the connection point as an equivalent of the network.

3. The relevant transmission-connected demand facility owner or the transmission-connected distribution system operator shall deliver to the relevant TSO an estimate of the minimum and maximum short-circuit current contribution to be expected at the connection point as an equivalent of the network.

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(s) within a reactive power range specified by the relevant TSO, according to the following conditions:

- (a) for transmission-connected demand facilities, the actual reactive power range specified by the relevant TSO for absorption and supply of reactive power shall not be wider than 48 percent of the larger of the maximum consumption capability or maximum infeed capability, 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;
- (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:
 - (i) 48 percent of the larger of the maximum consumption capability or maximum infeed capability during reactive power absorption; and
 - (ii) 48 percent of the larger of the maximum consumption capability or maximum infeed capability during reactive power supply;
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;
- (c) the relevant TSO and the transmission-connected distribution system operator shall agree on the scope of the analysis, which shall address the possible solutions, and determine the optimal solution for reactive power exchange between their systems, taking adequately into consideration the specific system characteristics, variable structure of power exchange, bidirectional flows and the reactive power capabilities in the distribution system;
- (d) the relevant TSO may establish the use of metrics other than a percentage of the maximum consumption capability or maximum infeed capability in order to set out equivalent reactive power capability ranges;
- (e) the reactive power range requirement values shall be met at the connection point;
- (f) by way of derogation from point (e), where a connection point is shared between a power generating module and a demand facility, equivalent requirements shall be met at the point defined in relevant agreements or national law.

2. The relevant TSO may require that transmission-connected distribution systems have the capability at the connection point or over a set of connection points defined by the relevant

TSO, not to supply reactive power to the transmission system when the magnitude of the active power exchange between the transmission-connected distribution system and the transmission system is lower than a threshold defined by the relevant TSO.

Where applicable, Member States may require the relevant TSO to justify its request through a joint analysis with transmission-connected distribution system operators. 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.

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.

4. In accordance with paragraph 3, the transmission-connected distribution system operator may require the relevant TSO to consider its transmission-connected distribution system for reactive power management.

Article 16

Protection requirements

1. The relevant TSO shall specify the devices and settings required to protect the transmission network in accordance with the characteristics of the transmission-connected demand facility or the transmission-connected distribution system. The relevant TSO and the transmission-connected demand facility owner or the transmission-connected distribution system operator shall agree on protection schemes and settings relevant for the transmission-connected demand facility or the transmission-connected distribution system.

2. Electrical protection of the transmission-connected demand facility or the transmission-connected distribution system shall take precedence over operational controls while respecting system security, health and safety of staff and the public.

3. Protection scheme devices may cover the following elements:

- (a) external and internal short circuit;
- (b) over- and under-voltage at the connection point to the transmission system;
- (c) over- and under-frequency;
- (d) demand circuit protection;
- (e) unit transformer protection;
- (f) back-up against protection and switchgear malfunction.

4. The relevant TSO and the transmission-connected demand facility owner or the transmission-connected distribution system operator shall agree on any changes to the protection schemes relevant for the transmission-connected demand facility or the transmission-connected distribution system, and on the arrangements for the protection

schemes of the transmission-connected demand facility or the transmission-connected distribution system.

Article 17

Control requirements

1. The relevant TSO and the transmission-connected demand facility owner or the transmission-connected distribution system operator shall agree on the schemes and settings of the different control devices of the transmission-connected demand facility or the transmission-connected distribution system relevant for system security.
2. The agreement shall cover at least the following elements:
 - (a) isolated (network) operation;
 - (b) damping of oscillations;
 - (c) disturbances to the transmission network;
 - (d) automatic switching to emergency supply and restoration to normal topology;
 - (e) automatic circuit-breaker re-closure.
3. The relevant TSO and the transmission-connected demand facility owner or the transmission-connected distribution system operator shall agree on any changes to the schemes and settings of the different control devices of the transmission-connected demand facility or the transmission-connected distribution system relevant for system security.
4. With regard to priority ranking of protection and control, the transmission-connected demand facility owner or the transmission-connected distribution system operator shall set the protection and control devices of its transmission-connected demand facility or its transmission-connected distribution system respectively, in compliance with the following priority ranking, organised in decreasing order of importance:
 - (a) transmission network protection;
 - (b) transmission-connected demand facility or transmission-connected distribution system protection;
 - (c) frequency control (active power adjustment);
 - (d) power restriction.

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.
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.

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

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;
 - (b) the low frequency demand disconnection functional capabilities shall allow for disconnecting demand in stages for a range of operational frequencies;
 - (c) the low frequency demand disconnection functional capabilities shall allow for operation from an electrical input signal to be specified by the relevant system operator, in coordination with the relevant TSO, and shall meet the following requirements:
 - (i) frequency range: at least between 47-50 Hz, adjustable in steps of 0,05 Hz;
 - (ii) maximum total tripping time: no more than 200 ms, starting from the system frequency crossing the frequency setpoint to the circuit breaker opening, including all necessary relay operating times, such as measurement and calculation time and tripping time of auxiliary circuits;
 - (iii) relay accuracy: lower than 30 mHz;
 - (iv) 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;
 - (v) provide the direction of active power flow at the point of disconnection;
 - (d) the electrical input signal used in providing low frequency demand disconnection functional capabilities, shall be provided from the network at the frequency signal measuring point, as used in providing functional capabilities in accordance with paragraph 1(c), so that the frequency of the low frequency demand disconnection functional capabilities input signal is the same as the one of the network and may be specified by the relevant system operator. Input signals shall consist of at least two phases of the measured network.
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;

- (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.
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;
 - (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;
 - (c) if required by the relevant TSO, a transmission-connected demand facility or a transmission-connected distribution facility shall be equipped with a logic interface (input

port) in order to be disconnected, eventually in block loading, from the transmission system. If the relevant TSO requires a transmission-connected demand facility or a transmission-connected distribution facility to be equipped with such logic interface, it shall have the right to specify requirements for the equipment to make this facility operable remotely. The relevant TSO shall specify the time required for remote disconnection.

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.

Article 21

Simulation models

1. Transmission-connected demand facilities and transmission-connected distribution systems shall fulfil the requirements set out in paragraphs 3 and 4 related to the simulation models or equivalent information.
2. Each TSO may require simulation models or equivalent information showing the behaviour of the transmission-connected demand facility, or the transmission-connected distribution system, or both, in steady and dynamic states.
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 in time domain at the connection point;
 - (c) frequency domain simulations including the frequency dependent grid impedance at the connection point;
 - (d) structure and block diagrams.
4. For the purpose of dynamic simulations, the simulation model or equivalent information referred to in paragraph 3(a) shall contain the following sub-models or equivalent information:
 - (a) power control;
 - (b) voltage and frequency control;
 - (c) transmission-connected demand facility and transmission-connected distribution system protection models;
 - (d) the different types of demand, namely electro technical characteristics of the demand; and
 - (e) converter models.

5. Each relevant TSO in coordination with the relevant system operators 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.

CHAPTER 2

Operational notification procedure

Article 22

General provisions

1. The operational notification procedure for the connection of each new transmission-connected demand facility, each new transmission-connected distribution facility and each new transmission-connected distribution system, shall comprise:

- (a) an energisation operational notification (EON);
- (b) an interim operational notification (ION);
- (c) a final operational notification (FON).

2. Each transmission-connected demand facility owner or transmission-connected distribution system operator to which one or more of the requirements in Title II apply shall demonstrate to the relevant TSO that it has complied with the requirements set out in Title II of this Regulation by completing successfully the operational notification procedure for connection of each transmission-connected demand facility, each transmission-connected distribution facility and each transmission-connected distribution system described in Article 23 to Article 26.

3. The relevant TSO shall specify and make publicly available further details concerning the operational notification procedure.

Article 23

Energisation operational notification

1. An EON shall entitle the transmission-connected demand facility owner or transmission-connected distribution system operator to energise its internal network and auxiliaries by using the grid connection that is specified for the connection point.

2. An EON shall be issued by the relevant TSO, subject to completion of preparations including agreement on the protection and control settings relevant to the connection point between the relevant TSO and the transmission-connected demand facility owner or transmission-connected distribution system operator.

Article 24

Interim operational notification

1. An ION shall entitle the transmission-connected demand facility owner or transmission-connected distribution system operator to operate the transmission-connected demand facility,

the transmission-connected distribution facility, or the transmission-connected distribution system by using the grid connection for a limited period of time.

2. An ION shall be issued by the relevant TSO, subject to completion of the data and study review process as required by this Article.

3. With regard to the data and study review, the relevant TSO shall have the right to request that the transmission-connected demand facility owner or transmission-connected distribution system operator provide the following:

- (a) an itemised statement of compliance;
- (b) detailed technical data of the transmission-connected demand facility including any V1G electric vehicle supply equipment, power-to-gas demand units, heat pumps of the facility, the transmission-connected distribution facility or the transmission-connected distribution system relevant to the grid connection as specified by the relevant TSO;
- (c) equipment certificates issued by an authorised certifier in respect of transmission-connected demand facilities including any V1G electric vehicle supply equipment, power-to-gas demand units, heat pumps of the facility, transmission-connected distribution facilities and transmission-connected distribution systems, where these are relied upon as part of the evidence of compliance;
- (d) simulation models, as specified in Article 21 and required by the TSO;
- (e) studies demonstrating expected steady-state and dynamic performance as required in Article 43 and Article 44;
- (f) details of intended practical method of completing compliance tests according to Chapter 2 of Title IV.

4. The maximum period during which the transmission-connected demand facility owner or transmission-connected distribution system operator may maintain ION status shall be 24 months. The relevant TSO is entitled to specify a shorter ION validity period. An extension of the ION shall be granted only if the transmission-connected demand facility owner or transmission-connected distribution system operator has made substantial progress towards full compliance. Outstanding issues shall be clearly identified at the time of requesting extension.

5. An extension of the period during which the transmission-connected demand facility owner or transmission-connected distribution system operator may maintain ION status, beyond the period established in paragraph 4, may be granted if a request for a derogation is made to the relevant TSO before the expiry of that period in accordance with the derogation procedure laid down in Article 50.

Article 25

Final operational notification

1. A FON shall entitle the transmission-connected demand facility owner or transmission-connected distribution system operator to operate the transmission-connected demand facility, the transmission-connected distribution facility or the transmission-connected distribution system by using the grid connection.

2. A FON shall be issued by the relevant TSO, upon prior removal of all incompatibilities identified for the purposes of the ION status and subject to the completion of the data and study review process as required by this Article.
3. For the purposes of the data and study review, the transmission-connected demand facility owner or transmission-connected distribution system operator must submit the following to the relevant TSO:
 - (a) an itemised statement of compliance;
 - (b) an update of the applicable technical data, simulation models and studies as referred to in points (b), (d) and (e) of Article 24(3), including the use of actual measured values during testing; and
 - (c) for transmission connected demand facilities an update of the applicable technical data, simulation models and studies proving compliance of V1G electric vehicles and associated V1G electric vehicle supply equipment, power-to-gas demand units and heat-pumps.
4. If incompatibility is identified in connection with the issuing of the FON, a derogation may be granted upon a request made to the relevant TSO, in accordance with the derogation procedure described in Chapter 2 of Title V. A FON shall be issued by the relevant TSO if the transmission-connected demand facility, the transmission-connected distribution facility, or the transmission-connected distribution system complies with the provisions of the derogation.

Where a request for a derogation is rejected, the relevant TSO shall have the right to refuse to allow the operation of the transmission-connected demand facility, the transmission-connected distribution facility, or the transmission-connected distribution system until the transmission-connected demand facility owner or transmission-connected distribution system operator and the relevant TSO resolve the incompatibility and the relevant TSO considers that the transmission-connected demand facility, the transmission-connected distribution facility, or the transmission-connected distribution system complies with the provisions of this Regulation.

If the relevant TSO and the transmission-connected demand facility owner or transmission-connected distribution system operator do not resolve the incompatibility within a reasonable time frame, but in any case not later than six months after the notification of the rejection of the request for a derogation, each party may refer the issue for decision to the regulatory authority.

Article 26

Limited operational notification

1. Transmission-connected demand facility owners or transmission-connected distribution system operators to whom a FON has been granted, shall inform the relevant TSO, no later than 24 hours after the incident has occurred, of the following circumstances:
 - (a) the facility is temporarily subject to either significant modification or loss of capability affecting its performance; or
 - (b) equipment failure leading to non-compliance with some relevant requirements.

A longer time period to inform the relevant TSO can be agreed with the transmission-connected demand facility owner or transmission-connected distribution system operator depending on the nature of the changes.

2. The transmission-connected demand facility owner or transmission-connected distribution system operator shall apply to the relevant TSO for a limited operational notification (LON), if the transmission-connected demand facility owner or transmission-connected distribution system operator expects the circumstances described in paragraph 1 to persist for more than three months.
3. A LON shall be issued by the relevant TSO and shall contain the following information which shall be clearly identifiable:
 - (a) the unresolved issues justifying the granting of the LON;
 - (b) the responsibilities and timescales for expected solution; and
 - (c) a maximum period of validity which shall not exceed 12 months. The initial period granted may be shorter with the possibility of an extension if evidence is submitted to the satisfaction of the relevant TSO demonstrating that substantial progress has been made towards achieving full compliance.
4. The FON shall be suspended during the period of validity of the LON with regard to the items for which the LON has been issued.
5. A further extension of the period of validity of the LON may be granted upon a request for a derogation made to the relevant TSO before the expiry of that period, in accordance with the derogation procedure described in Chapter 2 of Title V.
6. The relevant TSO shall have the right to refuse to allow the operation of the transmission-connected demand facility, the transmission-connected distribution facility, or the transmission-connected distribution system once the LON is no longer valid. In such cases, the FON shall automatically become invalid.
7. If the relevant TSO does not grant an extension of the period of validity of the LON in accordance with paragraph 5 or if it refuses to allow the operation of the transmission-connected demand facility, the transmission-connected distribution facility, or the transmission-connected distribution system once the LON is no longer valid in accordance with paragraph 6, the transmission-connected demand facility owner or transmission-connected distribution system operator may refer the issue for decision to the regulatory authority within six months after the notification of the decision of the relevant TSO.

TITLE XXX

CONNECTION OF V1G ELECTRIC VEHICLES AND ASSOCIATED V1G ELECTRIC VEHICLE SUPPLY EQUIPMENT, POWER-TO-GAS DEMAND UNITS AND HEAT-PUMPS

CHAPTER 1

General requirements

Article XX

Specific provisions for V1G electric vehicles and associated V1G electric vehicle supply equipment, power-to-gas demand units and heat-pumps

1. With regard to frequency and voltage ranges, V1G electric vehicles and associated V1G electric vehicle supply equipment, power-to-gas demand units and heat-pumps shall comply with the following requirements:

- (a) be capable of operating across the frequency ranges specified in Table XY;
- (a) be capable of remaining connected to the network and operate continuously within the range of 0,85 pu - 1,1 pu at the connection point. Beyond these voltage range values, the under voltage ride through immunity limits apply.

Table XY

Minimum time periods for which a V1G electric vehicle and an associated V1G electric vehicle supply equipment shall be capable of operating on different frequencies, deviating from a nominal value, without disconnecting from the network

Frequency range	Time period for operation
47,5 Hz-48,5 Hz	30 minutes
48,5 Hz-49,0 Hz	30 minutes
49,0 Hz-51,0 Hz	Unlimited
51,0 Hz-51,5 Hz	30 minutes
51,5 Hz-52,5 Hz	10 seconds

2. With regard to the rate of change of frequency withstand capability,

- (a) a V1G electric vehicle and associated V1G electric vehicle supply equipment, power-to-gas demand unit and heat-pump shall be capable of remaining connected to the network and to operate continuously at rates-of-change-of-frequency up to the following values:
 - $\pm 4,0$ Hz/s over a period of 0,25s
 - $\pm 2,0$ Hz/s over a period of 0,5 s
 - $\pm 1,5$ Hz/s over a period of 1 s
 - $\pm 1,25$ Hz/s over a period of 2 s
- (b) Without prejudice to point (a) of this paragraph, a V1G electric vehicle and associated V1G electric vehicle supply equipment, power-to-gas demand unit and heat-pump shall be capable of remaining connected to the network and continuing to operate stably at the sequence of rates of change of frequencies which are defined considering the overfrequency against time profiles given in Figure (1)XX.a and the underfrequency against time profiles given in Figure (2)XX.b.

- (c) With regard to the rate of change of frequency withstand capability defined in points (a) and (b) of this paragraph, a V1G electric vehicle and associated V1G electric vehicle supply equipment, power-to-gas demand unit and heat-pump shall be capable of staying connected to the network and continuing to operate stably, unless disconnection was triggered by the low frequency demand disconnection of the demand facility.

Figure (1)XX.a

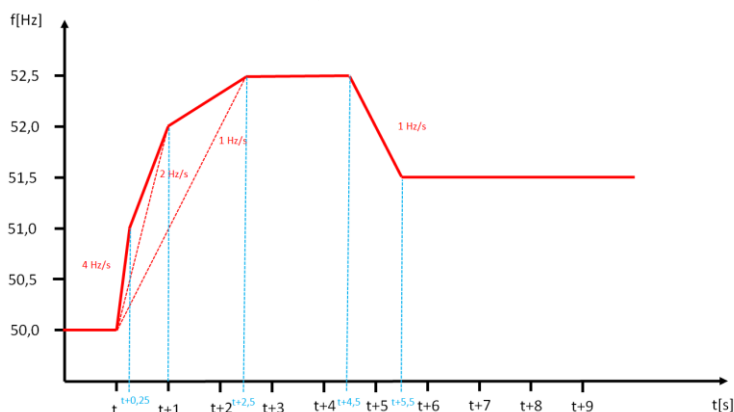
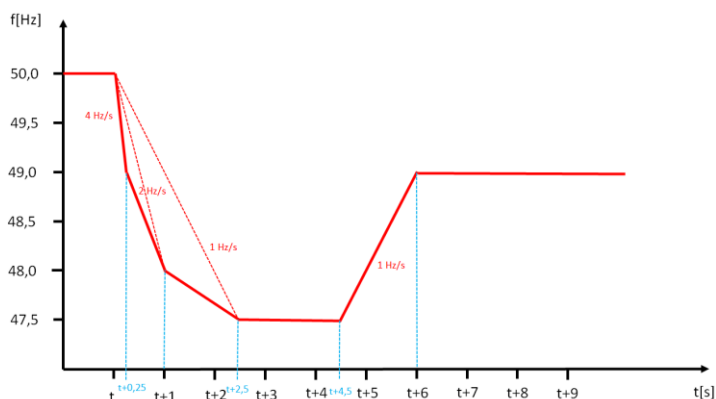


Figure (2)XX.b



- (d) The V1G electric vehicle and associated V1G electric vehicle supply equipment, power-to-gas demand unit and heat-pump shall be capable of remaining connected to the network and continuing to operate stably when the system frequency remains within the frequency range specified in Annex II. The V1G electric vehicle and associated V1G electric vehicle supply equipment, power-to-gas demand unit and heat-pump protection schemes shall not jeopardise frequency-ride-through performance specified in point (b) of this paragraph;

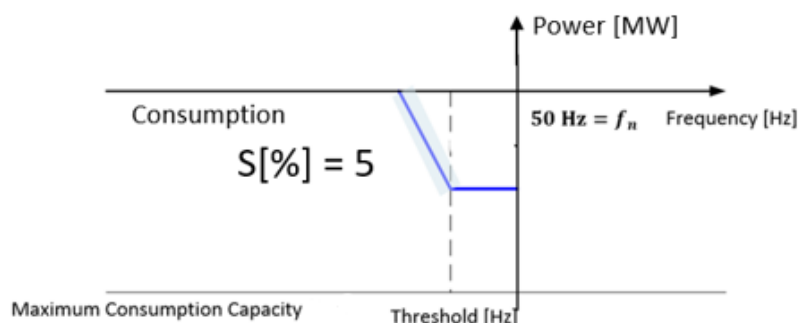
3. With regard to LFSM-UC on V1G electric vehicles and associated V1G electric vehicle supply equipment and power-to-gas demand units:

- (a) The V1G electric vehicle and associated V1G electric vehicle supply equipment and the power-to-gas demand unit shall be capable of reducing the consumption from the actual active power input (P_{ref}) automatically down to the minimum technical operational

level according to the indicative Figure (3)XX.c at a frequency threshold and with a droop setting:

- (b) The droop s shall be 5%.
- (c) The frequency threshold shall be 49,8 Hz, except for synchronous areas IE and Nordic where the frequency threshold shall be 49,5 Hz.
- (d) The V1G electric vehicle and associated V1G electric vehicle supply equipment and the power-to-gas demand unit shall stay in this specific mode as long as the frequency is below the frequency threshold. If the frequency recovers, the electrical charging demand unit shall follow the same power-frequency characteristic until it is back to its prior state of active power input.
- (e) If the minimum technical operating level is larger than 20% of P_{ref} , the V1G electric vehicles and associated V1G electric vehicle supply equipment or the power-to-gas demand unit shall disconnect when reaching its minimum technical operating level;
- (f) If disconnection was performed according to point (e) of this paragraph, on return of frequency above the frequency threshold, a random time delay of up to 5 minutes shall be initiated before normal operation resumes.
- (g) Requirements for frequency measurement:
 - (i) Maximum measuring time window: 100 ms
 - (ii) Accuracy: ± 30 mHz
- (h) Stable operation of the V1G electric vehicle and associated V1G electric vehicle supply equipment and the power-to-gas demand unit during LFSM-UC operation shall be ensured;
 - (i) The response time for LFSM-UC shall be less or equal to 0,5 seconds. The relevant system operator has the right to request the demonstration of technical evidence of the response time.

Figure (3)XX.c



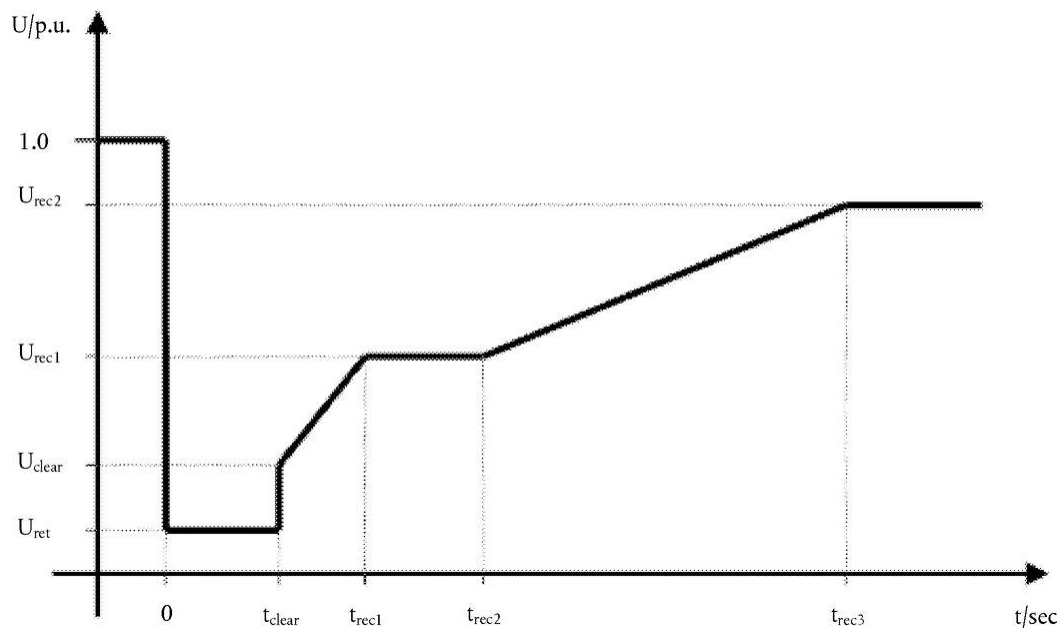
P_{ref} is the actual active power at the moment the LFSM-UC threshold is reached.

4. With regard to LFSM-UC on heat-pumps:

- (a) The control system of the LFSM-UC shall have no influence on the target temperature, above a frequency threshold specified in paragraph 3(c).
 - (b) The built-in hysteresis of the heat-pump between its controllers on and off temperature range settings shall be designed to be utilised by the LFSM-UC.
 - (c) The heat-pumps on and off temperature range settings shall not be exceeded by the LFSM-UC when responding to frequency deviations from 50Hz.
 - (d) The LFSM-UC shall provide a response to deviations in system frequency across a frequency range by corresponding changes to the target temperature or target power in proportion of its maximum temperature range. The change in target temperature or target power shall be at the minimum when the system frequency reaches the frequency threshold specified in paragraph 3(c). The change in target temperature shall be at the widest when the system frequency reaches 49 Hz.
 - (e) The temperature controller of the device shall measure and update the actual system frequency measurement at least every 0.2 seconds.
 - (f) For system frequency below the frequency threshold around the nominal value of 50 Hz, the target temperature or target power of a heat pump shall be lowered or raised accordingly.
 - (g) On return of above the frequency threshold, a random time delay of up to 5 minutes shall be initiated before normal operation resumes.
 - (h) With regard to the LFSM-UC's sensitivity and accuracy of the frequency measurement and the consequent movement of the temperature target or target power, the system shall be able to detect a change in system frequency of 0,01 Hz, in order to give overall linear proportional system response. The system shall be capable of a rapid detection and response to changes in system frequency. The total reaction time including frequency measurement shall be as fast as technically feasible but not higher than 300ms. An offset in the steady state measurement of frequency shall be acceptable up to 0,05 Hz.
5. With regard to fault-ride-through capability on V1G electric vehicles and associated V1G electric vehicle supply equipment:
- (a) The V1G electric vehicle and associated V1G electric vehicle supply equipment, when operating above the minimum stable operating level, shall be capable of remaining connected to the network and continuing to operate stably after the power system has been disturbed by faults in the transmission network according to a voltage-against-time-profile in line with Figure (4)XX.d at the connection point and with the set points in Table (1)X.1.1 and Table (2)X.1.2.

Figure (4)XX.d

Fault-ride-through profile of a V1G electric vehicle and associated V1G electric vehicle supply equipment



The diagram represents the lower limit of a voltage-against-time profile of the voltage at the connection point, expressed as the ratio of its actual value and its reference 1 pu value before, during and after a fault. U_{ret} is the retained voltage at the connection point during a fault, t_{clear} is the instant when the fault has been cleared. U_{rec1} , U_{rec2} , t_{rec1} , t_{rec2} and t_{rec3} specify certain points of lower limits of voltage recovery after fault clearance.

Table (1)X.1.1

Voltage parameters for Figure (4)XX.d for fault-ride-through capability of type V1G electric vehicle and associated V1G electric vehicle supply equipment.

Voltage parameters (pu)

U_{ret} :	0,05
U_{clear} :	0,15
U_{rec1} :	0,15
U_{rec2} :	0,85

Table (2)X.1.2

Time parameters for Figure (4)XX.d for fault-ride-through capability of type V1G electric vehicle and associated V1G electric vehicle supply equipment.

Time parameters (seconds)	
t_{clear} :	0,15
t_{rec1} :	0,15
t_{rec2} :	0,15
t_{rec3} :	3,0

- (b) The voltage-against-time-profile expresses a lower limit of the profile of the phase-to-phase voltages (or phase to neutral voltages for single phase V1G electric vehicles and associated V1G electric vehicle supply equipment) on the network voltage level during a symmetrical fault, as a function of time before, during and after the fault.
- (c) When the network voltage resumes, after the fault has been cleared, to a value within the voltage range of 0,85 pu – 1,1 pu, a V1G electric vehicle and associated V1G electric vehicle supply equipment shall recover its active power consumption level to its pre-fault value. The recovery time shall not exceed a maximum of 60 s.
6. With regard to fault-ride-through capability of power-to-gas demand units:
- (a) The power-to-gas demand unit, when operating above the minimum stable operating level, shall be capable of remaining connected to the network and continuing to operate stably after the power system has been disturbed by faults in the transmission network according to a voltage-against-time-profile in line with Figure (4)XX.d at the connection point and with the set points in Table (3)X.1.3 and Table (4)X.1.4.

Table (3)X.1.3

Voltage parameters for Figure (4)XX.d of a power-to-gas demand unit.

Voltage parameters (pu)

U_{ret} :	0
U_{clear} :	0
U_{rec1} :	0
U_{rec2} :	0,85

Table (4)X.1.4

Time parameters for Figure (4)XX.d for fault-ride-through capability of a power-to-gas demand unit.

Time parameters (seconds)	
t _{clear} :	0,15
t _{rec1} :	0,15
t _{rec2} :	0,15
t _{rec3} :	3,0

- (b) The voltage-against-time-profile expresses a lower limit of the profile of the phase-to-phase voltages (or phase to neutral voltages for single phase power-to-gas demand units) on the network voltage level during a symmetrical fault, as a function of time before, during and after the fault.

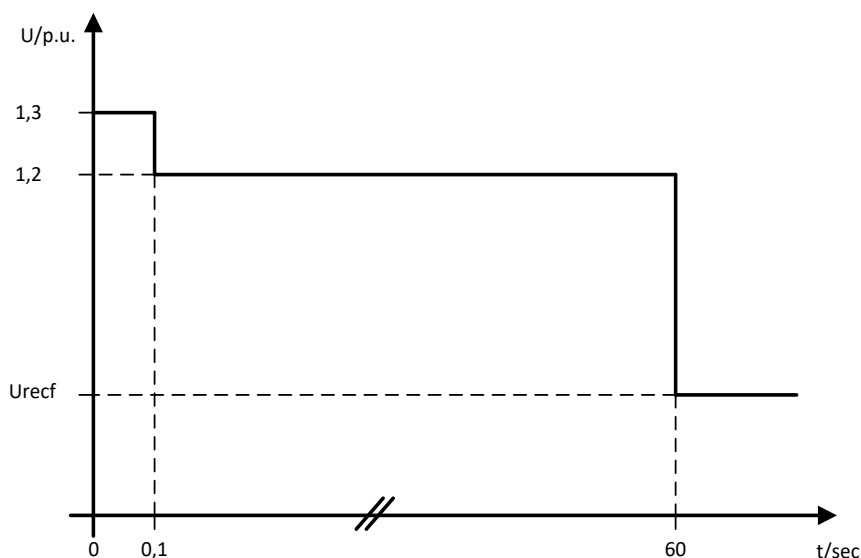
When the network voltage resumes, after the fault has been cleared, to a value within the voltage range of 0,85 pu – 1,1 pu, a power-to-gas demand unit shall recover its active power consumption level at the connection point. The relevant TSO shall specify the magnitude and time for active power recovery.

- (c) Fault-ride-through capabilities in case of asymmetrical faults shall be specified by the relevant system operator.

7. The power-to-gas demand unit shall be capable of operating stably without disconnecting from the network, if none of the phase -to -phase voltages exceed the voltage-against-time-profile defined in Figure (5)XX.e at the connection point. The relevant system operator, in coordination with the relevant TSO, shall define higher longer times for operation, if it is required to preserve or to restore system security.

Figure (5)XX.e

High voltage-ride-through profile of a power-to-gas demand unit



The diagram represents the higher limit of a voltage-against-time profile of the voltage at the connection point, before, during and after a fault. U_{ref} is the maximum voltage specified in Annex II.

CHAPTER 2

Operational notification procedure

Article XX+1

General provisions

1. The operational notification procedure for V1G electric vehicles and associated V1G electric vehicle supply equipment, power-to-gas demand units and heat-pumps shall be distinguished between:
 - (a) V1G electric vehicles and associated V1G electric vehicle supply equipment, power-to-gas demand units and heat-pumps within a demand facility or a closed distribution system connected at a voltage level of or below 1000 V;
 - (b) V1G electric vehicles and associated V1G electric vehicle supply equipment, power-to-gas demand units and heat-pumps within a demand facility or a closed distribution system connected at a voltage level above 1000 V.
2. The relevant system operator shall specify and make publicly available further details concerning the operational notification procedure.

Article XX+2

Procedures for V1G electric vehicles and associated V1G electric vehicle supply equipment, power-to-gas demand units and heat-pumps within a demand facility or a closed distribution system connected at a voltage level of or below 1000 V

V1G electric vehicles and associated V1G electric vehicle supply equipment, power-to-gas demand units and heat-pumps connected at a voltage level of or below 1000 V shall possess equipment certificates, proving compliance with this Regulation.

Article XX+3

Procedures for V1G electric vehicles and associated V1G electric vehicle supply equipment, power-to-gas demand units and heat-pumps within a demand facility or a closed distribution system connected at a voltage level above 1000 V

1. V1G electric vehicles and associated V1G electric vehicle supply equipment, and heat-pumps connected at a voltage level above 1000 V shall possess equipment certificates, proving compliance with this Regulation.
2. The operational notification procedure for a power-to-gas demand unit within a demand facility or a closed distribution system connected at a voltage level above 1000 V shall comprise a DUD. The relevant system operator, in coordination with the relevant TSO, shall specify and make publicly available the content required for the DUD. The content of the DUD shall require a statement of compliance which contains the information in Article 36 to Article 47 for demand facilities and closed distribution systems, but the compliance requirements in Article 36 to Article 47 for demand facilities and closed distribution systems can be simplified to a single operational notification stage as well as be reduced. The demand facility owner or CDSO shall provide the information required and submit it to the relevant system operator. For any subsequent demand units, separate DUDs shall be provided.
3. Based on the DUD, the relevant system operator shall issue a FON to the demand facility owner or CDSO.

**TITLE IV
COMPLIANCE**

**CHAPTER 1
General provisions**

Article 34

Responsibility of the demand facility owner, the distribution system operator and the closed distribution system operator

1. Transmission-connected demand facility owners and DSOs shall ensure that their transmission-connected demand facilities, transmission-connected distribution facilities, or distribution systems comply with the requirements provided for in this Regulation. A demand facility owner or a CDSO having a V1G electric vehicle and associated V1G electric vehicle

supply equipment, power-to-gas demand unit or heat-pump shall ensure that the V1G electric vehicle and associated V1G electric vehicle supply equipment, power-to-gas demand unit or heat-pump complies with the requirements provided for in this Regulation.

2. Where the requirements are specified by the relevant TSO, or are for the purpose of the operation of the relevant TSO's system, alternative tests or requirements for test result acceptance for these requirements may be agreed with the relevant TSO.
3. Any intention to modify the technical capabilities of the transmission-connected demand facility, the transmission-connected distribution facility, the distribution system, or the demand unit, which has impact on compliance with the requirements provided for in Chapters 2 to 4 of Title IV, shall be notified to the relevant system operator, directly or indirectly through a third party, prior to pursuing such modification, within the time frame provided by the relevant system operator.
4. Any operational incidents or failures of the transmission-connected demand facility, the transmission-connected distribution facility, the distribution system or the demand unit, which have an impact on compliance with the requirements provided for in Chapters 2 to 4 of Title IV, shall be notified to the relevant system operator, directly or indirectly through a third party, as soon as possible after the occurrence of such an incident.
5. Any planned test schedules and procedures to verify compliance of the transmission-connected demand facility, the transmission-connected distribution facility, the distribution system, or the demand unit, with the requirements of this Regulation, shall be notified to the relevant system operator within the time frame specified by the relevant system operator and approved by the relevant system operator prior to their commencement.
6. The relevant system operator may participate in such tests and may record the performance of the transmission-connected demand facility, the transmission-connected distribution facility, the distribution system, and the demand unit.

Article 35

Tasks of the relevant system operator

1. The relevant system operator shall assess the compliance of a transmission-connected demand facility, a transmission-connected distribution facility, a distribution system, or a demand unit, with the requirements of this Regulation throughout the lifetime of the transmission-connected demand facility, the transmission-connected distribution facility, the distribution system, or the demand unit. The demand facility owner, the DSO or the CDSO shall be informed of the outcome of this assessment.
2. The relevant system operator shall have the right to request that the demand facility owner, the DSO or the CDSO carries out compliance tests and simulations according to a repeat plan or general scheme or after any failure, modification or replacement of any equipment that may have an impact on the compliance of the transmission-connected demand facility, the transmission-connected distribution facility, the distribution system, or the demand unit with the requirements of this Regulation.

The demand facility owner, the DSO or the CDSO shall be informed of the outcome of those compliance tests and simulations.

3. The relevant system operator shall make publicly available the list of information and documents to be provided as well as the requirements to be fulfilled by the demand facility owner, the DSO or the CDSO in the frame of the compliance process. The list shall cover at least the following information, documents and requirements:
- (a) all documentation and certificates to be provided by the demand facility owner, the DSO or the CDSO;
 - (b) details of the technical data required from the transmission-connected demand facility, the transmission-connected distribution facility, the distribution system, or the demand unit, with relevance to the grid connection or operation;
 - (c) requirements for models for steady-state and dynamic system studies;
 - (d) timeline for the provision of system data required to perform the studies;
 - (e) studies by the demand facility owner, the DSO or the CDSO for demonstrating expected steady-state and dynamic performance referring to the requirements set forth in Article 43 and Article 44;
 - (f) conditions and procedures including scope for registering equipment certificates;
 - (g) conditions and procedures for the use of relevant equipment certificates issued by an authorised certifier by the demand facility owner, the DSO or the CDSO.
4. The relevant system operator shall make public the allocation of responsibilities to the demand facility owner, the DSO or the CDSO and to the system operator for compliance testing, simulation and monitoring.
5. The relevant system operator may totally or partially delegate the performance of its compliance monitoring to third parties. In such cases, the relevant system operator shall continue ensuring compliance with Article 11, including entering into confidentiality commitments with the assignee.
6. If compliance tests or simulations cannot be carried out as agreed between the relevant system operator and the demand facility owner, the DSO or the CDSO due to reasons attributable to the relevant system operator, then the relevant system operator shall not unreasonably withhold the operational notification referred to in Title II.

CHAPTER 2

Compliance testing

Article 36

Common provisions for compliance testing

1. Testing of the performance of a transmission-connected demand facility, or a transmission-connected distribution facility, shall aim at demonstrating that the requirements of this Regulation have been complied with.

2. Notwithstanding the minimum requirements for compliance testing set out in this Regulation, the relevant system operator is entitled to:
 - (a) allow the demand facility owner, the DSO or the CDSO to carry out an alternative set of tests, provided that those tests are efficient and suffice to demonstrate that a demand facility or a distribution system complies with the requirements of this Regulation; and
 - (b) require the demand facility owner, the DSO or the CDSO to carry out additional or alternative sets of tests in those cases where the information supplied to the relevant system operator in relation to compliance testing under the provisions of Article 37 to Article 40, is not sufficient to demonstrate compliance with the requirements of this Regulation.
3. The demand facility owner, the DSO or the CDSO is responsible for carrying out the tests in accordance with the conditions laid down in Chapter 2 of Title IV. The relevant system operator shall cooperate and not unduly delay the performance of the tests.
4. The relevant system operator may participate in the compliance testing either on site or remotely from the system operator's control room. For that purpose, the demand facility owner, the DSO or the CDSO shall provide the monitoring equipment necessary to record all relevant test signals and measurements as well as ensure that the necessary representatives of the demand facility owner, the DSO or the CDSO are available on site for the entire testing period. Signals specified by the relevant system operator shall be provided if, for selected tests, the system operator wishes to use its own equipment to record performance. The relevant system operator has sole discretion to decide about its participation.

Article 37

Compliance testing for disconnection and reconnection of transmission-connected distribution facilities

1. The transmission-connected distribution facilities shall comply with the requirements for disconnection and reconnection referred in Article 19 and shall be subject to the following compliance tests.
2. With regard to testing of the capability of reconnection after an incidental disconnection due to a network disturbance, reconnection shall be achieved through a reconnection procedure, preferably by automation, authorised by the relevant TSO.
3. With regard to the synchronisation test, the technical synchronisation capabilities of the transmission-connected distribution facility shall be demonstrated. This test shall verify the settings of the synchronisation devices. This test shall cover the following matters: voltage, frequency, phase angle range, deviation of voltage and frequency.
4. With regard to the remote disconnection test, the transmission-connected distribution facility's technical capability for remote disconnection at the connection point or points from the transmission system when required by the relevant TSO and within the time specified by the relevant TSO shall be demonstrated.
5. 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.

6. With regard to the low frequency demand disconnection relays test, the transmission-connected distribution facility's technical capability to operate from a nominal AC supply input shall be demonstrated in accordance with Article 19(1) and (2). This AC supply input shall be specified by the relevant TSO.

7. With regard to the low voltage demand disconnection test, the transmission-connected distribution facility's technical capability to operate in a single action with on load tap changer blocking in Article 19(3) shall be demonstrated in accordance with Article 19(2).

8. An equipment certificate may be used instead of part of the tests provided for in paragraph 1, on the condition that it is provided to the relevant TSO.

Article 38

Compliance testing for information exchange of transmission-connected distribution facilities

1. With regard to information exchange between the relevant TSO and the transmission-connected distribution system operator in real time or periodically, the transmission-connected distribution facility's technical capability to comply with the information exchange standard established pursuant to Article 18(3) shall be demonstrated.

2. An equipment certificate may be used instead of part of the tests provided for in paragraph 1, on the condition that it is provided to the relevant TSO.

Article 39

Compliance testing for disconnection and reconnection of transmission-connected demand facilities

1. The transmission-connected demand facilities shall comply with the requirements for disconnection and reconnection referred to in Article 19 and shall be subject to the following compliance tests.

2. With regard to testing of the capability of reconnection after an incidental disconnection due to a network disturbance, reconnection shall be achieved through a reconnection procedure, preferably by automation, authorised by the relevant TSO.

3. With regard to the synchronisation test, the technical synchronisation capabilities of the transmission-connected demand facility shall be demonstrated. This test shall verify the settings of the synchronisation devices. This test shall cover the following matters: voltage, frequency, phase angle range, deviation of voltage and frequency.

4. With regard to the remote disconnection test, the transmission-connected demand facility's technical capability for remote disconnection at the connection point or points from the transmission system when required by the relevant TSO and within the time specified by the relevant TSO shall be demonstrated.

5. With regard to the low frequency demand disconnection relays test, the transmission-connected demand facility's technical capability to operate from a nominal AC input shall be

demonstrated in accordance with Article 19(1) and (2). This AC supply input shall be specified by the relevant TSO.

6. With regard to the low voltage demand disconnection test, the transmission-connected demand facility's technical capability to operate in a single action with on load tap changer blocking in Article 19(3) shall be demonstrated in accordance with Article 19(2).

7. An equipment certificate may be used instead of part of the tests provided for in paragraph 1, on the condition that it is provided to the relevant TSO.

Article 40

Compliance testing for information exchange of transmission-connected demand facilities

1. With regard to information exchange between the relevant TSO and the transmission-connected demand facility owner in real time or periodically, the transmission-connected demand facility's technical capability to comply with the information exchange standard established pursuant to Article 18(3) shall be demonstrated.

2. An equipment certificate may be used instead of part of the tests provided for in paragraph 1, on the condition that it is provided to the relevant TSO.

CHAPTER 3

Compliance simulation

Article 42

Common provisions on compliance simulations

1. Simulation of the performance of a transmission-connected demand facility, or a transmission-connected distribution facility shall result in demonstrating whether the requirements of this Regulation have been fulfilled or not.

2. Simulations shall be run in the following circumstances:

- (a) a new connection to the transmission system is required;
- (b) a further development, replacement or modernisation of equipment takes place;
- (c) alleged non-compliance by the relevant system operator with the requirements of this Regulation.

3. Notwithstanding the minimum requirements for compliance simulation set out in this Regulation, the relevant system operator is entitled to:

- (a) allow the demand facility owner, the DSO or the CDSO to carry out an alternative set of simulations, provided that those simulations are efficient and suffice to demonstrate that a demand facility or a distribution system complies with the requirements of this Regulation or with national legislation; and
- (b) require the demand facility owner, the DSO or the CDSO to carry out additional or alternative sets of simulations in those cases where the information supplied to the relevant

system operator in relation to compliance simulation under the provisions of Article 43 and Article 44, is not sufficient to demonstrate compliance with the requirements of this Regulation.

4. The transmission-connected demand facility owner or the transmission-connected distribution system operator shall provide a report with the simulation results for each individual transmission-connected demand facility or transmission-connected distribution facility. The transmission-connected demand facility owner or the transmission-connected distribution system operator shall produce and provide a validated simulation model for a given transmission-connected demand facility or transmission-connected distribution facility. The scope of the simulation models is set out in Article 21(1) and (2).
5. The relevant system operator shall have the right to check that a demand facility or a distribution system complies with the requirements of this Regulation by carrying out its own compliance simulations based on the provided simulation reports, simulation models and compliance test measurements.
6. The relevant system operator shall provide the demand facility owner, the DSO or the CDSO with technical data and a simulation model of the network, to the extent necessary to carry out the requested simulations in accordance with Article 43 and Article 44.

Article 43

Compliance simulations for transmission-connected distribution systems

1. With regard to the reactive power capability simulation of a transmission-connected distribution system:
 - (a) a steady-state load flow simulation model of the network of the transmission-connected distribution system in future system conditions shall be used in order to calculate the reactive power exchange under different load and generation conditions;
 - (b) the simulations shall include a combination of steady-state minimum and maximum load and generation conditions resulting in the lowest and highest reactive power exchange as well as low and high ratio between the instantaneous active power produced by power generating modules and the instantaneous consumption in the transmission-connected distribution system;
2. The relevant TSO may specify the method for compliance simulation of the active control of reactive power set out in Article 15(3).
3. The simulation shall be deemed passed if the results demonstrate compliance with the requirements set out in Article 15.

Article 44

Compliance simulations for transmission-connected demand facilities

1. With regard to the reactive power capability simulation of a transmission-connected demand facility without onsite generation:
 - (a) the transmission-connected demand facility without onsite generation's reactive power capability at the connection point shall be demonstrated;

- (b) a load flow simulation model of the transmission-connected demand facility shall be used to calculate the reactive power exchange under different load conditions. Minimum and maximum load conditions resulting in the lowest and highest reactive power exchange at the connection point shall be part of the simulations;
 - (c) the simulation shall be deemed passed if the results demonstrate compliance with the requirements set out in Article 15(1) and (2).
2. With regard to the reactive power capability simulation of a transmission-connected demand facility with onsite generation:
- (a) a load flow simulation model of the transmission-connected demand facility shall be used to calculate the reactive power exchange under different load conditions and under different generation conditions;
 - (b) a combination of minimum and maximum load and generation conditions resulting in the lowest and highest reactive power capability at the connection point shall be part of the simulations;
 - (c) the simulation shall be deemed passed if the results demonstrate compliance with the requirements set out in Article 15(1) and (2).

CHAPTER 4 ***Compliance monitoring***

Article 46

Compliance monitoring for transmission-connected distribution facilities

1. With regard to compliance monitoring of the reactive power requirements applicable to transmission-connected distribution facilities:
- (a) the transmission-connected distribution facility shall be equipped with necessary equipment to measure the active and reactive power, in accordance with Article 15; and
 - (b) the relevant system operator shall specify the time frame for compliance monitoring.

Article 47

Compliance monitoring for transmission-connected demand facilities

1. With regard to compliance monitoring of the reactive power requirements applicable to transmission-connected demand facilities:
- (a) the transmission-connected demand facility shall be equipped with necessary equipment to measure the active and reactive power, in accordance with Article 15; and
 - (b) the relevant system operator shall specify the time frame for compliance monitoring.

TITLE V **APPLICATIONS AND DEROGATIONS**

CHAPTER 1
Cost-benefit analysis

Article 48

Identification of costs and benefits of application of requirements to existing transmission-connected demand facilities, existing transmission-connected distribution facilities, existing distribution systems and existing demand units

1. Prior to the application of any requirement set out in this Regulation to existing transmission-connected demand facilities, existing transmission-connected distribution facilities, existing distribution systems and existing demand units in accordance with Article 4(3), the relevant TSO shall undertake a qualitative comparison of costs and benefits related to the requirement under consideration. This comparison shall take into account available network-based or market-based alternatives. The relevant TSO may only proceed to undertake a quantitative cost-benefit analysis in accordance with paragraphs 2 to 5, if the qualitative comparison indicates that the likely benefits exceed the likely costs. If, however, the cost is deemed high or the benefit is deemed low, then the relevant TSO shall not proceed further.
2. Following a preparatory stage undertaken in accordance with paragraph 1, the relevant TSO shall carry out a quantitative cost-benefit analysis of any requirement under consideration for application to existing transmission-connected demand facilities, existing transmission-connected distribution facilities, existing distribution systems and existing demand units that have demonstrated potential benefits as a result of the preparatory stage according to paragraph 1.
3. Within three months of concluding the cost-benefit analysis, the relevant TSO shall summarise the findings in a report which shall:
 - (a) include the cost-benefit analysis and a recommendation on how to proceed;
 - (b) include a proposal for a transitional period for applying the requirement to existing transmission-connected demand facilities, existing transmission-connected distribution facilities, existing distribution systems and existing demand units. That transitional period shall not be more than two years from the date of the decision of the regulatory authority or where applicable the Member State on the requirement's applicability;
 - (c) be subject to public consultation in accordance with Article 9.
4. No later than six months after the end of the public consultation, the relevant TSO shall prepare a report explaining the outcome of the consultation and making a proposal on the applicability of the requirement under consideration to existing transmission-connected demand facilities, existing transmission-connected distribution facilities, existing distribution systems and existing demand units. The report and proposal shall be notified to the regulatory authority or, where applicable, the Member State, and the demand facility owner, DSO, CDSO or, where applicable, third party shall be informed on its content.
5. The proposal made by the relevant TSO to the regulatory authority or, where applicable, the Member State pursuant to paragraph 4 shall include the following:
 - (a) an operational notification procedure for demonstrating the implementation of the requirements by the existing transmission-connected demand facilities, existing

transmission-connected distribution facilities, existing distribution systems and existing demand units;

- (b) a transitional period for implementing the requirements which shall take into account the classes of transmission-connected demand facilities, transmission-connected distribution facilities, distribution systems and demand units and any underlying obstacles to the efficient implementation of the equipment modification/refitting.

Article 49

Principles of cost-benefit analysis

1. Demand facility owners, DSOs and CDSOs shall assist and contribute to the cost-benefit analysis undertaken according to Article 48 and 53 and provide the necessary data as requested by the relevant system operator or relevant TSO within three months of receiving a request, unless agreed otherwise by the relevant TSO. For the preparation of a cost-benefit-analysis by a demand facility owner or prospective owner, or by a DSO/CDSO or prospective operator, assessing a potential derogation pursuant to Article 52, the relevant TSO and DSO shall assist and contribute to the cost-benefit analysis and provide the necessary data as requested by the demand facility owner or prospective owner, or by the DSO/CDSO or prospective operator, within three months of receiving a request, unless agreed otherwise by the demand facility owner or prospective owner, or by the DSO/CDSO or prospective operator.
2. A cost-benefit analysis shall be in line with the following principles:
 - (a) the relevant TSO, demand facility owner or prospective owner, DSO/CDSO or prospective operator, shall base its cost-benefit analysis on one or more of the following calculating principles:
 - (i) the net present value;
 - (ii) the return on investment;
 - (iii) the rate of return;
 - (iv) the time needed to break even;
 - (b) the relevant TSO, demand facility owner or prospective owner, DSO/CDSO or prospective operator, shall also quantify socioeconomic benefits in terms of improvement in security of supply and shall include at least:
 - (i) the associated reduction in probability of loss of supply over the lifetime of the modification;
 - (ii) the probable extent and duration of such loss of supply;
 - (iii) the societal cost per hour of such loss of supply;
 - (c) the relevant TSO, demand facility owner or prospective owner, DSO/CDSO or prospective operator, shall quantify the benefits to the internal market in electricity, cross-border trade and integration of renewable energies, including at least:
 - (i) the active power frequency response;
 - (ii) the balancing reserves;

- (iii) the reactive power provision;
 - (iv) congestion management;
 - (v) defence measures;
- (d) the relevant TSO shall quantify the costs of applying the necessary rules to existing transmission-connected demand facilities, existing transmission-connected distribution facilities, existing distribution systems, or existing demand units, including at least:
- (i) the direct costs incurred in implementing a requirement;
 - (ii) the costs associated with attributable loss of opportunity;
 - (iii) the costs associated with resulting changes in maintenance and operation.

CHAPTER 2

Derogations

Article 50

Power to grant derogations

1. Regulatory authorities may, at the request of a demand facility owner or prospective owner, and a DSO/CDSO or prospective operator, relevant system operator or relevant TSO, grant demand facility owners or prospective owners, and DSOs/CDSOs or prospective operators, relevant system operators or relevant TSOs derogations from one or more provisions of this Regulation for new and existing transmission-connected demand facilities, transmission-connected distribution facilities, distribution systems and demand units in accordance with Article 51 to 53.
2. Where applicable in a Member State, derogations may be granted and revoked in accordance with Article 51 to 53 by other authorities than the regulatory authority.

Article 51

General provisions

1. Each regulatory authority shall specify, after consulting relevant system operators, demand facility owners, DSOs, CDSOs, and other stakeholders whom it deems affected by this Regulation, the criteria for granting derogations pursuant to Article 52 and 53. It shall publish those criteria on its website and notify them to the Commission within nine months of the entry into force of this Regulation. The Commission may require a regulatory authority to amend the criteria if it considers that they are not in line with this Regulation. This possibility to review and amend the criteria for granting derogations shall not affect the derogations already granted which shall continue to apply until the scheduled expiry date as detailed in the decision granting the exemption.
2. If the regulatory authority deems that it is necessary due to a change in circumstances relating to the evolution of system requirements, it may review and amend at most once every

year the criteria for granting derogations in accordance with paragraph 1. Any changes to the criteria shall not apply to derogations for which a request has already been made.

3. The regulatory authority may decide that transmission-connected demand facilities, transmission-connected distribution facilities, distribution systems and demand units for which a request for a derogation has been filed pursuant to Article 52 and 53 do not need to comply with the requirements of this Regulation from which a derogation has been sought from the day of filing the request until the regulatory authority's decision is issued.

Article 52

Request for a derogation by a demand facility owner, a distribution system operator or a closed distribution system operator

1. Demand facility owners or prospective owners, and DSOs/CDSOs or prospective operators, may request a derogation to one or several requirements of this Regulation for transmission-connected demand facilities, transmission-connected distribution facilities, distribution systems, or demand units.

2. A request for a derogation shall be filed with the relevant system operator and include:

- (a) an identification of the demand facility owner or prospective owner, the DSO/CDSO or prospective operator, and a contact person for any communications;
- (b) a description of the transmission-connected demand facility, the transmission-connected distribution facility, the distribution system, or the demand unit for which a derogation is requested;
- (c) a reference to the provisions of this Regulation from which a derogation is requested and a detailed description of the requested derogation;
- (d) detailed reasoning, with relevant supporting documents and cost-benefit analysis pursuant to the requirements of Article 49;
- (e) demonstration that the requested derogation would have no adverse effect on cross-border trade.

3. Within two weeks of receipt of a request for a derogation, the relevant system operator shall confirm to the demand facility owner or prospective owner, or to the DSO/CDSO or prospective operator, whether the request is complete. If the relevant system operator considers that the request is incomplete, the demand facility owner or prospective owner, or the DSO/CDSO or prospective operator, shall submit the additional required information within one month from the receipt of the request for additional information. If the demand facility owner or prospective owner, or if the DSO/CDSO or prospective operator, does not supply the requested information within that time limit, the request for a derogation shall be deemed withdrawn.

4. The relevant system operator shall, in coordination with the relevant TSO and any affected adjacent DSO, 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 51.

5. Within six months of receipt of a request for a derogation, the relevant system operator shall forward the request to the regulatory authority and submit the assessment(s) prepared in accordance with paragraphs 4. That period may be extended by one month where the relevant

system operator seeks further information from the demand facility owner or prospective owner, or from the DSO/CDSO or prospective operator, and by two months where the relevant system operator requests the relevant TSO to submit an assessment of the request for a derogation.

6. The regulatory authority shall adopt a decision concerning any request for a derogation within six months from the day after it receives the request. That time limit may be extended by three months before its expiry where the regulatory authority requires further information from the demand facility owner or prospective owner, or from the DSO/CDSO or prospective operator, or from any other interested parties. The additional period shall begin when the complete information has been received.

7. The demand facility owner or prospective owner, or the DSO/CDSO or prospective operator, shall submit any additional information requested by the regulatory authority within two months of such request. If the demand facility owner or prospective owner, or if the DSO/CDSO or prospective operator, does not supply the requested information within that time limit, the request for a derogation shall be deemed withdrawn unless, before its expiry:

- (a) the regulatory authority decides to provide an extension; or
- (b) the demand facility owner or prospective owner, or the DSO/CDSO or prospective operator, informs the regulatory authority by means of a reasoned submission that the request for a derogation is complete.

8. The regulatory authority shall issue a reasoned decision concerning a request for a derogation. Where the regulatory authority grants a derogation, it shall specify its duration.

9. The regulatory authority shall notify its decision to the relevant demand facility owner or prospective owner, the DSO/CDSO or prospective operator, the relevant system operator and the relevant TSO.

10. A regulatory authority may revoke a decision granting a derogation if the circumstances and underlying reasons no longer apply or upon a reasoned recommendation of the Commission or reasoned recommendation by the ACER pursuant to Article 55(2).

11. For demand units within a demand facility or a closed distribution system connected at a voltage level of or below 1000 V, a request for a derogation under this Article may be made by a third party on behalf of the demand facility owner or prospective owner, or on behalf of the CDSO or prospective operator. Such a request may be for a single demand unit or multiple demand units within the same demand facility or closed distribution system. In the case of the latter, and provided the cumulative maximum capacity is specified, the third party may substitute the details required by point (a) of paragraph 2 with their details.

Article 53

Request for a derogation by a relevant system operator or relevant TSO

1. Relevant system operators or relevant TSOs may request derogations for transmission-connected demand facilities, transmission-connected distribution facilities, distribution systems, or demand units within a demand facility or a closed distribution system connected or to be connected to their network.

2. Relevant system operators or relevant TSOs shall submit their requests for a derogation to the regulatory authority. Each request for a derogation shall include:

- (a) identification of the relevant system operator or relevant TSO, and a contact person for any communications;
- (b) a description of the transmission-connected demand facility, the transmission-connected distribution facility, the distribution system, or the demand unit for which a derogation is requested and the total installed capacity and number of transmission-connected demand facilities, transmission-connected distribution facilities, distribution systems, or demand units;
- (c) the requirement or requirements of this Regulation for which a derogation is requested, with a detailed description of the requested derogation;
- (d) detailed reasoning, with all relevant supporting documents;
- (e) demonstration that the requested derogation would have no adverse effect on cross-border trade;
- (f) a cost-benefit analysis pursuant to the requirements of Article 49. If applicable, the cost-benefit analysis shall be carried out in coordination with the relevant TSO and any adjacent DSO.

3. Where the request for a derogation is submitted by a relevant DSO, the regulatory authority shall, within two weeks from the day after receipt of that request, ask the relevant TSO to assess the request for a derogation in the light of the criteria determined by the regulatory authority pursuant to Article 51.

4. Within two weeks from the day after the receipt of such request for assessment, the relevant TSO shall confirm to the relevant DSO whether the request for a derogation is complete. If the relevant TSO considers that it is incomplete, the relevant DSO shall submit the required additional information within one month from the receipt of the request for additional information.

5. Within six months of receipt of a request for a derogation, the relevant TSO shall submit to the regulatory authority its assessment, including any relevant documentation. The six-month time limit may be extended by one month where the relevant TSO seeks further information from the relevant DSO.

6. The regulatory authority shall adopt a decision concerning a request for a derogation within six months from the day after it receives the request. Where the request for a derogation is submitted by the relevant DSO, the six-month time limit runs from the day following receipt of the relevant TSO's assessment pursuant to paragraph 5.

7. The six-month time limit referred to in paragraph 6 may, before its expiry, be extended by an additional three months where the regulatory authority requests further information from the relevant system operator requesting the derogation or from any other interested parties. That additional period shall run from the day following the date of receipt of the complete information.

The relevant system operator shall provide any additional information requested by the regulatory authority within two months from the date of the request. If the relevant system

operator does not provide the requested additional information within that time limit, the request for a derogation shall be deemed withdrawn unless, before expiry of the time limit:

- (a) the regulatory authority decides to provide an extension; or
- (b) the relevant system operator informs the regulatory authority by means of a reasoned submission that the request for a derogation is complete.

8. The regulatory authority shall issue a reasoned decision concerning a request for a derogation. Where the regulatory authority grants derogation, it shall specify its duration.

9. The regulatory authority shall notify its decision to the relevant system operator requesting the derogation, the relevant TSO and ACER.

10. Regulatory authorities may lay down further requirements concerning the preparation of requests for a derogation by relevant system operators. In doing so, regulatory authorities shall take into account the delineation between the transmission system and the distribution system at the national level and shall consult with system operators, demand facility owners and stakeholders, including manufacturers.

11. A regulatory authority may revoke a decision granting a derogation if the circumstances and underlying reasons no longer apply or upon a reasoned recommendation of the Commission or reasoned recommendation by the ACER pursuant to Article 55(2).

Article 54

Register of derogations from the requirements of this Regulation

1. Regulatory authorities shall maintain a register of all derogations they have granted or refused and shall provide ACER with an updated and consolidated register at least once every six months, a copy of which shall be given to ENTSO for Electricity.

2. The register shall contain, in particular:

- (a) the requirement or requirements for which the derogation is granted or refused;
- (b) the content of the derogation;
- (c) the reasons for granting or refusing the derogation;
- (d) the consequences resulting from granting the derogation.

Article 55

Monitoring of derogations

1. ACER shall monitor the procedure of granting derogations with the cooperation of the regulatory authorities or relevant authorities of the Member State. Those authorities or relevant authorities of the Member State shall provide ACER with all the information necessary for that purpose.

2. ACER may issue a reasoned recommendation to a regulatory authority to revoke a derogation due to a lack of justification. The Commission may issue a reasoned recommendation to a regulatory authority or relevant authority of the Member State to revoke a derogation due to a lack of justification.

3. The Commission may request ACER to report on the application of paragraphs 1 and 2 and to provide reasons for requesting or not requesting derogations to be revoked.

TITLE VI

NON-BINDING GUIDANCE AND MONITORING OF IMPLEMENTATION

Article 56

Non-binding guidance on implementation

1. No later than six months after the entry into force of this Regulation, the ENTSO for Electricity shall prepare and thereafter every two years provide non-binding written guidance to its members and other system operators concerning the elements of this Regulation requiring national decisions. The ENTSO for Electricity shall publish this guidance on its website.
2. ENTSO for Electricity shall consult stakeholders when providing non-binding guidance.
3. The non-binding guidance shall explain the technical issues, conditions and interdependencies which need to be considered when complying with the requirements of this Regulation at national level.

Article 57

Monitoring

1. ACER shall monitor the implementation of this Regulation in accordance with Article 32 of Regulation (EC) No 2019/943. Monitoring shall cover in particular the following matters:

- (a) identification of any divergences in the national implementation of this Regulation;
- (b) assessment of whether the choice of values and ranges in the requirements applicable to transmission-connected demand facilities, transmission-connected distribution facilities, distribution systems and demand units under this Regulation continues to be valid.

ACER shall involve the European Stakeholder Committee in the monitoring, where relevant.

2. ACER, in cooperation with ENTSO for Electricity, shall maintain a list of the relevant information to be communicated by ENTSO for Electricity to ACER in accordance with Article 30(5) and 32(1) of Regulation (EC) No 2019/943. The list of relevant information may be subject to updates and shall be in line with the information contained in the implementation monitoring files to be published in accordance with paragraph 3. ENTSO for Electricity shall maintain a comprehensive, standardised format, digital data archive of the information required by ACER.

3. Relevant TSOs shall submit to ENTSO for Electricity the information required for ACER to perform the tasks referred to in paragraphs 1 and 2.

TSOs shall ensure that the information is provided without undue delay and is up to date.

The EU DSO entity shall cooperate with ENTSO for Electricity on the monitoring of implementation of this Regulation in accordance with Article 55(2)(a) of Regulation (EU)

2019/943, among other activities, on the provision of information necessary for monitoring the implementation of this Regulation.

Based on a request of the regulatory authority, DSOs shall provide TSOs with information under paragraph 2 unless the information has already been obtained by the regulatory authorities, ACER or the ENTSO for Electricity in relation to their respective implementation monitoring tasks, with the objective of avoiding duplication of information. DSOs shall ensure that the information is provided without undue delay and is up to date.

4. ACER, in cooperation with ENTSO for Electricity, shall maintain a public online repository where relevant national information regarding the progress of implementation of this Regulation shall be made available. The information to be made available shall at least include legal texts, implementation monitoring files, summaries of all the proposals for non-exhaustive requirements, TSO and DSO requirements and compliance tests and process to be performed and links to the national implementation websites. Where ENTSO for Electricity or ACER identify areas in which, based on market developments or experience gathered in the application of this Regulation, further harmonisation of the requirements under this Regulation is advisable to promote market integration, they shall propose draft amendments to this Regulation pursuant to Article 60(2) of Regulation (EU) 2019/943.

TITLE VII

FINAL PROVISIONS

Article 58

Amendment of contracts and general terms and conditions

1. Regulatory authorities shall ensure that all relevant clauses in contracts and general terms and conditions relating to the grid connection of new transmission-connected demand facilities, new transmission-connected distribution facilities, new distribution systems and new demand units are brought into compliance with the requirements of this Regulation.
2. All relevant clauses in contracts and relevant clauses of general terms and conditions relating to the grid connection of existing transmission-connected demand facilities, existing transmission-connected distribution facilities, existing distribution systems and existing demand units subject to all or some of the requirements of this Regulation in accordance with paragraph 1 of Article 4 shall be amended in order to comply with the requirements of this Regulation. The relevant clauses shall be amended within three years following the decision of the regulatory authority or Member State as referred to in Article 4(1).
3. Regulatory authorities shall ensure that agreements between system operators and owners of new or existing demand facilities or operators of new or existing distribution systems subject to this Regulation and relating to grid connection requirements for transmission-connected demand facilities, transmission-connected distribution facilities and distribution systems, in particular in national network codes, reflect the requirements set out in this Regulation.

Article 58a

Repeal

1. Regulation (EU) 2016/1833 is repealed. References to the repealed Regulation shall be construed as references to this Regulation and shall be read in accordance with the correlation table set out in Annex [].

2. Notwithstanding paragraph 1, Regulation (EU) 2016/1833 shall continue to apply to transmission-connected demand facilities, transmission-connected distribution facilities, distribution systems, including closed distribution systems and demand units which fall within its the scope of application at the entry into force of this Regulation and which are not subject to the requirements of this Regulation according to Article 4(1).

Article 59

Entry into force

This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

Without prejudice to Article 4(2)(b), Article 6, Article 51, Article 56 and Article 57, the requirements of this Regulation shall apply from three years after publication.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels,.....

For the Commission

The President

(1) [OJ L 158, 14.6.2019, p. 54](#).

(2) Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU (recast) ([OJ L 158, 14.6.2019, p. 125](#)).

(3) Directive (EU) 2015/1535 of the European Parliament and of the Council of 9 September 2015 laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services (codification) ([OJ L 241, 17.9.2015, p.1](#)).

(4) Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC ([OJ L 315, 14.11.2012, p. 1](#)).

(5) Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management ([OJ L 197, 25.7.2015, p. 24](#)).

(6) Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators ([OJ L 112, 27.4.2016, p. 1](#)).

(7) Commission Regulation (EU) No 543/2013 of 14 June 2013 on submission and publication of data in electricity markets and amending Annex I to Regulation (EC) No 714/2009 of the European Parliament and of the Council ([OJ L 163, 15.6.2013, p. 1](#)).

ANNEX I

Frequency ranges and time periods referred to in Article 12(1)

Synchronous area	Frequency range	Time period for operation
Continental Europe	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	30 minutes
	51,5 Hz-52,5 Hz	10 seconds
Nordic	47,5 Hz-48,5 Hz	30 minutes
	48,5 Hz-49,0 Hz	To be specified by each TSO, but not less than 30 minutes
	49,0 Hz-51,0 Hz	Unlimited
	51,0 Hz-51,5 Hz	30 minutes
	51,5 Hz-52,5 Hz	10 seconds
Ireland and Northern Ireland	47,5 Hz-48,5 Hz	90 minutes
	48,5 Hz-49,0 Hz	To be specified by each TSO, but not less than 90 minutes
	49,0 Hz-51,0 Hz	Unlimited
	51,0 Hz-51,5 Hz	90 minutes
	51,5 Hz-52,5 Hz	10 seconds

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
	51,5 Hz-52,5 Hz	10 seconds

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.

ANNEX II

Voltage ranges and time periods referred to in Article 13(1)

Synchronous area	Rated Voltage	Voltage range	Time period for operation
Continental Europe	110 kV	0,85 pu-0,90 pu	60 minutes
		0,90 pu-1,118 pu	Unlimited
		1,118 pu-1,15 pu	To be specified by each TSO, but not less than 20 minutes and not more than 60 minutes
		1,15 pu-1,20 pu	1 minute
	132 kV	0,85 pu-0,90 pu	60 minutes
		0,90 pu-1,098 pu	Unlimited

		1,098 pu-1,15 pu	To be specified by each TSO, but not less than 20 minutes and not more than 60 minutes
		1,15 pu-1,20 pu	1 minute
150 kV		0,85 pu-0,90 pu	60 minutes
		0,90 pu-1,118 pu	Unlimited
		1,118 pu-1,15 pu	To be specified by each TSO, but not less than 20 minutes and not more than 60 minutes
		1,15 pu-1,20 pu	1 minute
220 kV		0,85 pu-0,90 pu	60 minutes
		0,90 pu-1,113 pu	Unlimited
		1,113 pu-1,15 pu	To be specified by each TSO, but not less than 20 minutes and not more than 60 minutes
		1,15 pu-1,20 pu	1 minute
330 kV		0,85 pu-0,90 pu	60 minutes
		0,90 pu-1,05 pu	Unlimited
		1,05 pu-1,10 pu	To be specified by each TSO, but not less than 20 minutes and not more than 60 minutes
		1,10 pu-1,20 pu	1 minute
400 kV		0,85 pu-0,90 pu	60 minutes
		0,90 pu-1,05 pu	Unlimited
		1,05 pu-1,10 pu	To be specified by each TSO, but not less than 20 minutes and not more than 60 minutes
		1,10 pu-1,20 pu	1 minute

Nordic	110 kV	0,85 pu-0,90 pu	To be specified by each TSO, but not more than 60 minutes
		0,90 pu-1,05 pu	Unlimited
		1,05 pu-1,10 pu	60 minutes
		1,10 pu-1,20 pu	1 minute
	132 kV	0,85 pu-0,90 pu	To be specified by each TSO, but not more than 60 minutes
		0,90 pu-1,05 pu	Unlimited
		1,05 pu-1,10 pu	60 minutes
		1,10 pu-1,20 pu	1 minute
	220 kV	0,85 pu-0,90 pu	To be specified by each TSO, but not more than 60 minutes
		0,90 pu-1,05 pu	Unlimited
		1,05 pu-1,10 pu	60 minutes
		1,10 pu-1,20 pu	1 minute
	330 kV	0,85 pu-0,90 pu	To be specified by each TSO, but not more than 60 minutes
		0,90 pu – 1,05 pu	Unlimited
		1,05 pu – 1,10 pu	To be specified by each TSO, but not more than 60 minutes
		1,10 pu-1,20 pu	1 minute
	400 kV	0,85 pu-0,90 pu	To be specified by each TSO, but not more than 60 minutes
		0,90 pu – 1,05 pu	Unlimited
		1,05 pu – 1,10 pu	To be specified by each TSO, but not more than 60 minutes
		1,10 pu-1,20 pu	1 minute

Ireland and Northern Ireland	110 kV	0,90 pu-1,10 pu	Unlimited	
		1,10 pu-1,20 pu	1 minute	
	220 kV	0,90 pu-1,10 pu	Unlimited	
		1,10 pu-1,20 pu	1 minute	
	275 kV	0,90 pu – 1,09 pu	Unlimited	
		1,09 pu-1,20 pu	1 minute	
	400 kV	0,90 pu – 1,10 pu	Unlimited	
		1,10 pu-1,20 pu	1 minute	
	Baltic	110 kV	0,85 pu-0,90 pu	30 minutes
			0,90 pu-1,118 pu	Unlimited
1,118 pu-1,15 pu			20 minutes	
1,15 pu-1,20 pu			1 minute	
220 kV		0,85 pu-0,90 pu	30 minutes	
		0,90 pu-1,113 pu	Unlimited	
		1,113 pu-1,15 pu	20 minutes	
		1,15 pu-1,20 pu	1 minute	
330 kV		0,88 pu-0,90 pu	30 minutes	
		0,90 pu-1,097 pu	Unlimited	
		1,097 pu-1,15 pu	20 minutes	
		1,15 pu-1,20 pu	1 minute	
400 kV		0,88 pu-0,90 pu	30 minutes	
		0,90 pu-1,05 pu	Unlimited	
		1,05 pu-1,15 pu	20 minutes	
		1,15 pu-1,20 pu	1 minute	

The table shows the minimum time periods during which a transmission-connected demand facility, a transmission-connected distribution facility or a transmission-connected distribution system has to be capable of operating for voltages deviating from the reference 1 pu value at the connection point without disconnecting from the network.
