



An Coimisiún
um Rialáil Fóntas
**Commission for
Regulation of Utilities**

An Coimisiún um Rialáil Fóntas
Commission for Regulation of Utilities

Decision on Technical Requirements for Demand Connections resulting from the implementation of the Network Code on Demand Connection (DCC) (EU Commission Regulation (EU) 2016/1388)

Decision Paper

Reference:	CRU/19101	Date Published:	12/09/19	Closing Date:	N/A
-------------------	-----------	------------------------	----------	----------------------	-----

Table of Contents

1. Introduction.....	3
2. Frequency parameter proposals	10
3. Voltage parameter proposals	11
4. Demand Response Control.....	14
5. System Restoration related parameters	19
6. Instrumentation Simulation and Control parameters	22

CRU Mission Statement

The CRU's mission is to protect the public interest in Water, Energy and Energy Safety.

The CRU is guided by four strategic priorities that sit alongside the core activities we undertake to deliver on the public interest. These are:

1. Deliver sustainable low-carbon solutions with well-regulated markets and networks
2. Ensure compliance and accountability through best regulatory practice
3. Develop effective communications to support customers and the regulatory process
4. Foster and maintain a high-performance culture and organisation to achieve our vision

Customer Impact Statement

A fully transparent set of technical parameters for the connection of demand (both large demand users and distribution systems connected at transmission level) across the EU is important to consumers, the economy and society. The Demand Connection Network Code establishes across European Member States a set of common, minimum requirements and principles for the treatment of demand facilities and distribution systems. The CRU's decisions outlined in this paper and the changes requested underline the CRU's intention to ensure that these technical parameters enable more efficient use of the network and resources, ensure system security and facilitate the role of demand facilities in the evolution of electricity networks.

1. Introduction

Commission Regulation (EU) 2016/1388 of 17 August 2016 establishing a Network Code on Demand Connection (hereafter referred to as **DCC**) aims to establish a set of common, minimum requirements and principles for demand connections across EU Member states to enable the appropriate use of demand facilities' and distribution systems' capabilities to increase system security, facilitate trade and assist in the integration of renewable sources

The decisions taken in this document relate to the technical parameters that must be met when a new demand connection (as captured by the DCC) is made to the electricity network. These parameters are technical in nature and will need to be reflected in the connection agreements, Grid Code, Distribution Code and operational procedures mandated by the Transmission System Operator (**TSO**) and the Distribution System Operator (**DSO**). In making these decisions the CRU balanced the need to ensure system security with efficient and reasonable system operation that accommodates greater levels of variable renewable generation and demand response units.

1.1. Date of application of the requirements of DCC

According to the timelines laid out within the DCC, full compliance by connecting plant is required by 7 March 2019, unless the relevant demand connecting party can demonstrate that a final and binding contract for the purchase of the main equipment or demand unit has concluded by 7 September 2018.

The CRU recognises that these dates are not practical in terms of compliance given that clarity on the required technical parameters is only provided in this decision paper. To address this, the CRU has, in advance of this decision, sought and received clarification from the Department of Communications, Climate Action and Environment (representing the Member State) to avail of the facility outlined in Article 4 (2) of DCC, which allows an extension of the deadlines for compliance.

On foot of receiving this clarification, the CRU has decided to require connecting parties to comply in full with the parameters of the DCC code from 7 September 2019, in line with the full go-live date of the DCC. This clarification was published in a [letter](#) on the 13 June 2019. This means that for all relevant demand connections connecting after the 7 September 2019 the relevant mandatory requirements set out in the DCC standards will apply, as will the approved parameters issued in this Decision paper (unless the facility owner has concluded a final and binding contract for purchase of the main plant before the 7 September 2019).

While the CRU is not in a position to made final decisions on all the parameters consulted on and submitted by TSO, the CRU has sought to provide as much clarity as possible on these parameters due to the timelines.

1.2. Requirements of General Application in accordance with Article 6 of DCC

The DCC Network Code outlines a range of technical standards and parameters that a Transmission System Operator (TSO), Distribution System Operator (DSO) or Relevant System Operator (RSO) has to apply in their implementation of the DCC. As this is a pan-European requirement, the DCC provides that some of the parameters can be determined and specified at a national level to take account of different power system structures and sizes. In doing so, the DCC outlines requirements that are commonly described as either mandatory or non-mandatory, and also requirements that are

exhaustive or non-exhaustive.

These are described as follows;

- A mandatory requirement must be applied by the TSO/DSO/RSO
- A non-mandatory requirement is one which the TSO/DSO/RSO may choose to apply
- An exhaustive parameter has a specified value or range in the DCC which the RSO must apply
- A non-exhaustive parameter is one for which the DCC provides a range from which the TSO/DSO/RSO selects the applicable value for their region.

In accordance with Article 76 of the DCC Network Code, the relevant system operator or TSO shall submit a proposal for requirements of general application, or the methodology used to calculate or establish them, for approval by the competent entity within two years of entry into force of this Regulation, i.e. by 7 September 2018. The CRU is the competent entity in Ireland for approval of system operator proposals.

The Irish TSO and DSO, EirGrid and ESNB respectively, have actively engaged, consulted upon, developed and submitted a proposal for requirements of general application, which focused on the non-mandatory and non-exhaustive parameters of the DCC for application in Ireland. The final proposal submitted to the CRU on 20 September 2018, covers a range of standards that demand connections must comply with to successfully connect to the distribution or transmission network. Some of the standards consulted upon are in line with existing Grid Code and Distribution Code requirements and some are new.

1.3. Relevant Documents

It is important to highlight to stakeholders that several other documents are essential reading material to gain a full understanding of the decisions made in this paper. The relevant documents are as follows:

- The Demand Code Network Code Regulation [2016/1388](#)
- The Emergency Restoration Network Code [2017/2196](#)
- EirGrid/ESNB [Consultation](#) on General application of DCC parameters
- EirGrid [Proposal](#) for General application of technical DCC requirements
- ESNB [Proposal](#) for General application of technical DCC requirements
- CRU clarification [letter](#) regarding date of application of DCC
- EirGrid Grid [Code](#)
- ESNB Distribution [Code](#)

1.4. Acronyms used in this document

DCC NC - Demand Connection Network Code

DSO – Distribution System Operator (ESB Networks in Ireland)

DS- distribution system

ER NC – Emergency Restoration Network Code

ENTSO-E – European Network of Transmission System Operators

MEC – Maximum Export Capacity

MIC - Maximum Import capacity

TCDF – Transmission connected demand facility

TCDS- Transmission connected distribution system

PPM - Power Park Module

RSO - Relevant System Operator - i.e. DSO or TSO

SNSP - System Non-Synchronous Penetration

SO - System Operator

TSO - Transmission System Operator (EirGrid in Ireland)

1.5. Articles 12-21 and 27-30 of DCC Proposals

The TSO and DSO have submitted separate proposals to the CRU on the relevant technical articles. It must be noted that the proposals submitted to the CRU (and those consulted upon) do not include proposals that are mandatory requirements contained within the DCC. Only the non-mandatory (i.e. where the relevant system operator has a choice to apply the requirement or not) and non-exhaustive parameters (i.e. where the system operator must select a value from within a certain range), have been consulted upon and are decided upon in this paper. The mandatory requirements of the DCC must be directly applied in Ireland. A relevant system operator may apply to the CRU for a derogation to the application of individual DCC requirements as outlined in Articles 50-53 of the DCC. The CRU has not received any derogation requests from the TSO or DSO in relation to the implementation of the DCC.

The TSO has structured its submission into sections dealing with;

- Frequency
- Voltage
- Demand Response control
- System Restoration
- Protection and Instrumentation

The DSO is responsible for submitting proposals for the necessary parameters for the following articles

- Article 28.2 (c)
- Article 28.2 (e) and (l) for distribution connected demand units,
- Article 28.2 (i) for distribution connected demand units; and
- Article 29.2 (c) for distribution connected demand units

The DSO also made a strong representation in its proposal in relation to the TSO's proposal regarding the application of Article 15.2 and 15.3. The CRU will deal with each of these categories in turn in this decision paper.

The CRU recognises that the TSO and DSO undertook a wide consultation process with industry in

determining appropriate parameters. The DCC did not mandate such consultative processes and the CRU welcomes the transparency provided to industry by EirGrid and ESB Networks in this regard. The CRU has reviewed the submitted proposals, and the responses received to the consultation.

2. Legal Background

2.1. Focus of DCC

The Demand Connection Code (DCC) is a European regulation that provides detailed guidelines for the purposes of safeguarding operational security, and lays down requirements on

- (a) the management by TSOs of the emergency, blackout and restoration states;
- (b) the coordination of system operation across the Union in the emergency, blackout and restoration states;
- (c) the simulations and tests to guarantee a reliable, efficient and fast restoration of the interconnected transmission systems to the normal state from the emergency or blackout states;
- (d) the tools and facilities needed to guarantee a reliable, efficient and fast restoration of the interconnected transmission systems to the normal state from the emergency or blackout states.

2.2. Legal basis for the CRU Decision on technical parameters of the DCC

This section of the paper outlines the legal background that underpins this Decision outlining the scope of application of the DCC requirements, the regulatory aspects and the consultation requirements. The full list of technical Articles have not been listed below as this would require unnecessary duplication of the DCC Regulation itself which can be accessed in full at this [link](#).

Article 3 Scope of application

1. The connection requirements set out in 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 demand units used by a demand facility or a closed distribution system to provide demand response services to relevant system operators and relevant TSOs.*

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, 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. Based on compliance monitoring in accordance with Title III,

the relevant TSO shall refuse demand response services subject to Articles 27 to 30 from new demand units not fulfilling the requirements set out in this Regulation. 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, Great Britain, Nordic, Ireland and Northern Ireland or Baltic synchronous area; (

b) storage devices except for pump-storage power generating modules in accordance with Article 5(2).

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 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 competent entity within two years of entry into force of this Regulation.

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 or TSO 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 and TSOs 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 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);

(d) the requirements for demand units specified in accordance with Article 28(2)(c),(e),(f),(k) and (l) and Article 29(2)(c) to (e).

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, the cost-benefit analysis, or the requirements for demand units specified in accordance with Article 28 and Article 29.

3. Frequency parameter proposals

Article 12 General frequency requirements

Article 12 of the DCC deals with parameters relating to frequency stability, and the ability of demand connection facilities to remain connected to the system at times of volatility in the system frequency. This is important to allow the TSO to maintain stable system operation at all times.

Article 12 and Annex 1 of the DCC outlines the frequency ranges and required times of operation that demand connections captured by the DCC have to maintain at each frequency range. The TSO has stated that as required by Article 12.1 of DCC that 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 range of 48.5-49Hz for 90 minutes. This is the minimum time allowed within the DCC.

The TSO has also stated that beyond the requirements of the DCC the current version of the Transmission Grid Code (Section CC7.4) in Ireland requires demand side units, generation and interconnectors to remain connected to the network for the following ranges and times

- 47.0Hz - 47.5 Hz for 20 seconds
- 51.5Hz - 52.0Hz for 60 minutes

The TSO proposes to require DCC units to meet the following standards;

Frequency range	Time Period for Operation
47.0 Hz – 47.5 Hz	20 seconds
47.5 Hz – 49.0 Hz	90 minutes
49.0 Hz – 51.0 Hz	Unlimited
51.0 Hz – 51.5 Hz	90 minutes
51.5 Hz – 52.0 Hz	60 minutes

The CRU requested further detail on this proposal from the TSO, which was provided and is satisfied that applying these standards to new transmission demand facilities, new transmission connected distribution facilities, new distribution systems, including new closed distribution systems and new demand units used to provide demand response is a reasonable and proportionate proposal to ensure stability of system operation. The CRU acknowledges that some of these ranges go further than the requirements of the DCC, and notes they have existed in the EirGrid Grid Code for some time for demand side units. Derogation processes are available to demand units if they wish to seek an exemption from these standards, and the decision as to whether to grant an exemption or time limited derogation will be taken in line with the published Derogation Criteria Decision [paper CER11176](#).

The CRU approves this proposal.

4. Voltage parameter proposals

Articles 13.6 Automatic disconnection due to Voltage level

The TSO has proposed that they can specify per Transmission connected demand facility or transmission connected distribution system the terms for automatic disconnection at specified voltages.

The CRU approves this proposal as it complies with the DCC requirements.

Article 14.1 Short Circuit requirements

Article 14.1 allows the TSO to specify the maximum short circuit level current at the connection point that the transmission connected demand facility or distribution system shall be capable of withstanding. The TSO has proposed that the current maximum short circuit values that are contained within the Grid Code can continue to apply and meet the requirements of Article 14.1

The CRU approves this proposal as it complies with the DCC requirements.

Article 14.3 Threshold for TSO report obligation for change in maximum short circuit current after unplanned event

The TSO proposes that a change can be made to maximum short circuit thresholds can be made within one week of an unplanned event, and in line with Article 14.4 that this would be made by the Transmission Connected Distribution Facility or Distribution system on a site-specific basis.

The CRU approves this proposal in that it addresses the requirements of the DCC.

Article 14.5 Threshold for TSO report obligation for change in maximum short circuit current before planned event

The TSO proposes that a change can be made to maximum short circuit thresholds, within one week of a planned event, and in line with Article 14.6 that this would be made by the Transmission Connected Distribution Facility owner or Distribution System on a site- specific basis.

The CRU approves this proposal in that it addresses the requirements of the DCC.

Article 14.8 Threshold for customer report obligation for change in maximum short circuit current after unplanned event

The TSO is obliged to specify a threshold above which a transmission connected demand facility, or a transmission connected distribution system must inform the TSO if they wish to make amend their short circuit contribution following an unplanned event. The TSO proposes that this value is set at 0.5kA. Therefore, for any change in a short circuit contribution by a transmission connected demand facility or a transmission connected distribution system that exceeds this threshold after an unplanned event the relevant party must notify the TSO as soon as possible and within one week of the unplanned event.

The CRU approves this proposal as it complies with the requirements of the DCC.

Article 14.9 Threshold for TSO report obligation for change in maximum short circuit current before planned event

The TSO is obliged to specify a threshold above which a transmission connected demand facility, or a transmission connected distribution system must inform the TSO if they wish to make amend

their short circuit contribution before a planned event. The TSO proposes that this value is set at 0.5kA. Therefore, for any change in a short circuit contribution by a transmission connected demand facility or a transmission connected distribution system that exceeds this threshold after an unplanned event the relevant party must notify the TSO as soon as possible and at the latest one week before the planned event.

The CRU approves this proposal as it complies with the requirements of the DCC.

Article 15.1(a) Reactive Power capability for Transmission connected demand facilities

Article 15.1(a) specifies requirements for reactive power capability required from transmission connected demand facilities. The TSO has proposed slightly different requirements for sites without on-site generation to sites with on-site generation. These DCC standards differ from today's Grid Code requirements, and will require Grid Code implementation for new DCC connections.

The CRU approves the proposal as it complies with the requirements of the DCC.

Article 15.1(b) Reactive power capability for Transmission Connected Distribution Systems

Article 15.1(b) specifies reactive power standards for Transmission connected distribution systems, and this is in line with the DCC code. The TSO proposal aligns with the ranges outlined in the DCC.

The CRU approves the proposal as it complies with the requirements of the DCC.

Article 15.1d Alternative Metrics to set out the equivalent reactive range

This Article allows the TSO to propose alternative metrics to using the power factor to set out the equivalent reactive power capability range. The TSO proposed that in addition to the power factor limits would be expressed as the ratio of Q/P_{max} , with P_{max} either as maximum import and export capability. The proposal of the TSO created some uncertainty by including both the use of the Q/P_{max} , and power factor. Following engagement with the TSO and DSO on this uncertainty it has been agreed that the Power factor shall be applied to set the outer bounds of the reactive range. A subsequent revision of the Grid Code (Section CC 10.13) will be required to align with the required standards.

The CRU therefore approves this proposal on the condition that the relevant Grid Code section is updated to ensure alignment.

Article 15.2 Reactive Power requirements

Article 15 (2) outlines how the TSO may require that distribution systems have the capability to not export reactive power when active power flow is less than 25% of the maximum import capability. EirGrid has proposed making this non-mandatory requirement mandatory. Article 15.2 also states that the relevant TSO may be required to *justify its request through a joint analysis with the transmission-connected distribution system operator*.

The DSO has proposed in its submission that this requirement is not made mandatory and that where there are new connections between the existing Distribution System and the existing Transmission System a case by case analysis should be conducted to identify the most feasible and cost-effective solution to dealing with reactive power issues.

The CRU has reviewed this matter in depth, and upon detailed consideration has decided that the rationale for mandatory application of this requirement to new connections between the existing TSO and DSO networks is not fully justified. In addition, with the expectation that the electricity systems

will be going through significant decentralisation and change over the coming years a more holistic approach to network optimisation will be necessary.

The CRU therefore does not approve the TSO's proposal in this regard to make this a mandatory requirement. The CRU encourages the TSO and DSO to work collaboratively and conduct joint analysis on all new connections between their two respective systems to identify the most cost - effective and sustainable solution to reactive power issues.

Article 15.3 Active control of the exchange of Reactive Power at Connection point of a Transmission Connected Distribution System

Under Article 15.3 EirGrid is proposing to make mandatory its right to specify that the TSO should actively control the exchange of reactive power at the connection point to the transmission system. Article 15.3 requires *“the relevant TSO and DSO to agree on a method to carry out such control to ensure the justified level of security of supply for both parties. The justification (to require the active control of reactive power by the DSO) shall include a roadmap in which the steps and the timeline for fulfilling the requirements are specified.*

The TSO has not submitted a roadmap for fulfilling the requirements as part of their proposals.

ESBN have stated that reactive power management by the DSO instead of the TSO at the TSO/DSO interface could assist the TSO system but do not agree that this should be made mandatory. The DSO also points to agreed protocols on the treatment of reactive power from Distributed Energy resources is already in place between the TSO and DSO. The DSO proposed that as per Article 15.2 a collaborative, case-by-case consideration of the best approach to reactive power management is a better approach.

In addition, given the changing nature of the energy mix, with higher levels of renewable technology and changes to the demand and generation mix it is possible that reactive power issues will increase over time. To best address this it is important that the TSO and DSO work together to assess the system holistically to address these issues. It is clear from the legally active Clean Energy Package that greater cooperation between TSO and DSO on system planning and operation will become the norm.

The CRU has decided therefore to not make a general decision on this parameter, and instead, has decided that such issues should be considered by the System Operators in cooperation on a case-by-case basis, with escalation to the CRU where no agreement can be reached.

Article 20 Power Quality

The TSO has proposed that the standards of IEC 61000-3-6 (Harmonics) and IEC/TR3 61000-3-7 (Voltage Fluctuation) are applied in relation to power quality and ensure that the standards of CENELEC Standard EN 50160 are not breached.

The CRU approves this proposal as this is in line with the requirements of the DCC.

5. Demand Response Control

Article 28.2(a) Demand response active and reactive power control and transmission constraint management- frequency

This Article requires the specification of frequency range operations by demand units with Demand response active power control, reactive power control and transmission constraint management functions. The TSO has proposed that the frequency requirements for are aligned with the detail in Article 12.1 and 12.2 and Annex 1 of the DCC, which is in line with the requirements of Article 28.2 (a)

The CRU approves this proposal as it complies with the requirements of the DCC.

Article 28.2(b) Demand response active and reactive power control and transmission constraint management- voltage

The TSO has proposed that demand units offering demand response 0 active and reactive power control or transmission constraint management shall comply with the operating voltage ranges specified in Article 13 of DCC for connections over 110kV.

The CRU approves this proposal as it complies with the requirements of the DCC.

Article 28.2 (c) DSO proposal - Demand response active and reactive power control and transmission constraint management- voltage

This Article requires the specification of normal operating voltage ranges at connections by Demand units with Demand response active power control, reactive power control and transmission constraint management functions to networks of 110kV or lower, which in Ireland relates to the DSO networks. ESNB submitted their proposal which contained a typographical error.

Following confirmation with ESNB the below table represents the proposed values listed in the correct columns- and this has now been updated in the published version on the ESNB website.

Nominal voltage	Highest voltage	Lowest Voltage
230V	253V	207V
400V	440V	360V
10kV	11.3kV	9.6kV
20kV	22.5kV	19.3kV
38kV	43.8kV	35.6kV
110kV	123kV	99kV

On initial observation the values proposed by the DSO for their 10kV and 20kV networks are such that they exceed $\pm 10\%$ as specified in Cenelec standard EN 50160:2010. However, this issue also arose in relation to the implementation of the Requirements for Generators (RfG) Network Code and was addressed by the implementation of a modification [Mod#44] to the Irish Distribution Code. This modification has been approved by the CRU during the assessment of the DCC proposals, and

ensures compliance with the requirements of Article 28 (2) (c), by including the new parameter of “Declared Supply Voltage” as facilitated by the most recent version of EN50160.

The voltage at the Connection Point shall be kept within +/- 10% of these Declared Supply Voltage values. Distribution voltages in operation and referred to in Planning standards, have, over time, reached a point now where on occasion the nominal values, are often exceeded. The ability of ESBN to mandate the appropriate U-Q behaviour is vital to the safe operation of the system and to the integrity of Connection Offers made to customers.

To address this anomaly and the requirements of the EU Network Codes values captured in the Declared Supply voltage have been chosen such that the highest and lowest voltages specified in the Distribution Code are within +/- 10% or between 0.9 – 1.1 pu of them. A new piece of text has been added to the D-Code to explicitly state that any reference to p.u. voltage values in any EU Network Code, is with reference to this new parameter.

This is illustrated in the table below.

Existing Nominal	Max	Min	Dedared Supply Voltage	% at Max	% at Min
38kV	43.8	35.6	40	1.095	0.890
20kV	22.5	19	21	1.071	0.905
10kV	11.3	10.1	11	1.027	0.918

The CRU hereby approves the proposed parameters and will separately request EirGrid and ESB Networks to ensure translation of all the DCC requirements into Grid Code, Distribution Code, Testing procedures, Operating Security Standards and processes at the earliest opportunity.

Article 28.2(e) and (l) Technical specifications for demand response instructions

The DSO and TSO have both stated separately in their submissions that the technical specifications for the exchange of information will be determined during the implementation phase of the DCC and once determined will be made publicly available on their respective websites.

The lack of detail contained within these proposals does not meet the requirements of Article 28.2 (e) and (l), nor does it meet the requirements of Article 9(1) which requires consultation with relevant stakeholders on proposed specifications.

The CRU therefore does not approve the DSO’s or TSO’s proposals in this regard, and requests that the DSO and TSO submit the detailed (following the required consultation in line with Article 9) proposals for separate approval by the 6th December 2019.

Article 28.2(f) and (j) Time period for power consumption adjustment

The TSO has stated that the definition of the period to adjust power consumption within agreed limits is to set on a site-specific basis. The TSO proposes this approach as it states this would best take account of specific issues such as the type of processes carried out by the demand unit, and the electrical configuration at an individual site.

The CRU approves this proposal as it achieves the goals of the DCC while taking account of site specificities.

Article 28.2(i) Modalities of notification of modification to demand response capacity

The DSO and TSO have stated separately in their submissions that the specification of the modalities of the notification of modifications to demand response capacity will be determined during the implementation of the DCC.

The CRU considers that this is insufficient and that there is a need to clarify how demand side units notify changes in their demand response capacity to the relevant system operator.

The CRU does not approve this proposal and requests that the SOs submit the detailed specification as required by the DCC for separate approval.

Article 28.2(k) ROCOF withstand capability

The TSO has proposed applying the “agreed in principle” Grid Code Standard for RoCoF of 1Hz/s over a 500ms window. This principle has been agreed following a large body of work that the TSO has delivered to ensure system stability with increased volumes of non-synchronous generation. The RoCoF standard is to be applied following industry changes, which are currently underway.

The CRU therefore approves this proposal as it complies with the DCC code requirements and is required for future system security.

Article 29.2(a) Frequency range for demand response units providing frequency control

The TSO has proposed that demand response units providing frequency control align with the requirements of Article 12. The CRU has clarified with the TSO that its proposal was intended to apply both the requirements of Article 12.1 and 12.2. This means that for such demand units they are required to align with the requirements of staying operational within the range of 47-52Hz.

The CRU therefore approves this proposal as it aligns with frequency range requirements for other DCC relevant units and systems.

Article 29.2(b) Voltage range for demand response units providing frequency control

The TSO has proposed that the voltage ranges that apply as per (the mandatory requirements of) Article 13 of the DCC also apply to Demand units offering demand response system frequency control.

This is in line with the requirements of the DCC and the CRU therefore approves this proposal.

Article 29.2(c) Voltage range for Demand units proving frequency control connected at 110kV or lower.

The DSO has proposed in this section that the voltage ranges to apply to demand units offering demand response system frequency control connected at 110kV or lower are as per the current version of the Distribution Code, and the below table (amended to correct previous typo)

Nominal voltage	Highest voltage	Lowest Voltage
10kV	11.3kV	9.6kV

20kV	22.5kV	19.3kV
38kV	43.8kV	35.6kV
110kV	123kV	99kV

The CRU approves this proposal as it is in line with the requirements of the DCC.

Article 29.2(d) Specification of a frequency deadband for demand response units providing frequency control

Article 29.2(d) requires the specification of a deadband within which the control system of a demand unit with demand response system frequency control capabilities shall remain insensitive i.e. that the unit's control system will not react until the frequency reaches a level outside the deadband.

The TSO has proposed a deadband of 49.5-50.2Hz for demand units providing frequency response.

While the CRU acknowledges that this is facilitated by the DCC, the CRU has not received sufficient explanation of how this deadband interacts with a number of important issues considerations such as increasing the flexibility of demand response, interactions with the wider DS3 project and increased levels of non-synchronous generation.

The CRU therefore reserves its decision on this proposal and asks the TSO to review this in line with the requirements to ensure as per Recitals (4), (8) and (9) that demand response plays an integral role in system security and in optimizing the efficiency of network operations. The TSO is therefore asked to review the proposal and re-submit with detailed justification its proposed frequency deadband range for demand units with demand response system frequency control.

Article 29.2 (e) Maximum frequency deviations for Demand response units providing frequency response

The TSO has proposed that the maximum frequency deviations from the nominal value of 50Hz is specified at 48.9Hz and 51.1Hz to match current underfrequency (involuntary) load shedding and over-frequency generation shedding. In addition the [Emergency Restoration Network Code \(ER NC\)](#) requires load shedding to start at 48.85 (as per the Annex) .

The CRU considers that these parameters are intrinsically linked to the values required under Article 29.2(d) and therefore proposes to postpone the decision in line with the requested detail under Article 29.2(d) above.

Article 29.2(g) Rapid Detection and response timings

The TSO has specified that the rapid detection and response should have an initial time delay of 0 seconds other than the inherent delays in the design of the demand response system frequency control system itself.

The CRU considers that this proposal is somewhat ambiguous and provides no guidance to DCC connected demand response units on what an acceptable inherent delay would be. The CRU approves this proposal but requests that the TSO reviews this proposal in line with best practice in other EU Member States, and provides an update to the CRU when submitting the documents requested under Article 28 above.

Article 30.1 and 30.2 Provisions for demand units delivering very fast active power control demand response

The TSO has proposed values in line with very fast active power control capabilities contracted under DS3. There are already contractual conditions with individual providers in place for such services and the TSO's proposal to allow the continuation of thus individual contractual based specifications for services provided in under 2 seconds is appropriate.

The CRU therefore approves this proposal.

6. System Restoration related parameters

Article 19.1 Low frequency demand disconnection

The TSO has outlined in this proposal that they will implement low frequency demand disconnection in the ranges of 47-49.5Hz, to both transmission connected demand facilities and transmission connected distribution systems. The TSO is therefore proposing to extend the frequency range to a higher value than the current low frequency demand disconnection scheme is designed to start shedding load at (48.85Hz) by proposing that demand disconnection now starts once the frequency drops below 49.5Hz. The TSO also however states that the demand disconnection will only activate for frequencies below 48.9Hz, which creates confusion. In addition the [Emergency Restoration Network Code \(ER NC\)](#) requires load shedding to start at 48.85 (as per the Annex) .

The TSO's proposal does not meet the requirements of the DCC, which as per Article 19.1(b)(1) requires demand disconnection in the range 47-50Hz in adjustable steps of 0.05Hz., nor does it align with the requirements of the Emergency Restoration Network Code, in particular Article 15 and Annex 1. The TSO has not provided detail on how the adjustable steps would be implemented nor how they consider their proposed range of 47-49.5 meets the requirements of Article 19.1(a).

The TSO has stated demand disconnection would apply to transmission connected demand facilities up to 100% - i.e. that such all facilities could be disconnected during an underfrequency situation. The TSO has stated that transmission connection distribution systems (and thereby demand connected to distribution systems) would be disconnected in a proportion agreed between the TSO and DSO. The CRU is aware of low frequency automatic demand disconnection scheme in place under emergency procedures, and in line with the CRU's recent [Decision](#) on the submitted Emergency Restoration documents further detail on this and the identification of critical loads has been requested from the TSO.

In addition the TSO has stated that the details of any multi stage low frequency demand disconnection scheme would need to be agreed between the TSO and the relevant connected transmission connected demand facility owner or transmission connected DSO, however the TSO has not provided any detail how this agreement would be reached between the TSO and the relevant party and what legal arrangement would govern such agreements.

The CRU therefore reserves its decision on this proposal and requires further detailed information on the low frequency demand disconnection process to be provided. This information should outline the requirements to be placed on new (DCC relevant) demand connections and the interactions with System Defence services and the System Defence plan as required under the Emergency Restoration Network Code.

Article 19.2 Low Voltage Demand Disconnection

The TSO has stated that they will retain the right to specify on a case by case basis a requirement for a transmission connected demand facility or transmission connected distribution system to have capability for low voltage disconnection. In relation to 19.2 (a) this applies to transmission connected distribution facilitates and in relation to 19.2(b) this applies to transmission connected demand facilities.

In relation to 19.2(c) and (d) this gives the TSO the capability to specify a requirement for on load tap changer blocking. The TSO has stated in their proposal that they are invoking the right to specify this requirement, and that the requirement for this would be advised on a case by case basis., with details made available in due time for plant design (connection offer phase).

The CRU notes that currently on load tap blocking is not in use on the transmission system in Ireland but may be required in the future if identified by future system security studies.

The CRU approves these proposals as they are in compliance with the DCC, and requests the TSO to ensure that its connection offer process is updated to ensure the TSO has the capability to specify on load tap changer blocking on a case by case basis.

Article 19.3 Definition of automatic on load tap changer blocking scheme

The TSO proposes to invoke the right to specify on load tap changer blocking capability as per Article 19.2 and proposes to specify the functional capability on a case by case basis following consultation with the relevant stakeholders. The TSO states it will take into consideration that the specific requirements will be dependent on plant design and compatibility requirements. The TSO also states that if such functionality is required that all the necessary details will be made available in due time for plant design which is intended to mean during the connection offer phase.

The CRU approves this proposal as it is in compliance with the DCC, and requests the TSO to ensure that its connection offer process is updated to ensure the TSO has the capability to specify on load tap changer blocking on a case by case basis.

Article 19.4(a) Connections for reconnection post disconnection

The TSO has stated that the requirements of Article 19.4(a)(b) and (c) are not included in the current version of the Distribution Code and as such are not in use on the Distribution system at this time. These requirements may be required on a case by case basis in the future if they are identified in system security studies.

Under Article 19.4(a) the TSO has to specify the conditions under which a transmission connected demand facility or distribution system is entitled to reconnect to the transmission system. Installation of automatic reconnection systems shall be subject to prior authorization by the TSO. The TSO has stated that the required specifications would be made available in the System Defence and System Restoration plans (required under EU Regulation 2017/2196 Emergency Restoration (ER NC)), which at the time of submitted the DCC proposals had not been completed.

The CRU has since reviewed the proposals submitted under ER NC and has issued a [Decision](#) not to approve and seek amendments to the TSO's proposals. The TSO did not provide specification of the conditions under which a transmission connected demand facility or distribution system is entitled to reconnect to the transmission system.

The CRU does not approve this proposal and requests that the TSO submits the detailed specifications to the CRU by the 6th December 2019, and also that the TSO includes detail on reconnection requirements in the amended System Restoration plan under ER NC.

Article 19.4(b) Settings of the synchronisation devices

The TSO is proposing to specify the settings of synchronisation devices on a site specific or case by case basis and that the exact settings would be agreed as part of the overall agreement of protection and control settings between the TSO and the transmission connected demand facility or distribution system prior to connection:

The CRU approves this proposal as it is in line with the requirements of the DCC.

Article 19.4(c)(1) Time required for remote disconnection

In relation to the time of remote disconnection the TSO proposes that upon receipt of a signal to disconnect from the transmission system or following the activation of the low frequency or low voltage relay the transmission connected demand facility or distribution system should disconnect from the transmission system without delay, other than any delay inherent in the disconnection process.

The CRU considers that this proposal is somewhat ambiguous and provides no guidance as required by Article 19.4(c) to users as to what an acceptable inherent delay would be. The CRU approves this proposal but requests that the TSO reviews this proposal in line with best practice in other EU Member States and provides an update to the CRU when submitting the documents as requested under Article 28, 29 and 19.4(a) above.

7. Instrumentation, Simulation and Control parameters

Article 16.1 Electrical Protection Schemes and Settings

The TSO is proposing to specify the electrical protection schemes and settings for transmission connected distribution systems or demand facilities on a case by case basis as per existing practices. Such specification may cover the following elements:

- External and internal short circuit
- Over and under-frequency
- Over and under-voltage at the connection point to the transmission system
- Demand circuit protection
- Unit transformer protection
- Back up against protection and switchgear malfunction

The CRU approves this proposal as it complies with the requirements of the DCC.

Article 17.1 Specification and agreement of control schemes and settings

The TSO is proposing to specify the schemes and settings of different control devices on a case by case basis for at least the following elements

- Isolated(network) operation
- Damping of oscillations
- Disturbances to the transmission network
- Automatic switching to emergency supply and restoration to normal topology
- Automatic circuit breaker re-closure (on 1-phase faults) and settings on a case by case basis as per existing practices.

The CRU approves this proposal as it complies with the requirements of the DCC.

Article 18.3 Information Exchange

The TSO has proposed to specify the standards for information exchange during the implementation phase with publication to the TSO website.

The lack of detail contained within this proposals does not meet the requirements of Article 18.3.

The CRU therefore does not approve the TSO's proposals in this regard, and requests that the TSO submits the detailed proposals for separate approval by the 6th December 2019.

Article 21.3 Specification of simulation models

The TSO is required to specify the content and format of simulations models or equivalent information for transmission connected demand facilities or distribution systems. The TSO has proposed that the simulation models shall include the following, which covers the minimum requirements outlined in

Article 21.3;

- Steady and dynamic states, including 50 Hz component, suitable for load flow, fault level analysis (balanced and unbalanced faults) and RMS dynamic simulations;
- Electromagnetic transient simulations at the connection point;
- Structure and block diagrams.
- Harmonics, including harmonic impedance and harmonic emissions

The CRU approves this proposal as it meets the requirements of Article 21.3

Article 21.5 Recording requirements

The TSO has proposed that the current power quality and event recorders installed at various points on the transmission system can also be used for the comparison and verification of models, and that the exact specification of the performance requirements of the recordings of transmission connected demand facilities and distribution systems.

The CRU understands from the TSO's submission that the proposal is to not specify the performance requirements of the power quality and event recorders for transmission connected demand facilities and distribution systems at this time. The TSO states that the exact specification of the recorders will be dependent on the intended applications.

The CRU is content to approve this proposal in that it would appear to meet the objective of Article 21.5 in a cost-effective manner. The CRU wishes to highlight to the TSO that if in future individual power quality and event recorders are required for each transmission connected demand facility or distribution system for the purposes of comparison of simulation models and actual characteristics that an information paper is provided to the CRU, and the necessary Grid Code changes are processed.

Next Steps

The CRU has approved a number of the proposals submitted by the TSO and DSO, and expects these to be implemented immediately with the integration of the requirements of the relevant proposals and the more general mandatory parameters of the DCC into the Grid Code and Distribution Code.

As outlined in Sections 3-7 of this paper the CRU has not approved the proposals submitted by the SOs for the following Articles

- Article 18.3
- Article 19.1
- Article 28.2(e)
- Article 28.2(1)
- Article 29.2(d)
- Article 29.2 (e)

The CRU requests the TSO and DSO to re-submit amended proposals (in line with the comments provided in this paper) on the above Articles by December 6th 2019. The CRU will aim to make a decision on the re-submitted proposals within a month of receipt of these from the SOs.

In addition, for the following Articles;

- Article 19.4(a)
- Article 19.4(c)

the CRU has approved the proposals but has also requested further information on the proposals, to be supplied also by the 6th December 2019.

Full compliance with the approved proposals and the mandatory requirements of the DCC is required by relevant units and the TSO and DSO are requested to expediate the integration of these standards into the Grid Code and Distribution Code to ensure full transparency for connecting parties.

In relation to the go-live of the DCC requirements for new demand connections captured by the DCC (as outlined in Section 2 of this paper) the full compliance of units with the Articles that are not yet approved (as listed above) is not required until 1 month after these are approved by the CRU.