EirGrid's proposal for the general application of technical requirements in accordance with Articles 12 – 21 & Articles 27 – 30 of the Commission Regulation (EU) 2016/1388 establishing a Network Code on Demand Connection

20 September 2018

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Table of Contents

1. Introduction

On the 7th September 2016, the Commission Regulation (EU) 2016/1388 establishing a network code on requirements for demand connection (hereafter referred to as 'DCC') entered in force.

The scope of this document is to seek approval from the National Regulatory Authority on EirGrid's proposal for the general application of technical requirements in accordance with Articles 12 – 21 and Articles 27 - 30 of the Commission Regulation (EU) 2016/1388 establishing a network code on requirements for demand connections.

This proposal document is produced by EirGrid plc in its role as the Transmission System Operator in Ireland (hereafter referred to as 'TSO'). References in this document to the Relevant System Operator (hereafter referred to as 'RSO') mean the operator of the system to which the user is connected to, i.e. either TSO or DSO. Section 2 gives details of which parameters are proposed by the TSO, either in its role as TSO or where applicable as the RSO.

The requirements of the DCC apply from three years after its publication in the Official Journal of the EU (OJEU) as per Article 59. The requirements of the DCC do not apply to existing demand units, demand facilities, distribution systems or closed distribution systems. A demand unit, demand facility, distribution system or closed distribution system is defined in Article 4 as existing if:

- It is already connected to either the transmission or distribution network in Ireland by two years on entry into force of the DCC (7th September 2018); or
- The demand facility owner has concluded a final and binding contract for the purchase of the main demand plant by two years after entry into force of the DCC (7 September 2018).

However, in the case where an existing demand unit, demand facility, distribution system or closed distribution system, as defined in Article 4 of the DCC, is modified to such an extent that its connection agreement must be substantially revised, some or all of the DCC requirements may become applicable.

Under Article 6 (4), the TSO or RSO is required to submit a proposal for necessary requirements of general application for approval by the Commission for Regulation of Utilities (CRU) within two years of entry into force of this regulation, i.e. 7 September 2018. The National Regulator then has six months to approve the proposal. It is not a requirement of the DCC to consult upon the TSO's proposals for all of the requirements of general application prior to submission to the CRU, only a subset of proposals as specified in DCC. On the 6 July 2018, the TSO along with the DSO issued a joint Consultation Document in the interest of transparency and to ensure that the TSO and DSO have the best information available to them to submit an appropriate set of recommendations to the CRU for the proposal of requirements of general application.

The TSO has an obligation, under the DCC, to submit proposals in relation to relevant TSO-proposed parameters. As such, the TSO are submitting these proposals for the general application of the non-mandatory requirements and non-exhaustive parameters in accordance with those set out in Title II Article 12 – 21 and Articles 27 - 30 of the DCC.

SONI Ltd, in its role as the Transmission System Operator in Northern Ireland, and Northern Ireland Electricity Networks, in its role as the Distribution System Operator in Northern Ireland, are submitting proposals to the Utility Regulator.

1.1. Associated documents

All references to Articles in this document refer to Articles set out in the DCC unless otherwise specified. The TSO strongly recommends that all readers review the DCC Network Code [1] and the DCC Consultation on Parameter Selection – Ireland [2].

1.2. Definitions and Interpretations

For the purposes of this proposal document, the terms used shall have the meaning of the definitions included in Article 2 of DCC.

In this proposal document, unless the context requires otherwise:

a) the singular indicates the plural and vice versa;
b) the table of contents and headings are inserted for convenience only and do not affect the interpretation of this proposal;
c) any reference to legislation, regulations, directive, order, instrument, code or any other enactment shall include any modification, extension or re-enactment of it then in force;
d) Site Specific:

   Where the term "Site Specific" is used in the parameter proposal tables in section 5, it is intended to specify these parameters, taking consideration of the following;

   - the appropriate system security studies; and
   - consultation with the necessary users e.g. demand facility owners, distribution system owners.

1.3. Structure of this document

The scope and background to this proposal are respectively set out in Sections 2 and 3, to provide important information to the reader. They guide the reader through the DCC concepts and principles underpinning this proposal document.

Section 4 provides a consultation update, where detail on submissions, changes and derogations are reported.

Section 5 sets out the TSO proposals. It details the proposal, justification, and applicability of parameter or requirement as appropriate. In this section, the TSO has grouped parameters by technical theme, with a number of sub-themes discussed further. Within each theme, the TSO goes into detail on which parameter or requirement applies to each demand connection type.

The themes are:

1. Frequency
2. Voltage
3. Demand Response Control
4. System Restoration
5. Protection & Instrumentation

A conclusion is provided in Section 6. Finally, Section 7 houses the consultation responses.

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[1] https://electricity.network-codes.eu/network_codes/dcc/

[2] http://www.eirgridgroup.com/site-files/library/EirGrid/DCC-Parameter-Consultation-Ireland.pdf

2. Scope

The scope of this document is to seek approval from the National Regulatory Authority on the TSO's proposal for the general application of technical requirements in accordance with Articles 12 – 21 and Articles 27 – 30 of the Commission Regulation (EU) 2016/1388 establishing a Network Code on Demand Connection. The TSO's proposals include:

- making non-mandatory requirements mandatory;
- parameter selection for the non-exhaustive parameters; and
- non-exhaustive parameters for demand units which are providing certain system services e.g. demand response control.

Note this document does not seek approval on the mandatory requirements or exhaustive parameters. These were set by the Commission and cannot be changed. Further information on some of the background to these decisions is available online at:

- DCC Public Consultation [3]
- DCC Implementation Guideline [4]

In some cases, exhaustive requirements are described in this document to provide context for relevant discussion points. This will be clearly indicated.

For the purpose of clarity, under the DCC, either the TSO and/or DSO as RSO is responsible for the proposal of each of the necessary parameters.

The DSO is responsible for the proposal of the necessary parameters for the following articles:

- Article 15.4,
- 28.2(c),
- Article 28.2 (e) and (l) for distribution connected demand units,
- 28.2 (i) for distribution connected demand units, and
- 29.2 (c) for distribution connected demand units;

while the TSO is responsible for the proposal of all other DCC required parameters. For clarity, a table listing the parameters which the TSO is responsible for proposing is available on page 10.

Please note that this document details the proposals for the TSO proposed DCC parameters only.

[3] https://www.entsoe.eu/fileadmin/user_upload/_library/news/DCC_public_consultation/120627_DCC_-_Explanatory_Note.pdf

[4] https://www.entsoe.eu/fileadmin/user_upload/_library/resources/DCC/131016_-_DCC_implementation_guideline.pdf

Article	Proposer
12.1	TSO
13.6	TSO
14.1	TSO
14.3	TSO
14.5	TSO
14.8	TSO
14.9	TSO
15.1 (a), (b) and (d)	TSO
15.2	TSO
15.3	TSO
16.1	TSO
17.1	TSO
18.3	TSO
19.1 (a)	TSO
19.2	TSO
19.3	TSO
19.4	TSO
20	TSO
21.3	TSO
21.5	TSO
28.2 (a), (b) and (k)	TSO
28.2 (e) and (l)	TSO
28.2 (f) and (j)	TSO
28.2 (i)	TSO
29.2 (a), (b) and (g)	TSO
29.2 (d)	TSO
29.2 (e)	TSO
30.2	TSO

3. Background

The DCC applies across the European Union. The DCC recognises that the requirements of power systems in different synchronous areas can be different due to the differing sizes. For this reason, the DCC provides that some of the requirements for general application are to be specified at National level, i.e. by the TSO, DSO, or RSO of the member state, rather than at EU level.

To give effect to this concept, the DCC contains requirements that are commonly described as either mandatory or non-mandatory, and also requirements that are commonly described as exhaustive or non-exhaustive.

- A mandatory requirement must be applied by the TSO/DSO/RSO as appropriate
- A non-mandatory requirement is one which the TSO/DSO/RSO as appropriate may choose to apply
- An exhaustive parameter has a specified value or range in the DCC which the TSO/DSO/RSO as appropriate must apply
- A non-exhaustive parameter is one for which either:
    - The DCC provides a range from which the TSO/DSO/RSO as appropriate must select the applicable value for their region; or
    - The DCC does not specify a value and the TSO/DSO/RSO as appropriate must select the applicable value for their region.

As mandatory and exhaustive parameters are not at the discretion of the TSO/DSO/RSO as appropriate to modify they do not form part of this proposal document.

3.1. Principles underpinning the Proposals

Some of the requirements for general application exist in Ireland today in the Grid and/or Distribution Codes. The assumptions for selecting the non-mandatory requirements and non-exhaustive parameters are set out below.

Non-Mandatory Requirement Selection

In the majority of cases, the following assumptions are made:

- where the requirement provided in the DCC is an existing requirement in Ireland, the requirement is made mandatory nationally under the DCC;
- where the requirement provided in the DCC is not an existing requirement in Ireland, the requirement is not made mandatory nationally under the DCC.

Non-Exhaustive Parameter Selection

There are two examples of non-exhaustive parameter selection under DCC;

1. DCC requests that the TSO/DSO/RSO selects the value from within a range; or
2. DCC does not specify a range and requests that the TSO/DSO/RSO specify a value.

In the majority of cases, the following assumptions are made:

- where the range for a non-exhaustive parameter provided in the DCC includes the existing value applied in Ireland, the existing value is proposed;
- where the range for a non-exhaustive parameter provided in the DCC does not include the existing value applied in Ireland then the value proposed represents the minimum amount of change possible;

- where the DCC does not provide a value for a non-exhaustive parameter but requests that the RSO defines the value and it is an existing parameter in Ireland, the existing value is proposed; and
- where the DCC does not provide a value for a non-exhaustive parameter but requests that the RSO defines the value and it is not an existing parameter in Ireland, a justification is given.

Please note that only the DCC parameters, which need to be proposed by the TSO or where the TSO is acting as the relevant RSO, are detailed in this proposal document.

3.2. Overview of Demand Connection Types

There are a number of different demand connection types allowed for within the DCC. These include the following:

- Transmission-connected distribution systems (TCDS)
- Transmission-connected demand facilities (TCDF)
- Closed distribution systems (CDS)
- Transmission-connected distribution facility (TC distribution facility)
- Distribution-connected demand facility (DCDF)

In addition to these demand connection types, the DCC code also refers to the following:

- Demand facility (DF)
- Demand unit (DU)

For ease of reading, the following abbreviations for each of the demand connection types are used throughout the document:

Transmission-connected distribution systems	TCDS
Transmission-connected distribution systems owner	TCDSO
Transmission-connected demand facilities	TCDF
Closed distribution systems	CDS
Closed distribution systems owner	CDSO
Transmission-connected distribution facility	TC distribution facility
Distribution-connected demand facility	DCDF
Demand facility	DF
Demand facility owner	DFO
Demand unit	DU

Table 1: Abbreviations of Demand Connection Types

Figure 1 shows how each of these DCC connection types relate to one another. Please note that Figure 1 is intended for illustrative purposes only and does not override the definitions in the DCC.

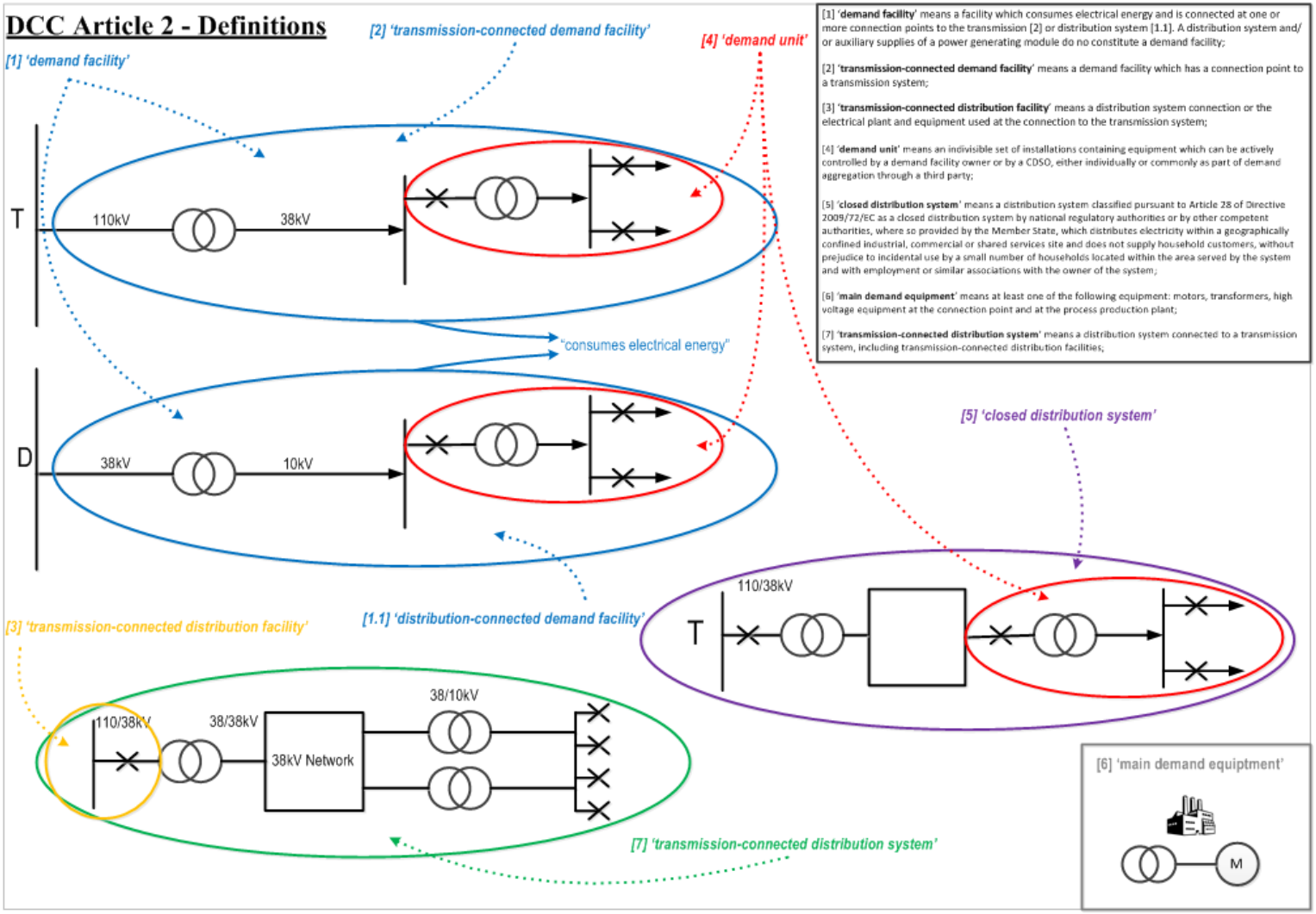


Figure 1: Representative Diagrams of DCC Connection Types

4. Consultation Update

EirGrid and ESB Networks held a joint consultation on the proposal for the general application of technical requirements in accordance with Articles 12 – 30 of the Commission Regulation (EU) 2016/1388 establishing a Network Code on Demand Connection. This consultation opened on the 6th July 2018 for a period of 5 weeks until 10th August 2018.

4.1. Summary of Submissions

The TSO received two individual submissions on the consultation, of which one (from Bord na Mona) is confidential. Please note both responses have been included as an appendix to this proposal document.

4.1.1. Bord na Móna Submission

Bord na Móna's consultation response asked that the TSO and DSO consider a means to support, enable and remunerate flexible demand response. The scope of the consultation is as defined in Section 2 of this document, and as such, did not seek to find a means to directly encourage flexible demand response. However, EirGrid's DS3 Programme [5] does provide a means to encourage such system services.

4.1.2. ESB Networks Submission

ESB Networks submitted a consultation response in which they raised a number of issues as detailed below:

1. In relation to Article 15 of the DCC, the making of a non-mandatory requirement mandatory, which may result in:
    a. The application of the reactive power requirement under article 15 resulting in unnecessarily high investment costs and unreasonable cost impact on the end user.
    b. Planning and delivery issues of the necessary equipment
2. The EU Regulation does not apply to the distribution system in Ireland as it is an existing distribution system

The TSO has provided responses to the submissions received from ESBN below with all submissions related to Article 15 grouped together for clarity.

[5] http://www.eirgridgroup.com/how-the-grid-works/ds3-programme/

Submission 1 – Approval of Consultation Document

ESB Networks Submission

ESBN herein notes that this document does not represent the views of the DSO. This publication was not a DSO approved proposal document. [ESB Networks]

TSO Response

The TSO agrees that the consultation document potentially introduced confusion around which parameters and/or requirements are proposed by which system operator. More importantly it potentially introduces confusion into those non-exhaustive parameters that have been jointly developed with DSO in their role as a system operator, and those in which DSO is a connecting demand customer. The TSO and DSO have worked together to clarify the roles per article in this final proposal document to alleviate this concern submitted by the DSO.

Submission 2 – Applicability

ESB Networks Submission

It is set out in DCC that "this Regulation should apply to …..new distribution systems" and "this Regulation should not apply to …existing distributions systems.". The Irish distribution system is an existing distribution system, whose development is by extension of the existing interconnected system, rather than by establishing new distribution systems.
The only other conditions in which DCC would only apply are in case regulatory approval were obtained for a TSO application to retrospectively impose the DCC, based on a full cost-benefit analysis, or in cases of substantial modernisation of the distribution system. Regarding the former, ESBN understands that the TSO is not seeking to pursue retrospective application of the DCC. Regarding the latter, ESBN is advised that this refers to very significant modernisation of the whole distribution system. As such it is unclear that there are any conditions in which the DCC would apply to the distribution system in Ireland. This point notwithstanding, ESBN believes it necessary to clarify a number of concerns regarding these proposals, in case any conditions should arise in future wherein they might be considered applicable. These concerns apply in all cases, though in particular they refer to any proposals affecting the development, modernisation or extension of the existing distribution system.

TSO Response

The applicability of DCC did not form a part of the consultation document, however, the TSO would like to take this opportunity to address the concerns raised by the DSO.

As stated in this submission, the requirements of DCC apply to new transmission connected distribution systems unless retrospection is being sought. The TSO have confirmed and agreed with the CRU that the Connection Codes in general will not be applied retrospectively at this time. It is envisaged that new transmission connected distribution facilities will continue to connect to the transmission system, and the applicable requirements of the DCC will apply to those new facilities going forward.

Article 4 states that the requirements of DCC will apply to existing distribution systems in the event of a significant modernisation. The DCC regulation states that for requirements of the DCC to apply to existing distribution systems or distribution facilities, any

modernisation must be of a sufficient scale to require an amendment to the connection agreement and which would change the technical capabilities of the equipment.

The TSO is committed to working with the DSO and CRU as modernisation of the Distribution System occurs to develop the most pragmatic approach to application of DCC requirements.

Submission 3 – Article 15 Proposal Approach (a)

ESB Networks Submission

ESBN has consistently proposed an alternative, collaborative and more proportionate approach. The TSO has communicated that at this time it does not see the merit of a collaborative approach.

TSO Response

The TSO acknowledges ESBNs proposal and has given it due consideration.

The TSO have been and will continue to be committed to working collaboratively with the DSO as part of our role as Transmission System Operator including during the establishment of the DCC proposal for general application.

However it is important to note that the TSO must also, in line with the European principles behind the EU Regulation and in line with existing Grid Code practice, treat all users equitably and without discrimination whilst being cognisant of the cost implications to the Irish consumer whilst making decisions.

The TSO has demonstrated the need for the requirements in Ireland at its inception and throughout development stages of the EU Regulation. It has considered the changing use of and the costs on the system and still sees the previously conducted cost benefit analysis as valid and appropriate. This CBA justifies the need for this requirement to apply to the DSO as a user of the transmission system.

Submission 5 – Article 15: Proposal Approach (b)

ESB Networks Submission

ESBN acknowledges that there may be locations and conditions where the TSO faces challenges managing reactive power transfer between the transmission and distribution systems. ESBN notes that to date the TSO and DSO have worked collaboratively to identify the most economic and effective solution to system challenges involving both transmission and distribution systems and resources. ESBN considers it appropriate that such an approach should continue, and represents the best interest of Irish electricity system users. ESBN would support a cooperative, evidenced based, balanced approach to the challenge of managing reactive power challenges.

TSO Response

The TSO have been and will continue to be committed to working collaboratively with the DSO as part of our role as Transmission System Operator including during the establishment of the DCC proposal for general application.

It is important to note that the TSO must also, in line with the European principles behind the EU Regulation and in line with existing Grid Code practice, treat all users equitably

and without discrimination whilst being cognisant of the cost implications to the Irish consumer whilst making decisions.

The TSO, like the DSO, has licence requirements to develop the transmission system in a reliable and efficient manner for all users. It is incumbent on the TSO to make a decision to apply or not a requirement on this basis; failure to implement a requirement when needed can be equally as damaging as implementing one.

In this case, the TSO has demonstrated the need for the requirements in Ireland at its inception and throughout development stages of the EU Regulation. It has considered the changing use of and the costs on the system and still sees the previously conducted cost benefit analysis as valid and appropriate. This CBA justifies the need for this requirement to apply to the DSO as a user of the transmission system.

Therefore, whilst it may be possible to examine this requirement with a number of bespoke joint assessments, the TSO believes that such repeated works, when the outcome is in net effect certain, is not efficient and ultimately costly to the Irish consumer.

Submission 4 – Article 15: Consultation at European Level

ESB Networks Submission

In the Consultation Proposal document, the TSO has proposed to make non-mandatory requirements in Articles 15.2, 15.3 and 15.4, which relate to reactive power requirements, mandatory. ESBN does not consider this a necessary, proportionate or appropriate measure.
ESBN would be concerned if the TSO were to consider any prior consultation, in Brussels or elsewhere in Europe, over the period when these non-mandatory proposals were being developed by the ENTSOE, to represent sufficient consultation. ESBN would be concerned if the TSO considers that further meaningful consideration of established approaches at a national level is somehow less necessary as a result.

TSO Response

The TSO agree that a prior European consultation does not negate a requirement for consultation nationally. The DCC does not mandate consultation on the proposal for general application of requirements with the exception of certain aspects of the Demand Side Response related articles. However, the TSO is cognisant of being transparent in all proposals and allowing impacted stakeholders to respond to our proposals for general application of non-exhaustive parameters and/or non-mandatory requirements. The TSO have maintained the right to specify the requirements as necessary where it is beneficial to the system and the Irish consumer.

The TSO is utilising a European consultation as supporting evidence to provide context and rationale for the TSO proposed requirement in this national consultation.

This European consultation showed the principles that were used to determine acceptance by member states of the EU Regulation. More detail on this supporting evidence is provided in Section 5.2.3.4.

Submission 6 - Article 15: Proposal lends itself to unnecessarily high investment

ESB Networks Submission

ESBN does not consider it appropriate to approach reactive power management challenges pertaining to a very small volume of very high value projects without considering the specific projects themselves on a case by case basis, as has been proposed. Such case by case analysis should consider the range of options available to address the challenge. These options include both capital solutions and the use of system services. Costs and practical considerations require the expertise and knowledge of both TSO and DSO, particularly insofar as they relate to distribution station specific design and delivery costs.

As such, ESBN has proposed that in cases where the TSO identifies reactive power management challenges, joint analysis involving both TSO and DSO, based on site specific design considerations and actual costings should be taken.

ESBN's understanding is that the TSO considers a standalone desktop electrical study, undertaken by the TSO a number of years ago as adequate justification for its proposals, which would apply universally going forward. This approach fails to acknowledge the real life conditions which drive costs in electricity infrastructure delivery. In practice these civil and structural issues can have at least as significant an impact on project costs as pure electrical capacity and connectivity considerations. Furthermore, ESBN notes that the solutions to any given system challenge may be efficiently met by service based solutions. ESBN does not consider it prudent to pre-judge the effectiveness with which system service based solutions might offer a cost effective alternative to the approach proposed over the coming years.

In summary, given the substantial cost of capital works in existing high voltage stations on the Irish distribution system, ESBN does not consider it realistic or efficient to prejudge that a given technical solution (additional capital investment on the distribution system) will in all, or almost all, cases prove the most cost effective. Given the low volume of projects involved, ESBN does not consider it excessive that case by case joint analysis would be undertaken.

TSO Response

The TSO has licence requirements to develop the system in a reliable and efficient manner for all users. It is incumbent on TSO to make a decision to apply or not a requirement on this basis; failure to implement a requirement when needed can be equally as damaging as implementing one.

In this case the TSO has demonstrated the need for the requirements in Ireland at its inception and throughout development stages of the EU Regulation. It has considered changing use and costs on the system and still sees the previously conducted cost benefit analysis as valid and appropriate to justify the need for this requirement.

Therefore whilst it may be possible to examine this requirement with a number of bespoke joint assessments, the TSO believes that such repeated works when the outcome is in net effect certain is not efficient and ultimately costly to the Irish consumer.

This is not unusual with many design policies and standards being universally applied, such as site layouts, conductor sizes, substation equipment configurations, etc.

Derogation procedures for any exceptions exist, as with this requirement, for exceptional cases.

The requirement does not preclude the use of compensation devices not owned by the DSO but provided to it as a system service. The only restriction is that it must be available for use at the time of the system conditions specified in the compliance test.

Therefore the TSO sees a justifiable reason to invoke the right to specify this requirement.

Submission 7 - Article 15: There is no practical need

ESB Networks Submission

ESBN has stated and demonstrated previously that it will undertake or facilitate measures agreed with the TSO, where they are judged and agreed by both parties to be the most economic technically acceptable solution.

Irrespective of the provisions of the EU Network Codes, ESBN has stated that it will continue to facilitate the best technical and economic solution, where the Commission for Regulation of Utilities (CRU) has approved the associated cost as efficient and allowed the requisite funding. ESBN remains committed to cooperating with the TSO to develop solutions to system wide issues. Furthermore, the regulation and governance of the relationship between TSO and DSO, in their respective roles and responsibilities, will continue to mandate such cooperation into the future. Experience to date has demonstrated the effectiveness of joint TSO/DSO delivery of cooperative solutions where such system wide issues required it.

There is no risk, precedent, or practical need to impose a legal obligation for ESBN to undertake something it would do anyway, where it is jointly agreed as the right thing to do.

TSO Response

The TSO has licence requirements to develop the system in a reliable and efficient manner for all users. It is incumbent on TSO to make a decision to apply or not a requirement on this basis; failure to implement a requirement when needed can be equally as damaging as implementing one.

In this case the TSO has demonstrated the need for the requirements in Ireland at its inception and throughout development stages of the EU Regulation. It has considered changing use and costs on the system and still sees the previously conducted cost benefit analysis as valid and appropriate to justify the need for this requirement.

Therefore whilst it may be possible to examine this requirement with a number of bespoke joint assessments, the TSO believes that such repeated works when the outcome is in net effect certain is not efficient and ultimately costly to the Irish consumer.

This is not unusual with many design policies and standards being universally applied, such as site layouts, conductor sizes, substation equipment configurations, etc. Derogation procedures for any exceptions exist as with this requirement for exceptional cases.

Therefore the TSO sees a justifiable reason to invoke the right to specify this requirement.

Submission 8 - Article 15: There is no legal need.

ESB Networks Submission

The proposals in question are not mandatory in the EU Code. They are options, which the TSO on this occasion has chosen to pursue. Both TSO and DSO have repeatedly confirmed to industry throughout the process of introducing the EU Network Codes that they do not intend on using the implementation of the EU Network Codes as a vehicle to impose new rules or obligations. To introduce these discretionary requirements in DCC would fail to respect the commitment which the TSO and DSO have made to industry.

TSO Response

Certain requirements of the code are defined as non-mandatory at a European level. This recognises and respects that there are requirements whose application and timing will be specific to national needs.

The code allows for the national RSO to consider and apply a requirement mandatorily at a national level, where the mandatory application is to the benefit of its system.

The TSO have stated that where possible we will not impose new rules or obligations where it is not prudent to do so. The TSO and DSO have made similar decisions with non-mandatory requirements in the Requirements for Generators Network Code.

In this case the TSO has demonstrated the need for the requirements in Ireland at its inception and throughout development stages of the EU Regulation. It has considered the changing use of and the costs on the system and still sees the previously conducted cost benefit analysis as valid and appropriate to justify the need for this requirement.

As discussed above in section 3.1, the TSO has committed to not impose new rules or obligations where it is not prudent to do so. The TSO's failure to utilise our rights in law would be a failing of its licence requirements to develop the system in a reliable and efficient manner for all users. It is incumbent on TSO to make a decision to apply or not a requirement on this basis; failure to implement a requirement when needed can be equally as damaging as implementing one.

Submission 9 – Article 15: could be a significant cost impact for electricity system users

ESB Networks Submission

ESBN does not believe that it would be proportionate or in the interests of electricity customers to require structural compensation or active control of reactive power by default. It would drive additional costs for new or modified demand or mixed demand-generation connections, and for DUoS customers when investment is needed to support local and regional growth. Decisions with this kind of investment cost impact warrant case by case consideration; a collaborative, analytical approach would be more prudent than a rules based approach. Regarding Article 15.3, reactive power management may offer a resource of value to the TSO, but retained in DSO management, it also has the potential to help release local capacity for demand or generation customers. ESBN does not consider it appropriate or in customers' interests to forfeit this value on their behalf, without careful, case by case joint consideration, consultation and agreement. An agreed protocol on the treatment of reactive power from Distributed Energy Resources (DERs) is already in place between the TSO and DSO, which recognises how topology and

electrical distance from the TSO-DSO boundary inform how and by whom, reactive power is treated. The resulting spectrum of implementations, ranging from direct control by TSO, to some shared control by means of a “Nodal Controller”, to static or dynamic agreed power factor ranges, to designation for use by DSO only, is one of the key achievements in system operation in Ireland in recent years.

TSO Response

Article 15.2

The TSO already applies mandatory design standard requirements on users of the Transmission System for example through the Grid Code. The TSO does this in cases where the requirement is consistently justifiable and therefore bespoke evaluation would be unnecessary and inefficient. The requirements of Article 15.2 are an example of this. A safe-guard in the form of a derogation is possible in unforeseen exceptional circumstances.

The supporting evidence referenced by the TSO has demonstrated the need for the requirements in Article 15.2 in Ireland at the inception and throughout the development stages of the EU Regulation. More detail on the supporting evidence is provided as part of Article 15 in Section 5: Proposals.

A more recent review of the costs and characteristics has not shown any change in the underlying case for this requirement. The TSO still sees the previously conducted cost benefit analysis as valid and appropriate to justify the need for this requirement.

The TSO believes from the analysis detailed above that there is a clear reduction in costs, footprint size and quantity of reactive compensation that a lower voltage solution will have over a higher voltage solution. This cost benefit analysis utilises TAO supplied costings. This means that a compensation solution for a DSO network is preferable at that lower voltage to a higher voltage i.e. 38kV to 110kV or 110kV to 220kV.

Article 15.3

The TSO is proposing to invoke the right under Article 15.3 which requires the DSO to actively control the reactive power exchange at the TSO/DSO interface point.

The TSO has not proposed to apply this requirement in all cases. As per the requirement in Article 15.3 the application will be justified and will include a roadmap for implementation. Any concerns on the implications for the utilisation of ‘Distributed Energy Resources (DER)’ would form part of this roadmap.

Submission 10 - Article 15: Planning and delivery challenges and delays

ESB Networks Submission

In case of Article 15.2 being made mandatory as proposed, the TSO has suggested that it would determine on a case by case basis whether to invoke the associated requirement, when distribution system planned projects are identified. ESBN’s project selection is typically based on an options analysis of a range of technical solutions. As such, having identified a preferred solution, the ex-post imposition of reactive power obligations (and thus project costs) could mean that a given proposal is no longer the Least Cost Technically Acceptable Option, and the development of an alternative Planning Design in cases where the proposal substantially alters the planned costs of a

project. Furthermore, in cases where reactive power compensation or other measures are required as part of project costs, ESBN is concerned that this may drive additional construction time, and the lead times associated with additional procurement. As such, ESBN considers it appropriate that any such additional investment is justified and agreed on a case by case basis.

TSO Response

Article 15.2

The TSO does not intend to implement this requirement on a case by case basis. Instead the TSO is proposing to invoke this requirement for the benefit of the system and the Irish consumer.

The conditions, under which this requirement applies, are when there are reactive power exports into the transmission system at times of low demand (25% of MIC). This condition reduces the number of connections that this requirement would apply to, and is likely to be applicable in only a small number of cases. These cases would be made up almost exclusively of distribution system connections which contain a very high proportion of cable making up its circuits.

Assessment of adequate voltage control, including at minimum loading, as well as reactive power compensation needs, is currently part of the ESBN project selection process. Therefore, this requirement should not require an ex-post solution, but would rather bring greater certainty to option selection.

Article 15.3

The TSO is proposing to invoke the right under Article 15.3 which requires the DSO to actively control the reactive power exchange at the TSO/DSO interface point.

The TSO has not proposed to apply this requirement in all cases. As per the requirement in Article 15.3 the application will be justified and will include a roadmap for implementation. Any concerns on the implications for the utilisation of 'Distributed Energy Resources (DER)' would form part of this roadmap.

Post Consultation Note:

On the 11 September 2018, ESBN provided the TSO with a document which provided additional information in relation to ESBN's submission on Article 15. While this document has been included in Appendix 1 in its entirety, the TSO would like to address one additional point which it raises and which was not included as part of the original consultation submission and therefore was not part of the TSO's subsequent responses, as detailed in the previous sections.

The ESBN further information document states that "the approach in GB, wherein a collaborative approach requiring agreement between SOs has been approved by the Authority OFGEM. By introducing the phrase "*where agreed with the Network Operator who is an EU Code User*", OFGEM has provided a simple solution wherein the objective of Article 15.2 can be achieved through agreement between the TSO ("NGET") and the DSO ("the Network Operator").".

The TSO has previously considered this approach but feels that such an approach is not the optimum, technical or cost effective, solution.

The TSO considers it to be prudent that the TCDS would be capable of providing its supplementary reactive power at an active power flow of less than 25% of the maximum import capability in order to avoid undesirable reactive power flows into the transmission system at the connection point, as demonstrated by the cost-benefit-analysis. Hence, the TSO is proposing to invoke the right to specify supplemental reactive power requirements under 15.2, as detailed in section 4.2.3.4.

5. Proposals

This section covers the proposals for the non-exhaustive parameter selection and non-mandatory requirement selection. The document is laid out by theme, and in some cases further broken down into subthemes for clarity. The five main themes are:

5.1 Frequency

5.2 Voltage

5.3 Demand Response Control

5.4 System Restoration

5.5 Protection & Instrumentation

Each section includes the article number and the topic being discussed. A brief description of the requirement is provided alongside a table of the items being consulted on. The tables contain:

- a description of the parameter or requirement;
- the DCC allowable range or an indication that a parameter needs to be specified by the RSO;
- the proposal for the parameter or requirement;
- the DCC Article reference;
- a list of the demand connection types that this applies to; and
- a justification code.

Justification Codes

The justification codes identify which of three categories the proposed parameters falls into. For category 1 further rationale is only provided where it is felt it is required to aid understanding. If a proposal falls into category 2 or 3, an explanation is provided.

1. "In line with existing"
   The proposed parameter is in line with the existing Grid or Distribution Code requirements.
2. "As close as possible to the existing"
   The existing Grid or Distribution Code requirements do not fit within the allowable DCC range. In this case the proposed parameter is as close to the existing Grid or Distribution Code requirements as is allowable under DCC.
3. "New or Different"
   The requirement does not exist in our Grid/Distribution Codes today and a rationale for the selection is provided. In some cases we have the requirement today but we are proposing a different value and a rationale is provided for this choice.
4. "N/A"

Please note that in some tables the TSO has also shown mandatory and/or exhaustive parameters to provide context to the non-exhaustive or non-mandatory parameter. These items are in greyed out cells and do not form part of this proposal document as the TSO does not have the right to change them.

4.1 Frequency Theme

The only non-exhaustive frequency parameter to be covered under this proposal is frequency ranges as detailed in 5.1.1 below.

4.1.1 Frequency Ranges

Article 12.1

Mandatory non-exhaustive parameter selection

Applies to:

- Transmission-connected demand facilities;
- Transmission-connected distribution facilities; and
- Distribution systems.

Requirement:

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 the table below.

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Frequency Ranges	47,5 Hz-48,5 Hz for 90 minutes	Mandatory	12.1	TCDF, TC distribution facilities, and TCDS	N/A
Frequency Ranges	48,5 Hz-49,0 Hz for a time to be specified by each TSO, but not less than 90 minutes	90 Minutes	12.1	TCDF, TC distribution facilities, and TCDS	2
Frequency Ranges	49,0 Hz-51,0 Hz for an unlimited time	Mandatory	12.1	TCDF, TC distribution facilities, and TCDS	N/A
Frequency Ranges	51,0 Hz-51,5 Hz for 90 minutes	Mandatory	12.1	TCDF, TC distribution facilities, and TCDS	N/A

Table 2: Frequency Ranges

Justification:

The DCC states that the operation time in the frequency range of 48.5 – 49.0 Hz shall be specified by the TSO but not less than 90 minutes. The current Grid Code requirement in this frequency range is 60 minutes. The proposed parameter of 90 minutes is the closest allowable to the current Grid Code requirement.

Please note the Grid Code also requires demand side units to remain connected to the network as follows:

- between 47- 47.5 Hz for 20 seconds
- and between 51.5 - 52 Hz for 60 minutes

These requirements will remain in the Grid Code in addition to the DCC requirements in the table above.

It is proposed that under Article 12.2, which states “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.”, to apply the existing Grid Code requirements within the ranges of 47.0 - 47.5 Hz and 51.5 - 52.0 Hz to all TCDF, TC distribution facilities, and TCDS.

4.2 Voltage Theme

The non-exhaustive and non-mandatory voltage / fault ride through parameters cover a number of different requirements. The following sub-themes are discussed in the next sections:

- General voltage requirements
- Short-circuit requirements
- Reactive power requirements
- Power quality

4.2.1 General Voltage Requirements

4.2.1.1 Voltage Ranges

Article 13.1 and 13.2

Mandatory exhaustive parameter selection

Applies to:

- Transmission-connected demand facilities
- Transmission-connected distribution facilities
- Transmission-connected distribution systems

Requirement:

Article 13.1: 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 in table 3.

Article 13.2: Equipment of Distribution Systems connected at the same 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 Table 3.

Parameters:

Voltage Level	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
110 kV	u_{min} = 0.9pu ≤ u u ≤ 1.118pu = u_{max} unlimited	u_{min} = 0.9pu ≤ u u ≤ 1.118pu = u_{max} unlimited	13.1 and 13.2	TCDF, TC distribution facilities, and TCDS	N/A
220 kV	u_{min} = 0.9pu ≤ u u ≤ 1.118pu = u_{max} unlimited	u_{min} = 0.9pu ≤ u u ≤ 1.118pu = u_{max} unlimited	13.1 and 13.2	TCDF, TC distribution facilities, and TCDS	N/A
400 kV	u_{min} = 0.9pu ≤ u u ≤ 1.05pu = u_{max} unlimited	u_{min} = 0.9pu ≤ u u ≤ 1.05pu = u_{max} unlimited	13.1 and 13.2	TCDF, TC distribution facilities, and TCDS	N/A

Table 3: Voltage ranges and time periods

Justification:

Included for the purpose of context. The voltage ranges for generators (RfG) and demand connections (DCC) are aligned.

4.2.1.2 Automatic Disconnection due to Voltage Level

Article 13.6

Non- mandatory non-exhaustive parameter selection

Applies to:

- Transmission-connected demand facilities
- Transmission-connected distribution facilities
- Transmission-connected distribution systems

Requirement:

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 TSO and the transmission-connected demand facility owner or the DSO.

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Minimum Voltage below which Module will automatic disconnect	Specified by the TSO	Site specific	13.6	TCDF, TC distribution facilities, and TCDS	1
Maximum Voltage above which Module will automatic disconnect	Specified by the TSO	Site specific	13.6	TCDF, TC distribution facilities, and TCDS	1

Table 4: Automatic Disconnection Due to Voltage Level

Justification:

The TSO may require TCDF, TC distribution facilities, and TCDS to install an automatic disconnection scheme due to voltage level and are as per the existing Grid Code Requirements.

4.2.2 Short-Circuit Requirements

4.2.2.1 Maximum Short-Circuit Current at the Connection Point

Article 14.1

Mandatory non-exhaustive parameter selection

Applies to:

- Transmission-connected demand facility
- Transmission-connected distribution system

Requirement:

Based on the rated short-circuit withstand capability of its transmission network elements, the 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.

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Maximum Short-Circuit Current	Not specified	25 kA on 110 kV	14.1	TCDF, TCDS	1
	Not specified	31.5 kA on 110 kV (at designated locations)	14.1	TCDF, TCDS	1
	Not specified	40 kA on 220 kV	14.1	TCDF, TCDS	1
	Not specified	50 kA on 400 kV	14.1	TCDF, TCDS	1

Table 5: Maximum Short-circuit current

Justification:

The maximum short-circuit current at the connection point is specific for each voltage level as per current Grid Code.

4.2.2.2 Threshold for TSO Report Obligation for Change in Maximum Short-Circuit Current after Unplanned Event

Article 14.3

Mandatory non-Exhaustive Parameter Selection

Applies to:

- Transmission-connected demand facility
- Transmission-connected distribution system

Requirement:

After an unplanned event, the TSO shall inform the affected transmission-connected demand facility owner or the affected transmission-connected distribution system operator as soon as possible and no later than one week after the unplanned event, of the changes above a threshold for the maximum short-circuit current that the affected transmission-connected demand facility or the affected transmission-connected distribution system shall be able to withstand from the relevant TSO's network in accordance with section 4.2.2.1.

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Threshold of the maximum short circuit current inducing an information from the TSO in case of a change above this threshold	Not specified	Specified by TCDF or TCDS	14.3	TCDF, TCDS	3

Table 6: Threshold of the maximum short circuit current inducing information from the TSO for an unplanned event

Justification:

The threshold set shall either be specified by the TCDF owner for its facility or by the TCDS operator for its network on a site specific basis.

4.2.2.3 Threshold for TSO Report Obligation for Change in Maximum Short-Circuit Current before Planned Event

Article 14.5

Mandatory non-exhaustive parameter selection

Applies to:

- Transmission-connected demand facility
- Transmission-connected distribution system

Requirement:

Before a planned event, the TSO shall inform the affected transmission-connected demand facility owner or the affected transmission-connected distribution system operator, as soon as possible and no later than one week before the planned event, of the changes above a threshold for the maximum short-circuit current that the affected transmission-connected demand facility or the affected transmission-connected distribution system shall be able to withstand from the relevant TSO's network, in accordance with section 4.2.2.1.

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Threshold of the maximum short circuit current inducing an information from the TSO in case of a change above this threshold	Not specified	Specified by TCDF or TCDS	14.5	TCDF, TCDS	3

Table 7: Threshold of the maximum short circuit current inducing information from the TSO for a planned event

Justification:

The threshold set shall either be specified by the TCDF owner for its facility or by the TCDS operator for its network on a site specific basis.

4.2.2.4 Threshold for Customer Report Obligation for Change in Maximum Short-Circuit Current Contribution after Unplanned Event

Article 14.8

Mandatory non-exhaustive parameter selection

Applies to:

- Transmission-connected demand facility
- Transmission-connected distribution system

Requirement:

After an unplanned event, the transmission-connected demand facility owner or the transmission-connected distribution system operator shall inform the relevant TSO, as soon as possible and no later than one week after the unplanned event, of the changes in short-circuit contribution above the threshold set by the relevant TSO.

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Threshold of the maximum short circuit current inducing an information from the TCDF or TCDS in case of a change above this threshold	Not specified	Increase of 0.5 kA or greater	14.8	TCDF, TCDS	3

Table 8: Threshold of the maximum short circuit current inducing information from the TCDF or TCDS after an unplanned event

Justification:

The transmission system is planned with a security margin of 10% of equipment ratings. The change of short circuit current contribution of 0.5 kA results in a relative increase of short circuit current of maximum 2% of the equipment rating, in which case a security margin of at least 8% could be maintained.

As part of the considerations in selection of the safety margin a reasonable time to instigate the necessary mitigations is included. Therefore a change of short current equivalent to a maximum of 2% of the 10% allowed is still considered sufficient for mitigations measures to be applied.

4.2.2.5 Threshold for Customer Report Obligation for Change in Maximum Short-Circuit Current Contribution before Planned Event

Article 14.9

Mandatory non-exhaustive parameter selection

Applies to:

- Transmission-connected demand facility
- Transmission-connected distribution system

Requirement:

Before a planned event, the transmission-connected demand facility owner or the transmission-connected distribution system operator shall inform the relevant TSO, as soon as possible and no later than one week before the planned event, of the changes in short-circuit contribution above the threshold set by the relevant TSO.

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
threshold of the maximum short circuit current inducing an information from the TSO in case of a change above this threshold	Not specified	Increase of 0.5 kA or greater	14.9	TCDF, TCDS	3

Table 9: Threshold of maximum short circuit current inducing information from the TSO before a planned event

Justification:

The transmission system is planned with a security margin of 10% of equipment ratings. The change of short circuit current contribution of 0.5 kA results in a relative increase of short circuit current of maximum 2% of the equipment rating, in which case a security margin of at least 8% could be maintained.

As part of the considerations in selection of the safety margin a reasonable time to instigate the necessary mitigations is included. Therefore a change of short current equivalent to a maximum of 2% of the 10% allowed is still considered sufficient for mitigations measures to be applied.

4.2.3 Reactive Power Requirements

4.2.3.1 Reactive Power Capability for Transmission-Connected Demand Facilities

Article 15.1 (a)

Mandatory non-exhaustive parameter selection

Applies to:

- Transmission-connected demand facilities

Requirement:

Transmission-connected demand facilities shall be capable of maintaining their steady-state operation at the connection point within a reactive power range specified by the TSO, according to the following condition:

a) the actual reactive power range specified by the TSO for importing and exporting reactive power shall not be wider than 48 percent of the larger of the maximum import capacity (P_{MIC}) or maximum export capacity (P_{MEC}) (0.9 power factor import or export of active power), except in situations where either technical or financial system benefits are demonstrated, for transmission-connected demand facilities, by the transmission-connected demand facility owner and accepted by the TSO.

b)

Proposal:

Parameter	Requirement in DCC	Proposal	Article Number	Type Applicability	Justification Code
Definition of the actual reactive power range for TCDF <u>without</u> onsite generation	consumption: Q_{min}/P_{max} = -0.48	consumption: Q_{min}/P_{MIC} = -0.48	15.1 (a)	TCDF	2
	production: Q_{max}/P_{max} = 0.48	production: Q_{max}/P_{MIC} = 0.0	15.1 (a)	TCDF	2
Definition of the actual reactive power range for TCDF <u>with</u> onsite generation	consumption: Q_{min}/P_{max} = -0.48	consumption: $Q_{min}/\max\{P_{MEC},P_{MIC}\}$ = -0.48	15.1 (a)	TCDF	3
	production: Q_{max}/P_{max} = 0.48	production: $Q_{max}/P_{max,MEC}$ = 0.48	15.1 (a)	TCDF	3

Table 10: Reactive power capability for transmission-connected demand facilities

Justification:

The maximum reactive power range of TCDF is determined by the maximum import capacity (P_{MIC}) or maximum export capacity (P_{MEC}).

The reactive power range of TCDF without onsite generation shall be within the range of 0 to 0.48 [Q_{max}/P_{MIC}] as per current grid code.

EirGrid considers that the current grid code requirements are adequate as:

Tariff's support a better power factor and consequently will be reflected in actual operation of the network

- A move by consumers towards DC connection of their devices is naturally improving their power factor

The maximum reactive power range of TCDF with onsite generation is determined on the reactive consumptions side by the larger of the maximum import capacity (P_{MIC}) or maximum export capacity (P_{MEC}). Whereas the reactive production is determined by onsite generation only and derives from the maximum export capacity (P_{MEC}). Consequently the reactive power range shall be within the range of -0.48 [$Q_{min}/\max\{P_{MEC},P_{MIC}\}$] to 0.48 [$Q_{max}/P_{MEC}$].

4.2.3.2 Reactive Power Capability for Transmission-Connected Distribution Systems

Article 15.1 (b)

Mandatory non-exhaustive parameter selection

Applies to:

- Transmission-connected distribution systems

Requirement:

Transmission-connected distribution systems shall be capable of maintaining their steady-state operation at their connection point within a reactive power range specified by the TSO, according to the following condition:

c) the actual reactive power range specified by the TSO for importing and exporting reactive power shall not be wider than

(i) 48 percent of the larger of the maximum import capability (P_{MIC}) or maximum export capability (P_{MEC}) during reactive power import (consumption); and

(ii) 48 percent of the larger of the maximum import capability (P_{MIC}) or maximum export capability (P_{MEC}) during reactive power export (production);

except in situation where either technical or financial systems benefits are proven by the TSO and the transmission-connected distribution system operator through joint analysis.

Proposal:

Parameter	Requirement in DCC	Proposal	Article Number	Type Applicability	Justification Code
Definition of the actual reactive power range for TCDS during <u>reactive power import</u>	consumption: Q_{min}/P_{max} = -0.48	consumption: $Q_{min}/\max\{P_{MEC},P_{MIC}\}$ = -0.48	15.1 (b)	TCDS	3
Definition of the actual reactive power range for TCDS during <u>reactive power export</u>	production: Q_{max}/P_{max} = 0.48	production: Q_{max}/P_{MEC} = 0.48	15.1 (b)	TCDS	3

Table 11: Reactive Power Capability

Justification:

The maximum reactive power requirements for TCDS are determined by the maximum import capacity (P_{MIC}) or maximum export capacity (P_{MEC}).

The maximum reactive consumption during reactive power import is determined by the larger of the maximum import capability (P_{MIC}) or maximum export capability (P_{MEC}).

The maximum reactive production during reactive power export is determined by the maximum export capability (P_{MEC}).

EirGrid also considers that the requirements are adequate as:

- Tariffs imposed by DSO support a better power factor and consequently will be reflected in actual operation of the network
- A move by consumers towards DC connection of their devices is naturally improving their power factor

4.2.3.3 Alternative Metrics to Set Out the Equivalent Reactive Range

Article 15.1 (d)

Non-mandatory being made mandatory

Applies to:

- Transmission-connected demand facilities
- Transmission-connected distribution facilities
- Transmission-connected distribution systems

Requirement:

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

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Metrics to Express Reactive Power Capability	Not specified	In addition to the power factor, all limits are also expressed as the ratio of Q/P_{max}. (with P_{max} as either maximum import capacity or maximum export capacity)	15.1 (d)	TSO	3

Table 12: Metrics to express reactive power capability

Justification:

As per current Grid Code, the metric of power factor will be maintained. In addition to align with the Requirements for Grid Connection of Generators ((EU) 2016/631), the limits are also expressed as the ratio of reactive power to maximum export/import capacity.

4.2.3.4 Reactive Power Requirements below 25% of Maximum Import Capability

Article 15.2

Non-mandatory being made mandatory

Applies to:

- Transmission-connected distribution systems

Requirement:

The TSO may require that transmission-connected distribution systems have the capability at the connection point to not export reactive power (at reference 1 pu voltage) at an active power flow of less than 25% of the maximum import capability (P_{MIC}).

Where applicable, Member States may require the TSO to justify its request through a joint analysis with the transmission-connected distribution system operator. If this requirement is not justified based on the joint analysis, the TSO and the transmission-connected distribution system operator shall agree on necessary requirements according to the outcomes of a joint analysis.

TSO Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
No reactive power export when at an active power flow of below 25% of maximum import capability	TSO have the right to specify	TSO have the right to specify	15.2	TCDS	3

Table 13: Reactive power requirements when at active power flow of below 25% of MIC

Justification: In situation of low demand, TCDS with a high share of cables act capacitive (leading power factor) and could spill/export reactive power on to the transmission system. Currently this is encountered in area like Dublin by the application of operational constraints rules[6]. According to the rules, there is a minimum amount of generators on-load at all-times in order to provide voltage control in Dublin.

For the future it is not guaranteed that generators will be available at all-times to compensate the reactive power export. Hence, the TSO considers to be prudent that the TCDS shall be capable of providing its supplementary reactive power at an active power flow of less than 25% of the maximum import capability in order to avoid spills of reactive power on to the transmission system at the connection point.

[6] http://www.eirgridgroup.com/site-files/library/EirGrid/Operational-Constraints-Update-January-2018.pdf

The capability shall be shown by TCDS by simulation.

Please note that the above justification was included as part of the DCC public consultation paper. Further background information supporting this justification is available in section entitled “Background and further information”.

Additonal information in relation to the TSO proposal:

In 2012, ENSTO-E published a document entitled “Call for Stakeholder Input”, which set out reasons for the application of Article 15 and provided case studies of the rationale for its application. These case studies included Cost Benefit Analysis (CBA) of the application of the requirement in Ireland, which identified the application of the requirements as being best practice and the optimum approach.

As part of the public consultation on the “Call for Stakeholder Input” paper, the DSO association Eurelectric, of which DSO is a member, provided a submission which stated that the provision of MVArs as close to the area of its use is normally the most efficient approach. This is in line with the EirGrid’s current position on the application of this requirement.

It is important to note that two Cost Benefits Analysis studies were included as part of the Call for Stakeholder Input” document:

- The first of these Cost benefit analysis compared centralised reactors connected to the HV side (transmission side) of a transmission connected distribution system to the same centralised reactors connected to the LV (distribution side) of a transmission connection distribution system. This analysis showed that assuming that the reactor is rated the same (i.e. the same MVAr) for the both the Transmission and Distribution connection, the transmission connected reactor will always have a higher cost and be less efficient.

The reason of this is the higher costs of a transmission-connected compensation are due to the higher insulation for higher voltage levels of both the reactor or the associated circuit breaker bay.

It should also be noted that is a conservative assessment and does not reflect the fact that the level of distribution-connected (LV) compensation can also be smaller due to :

1. the difficulty with transmitting Mvars through a network, and/or
2. the smaller voltage step change accepted on the TSO network (which often requires smaller reactor banks and consequently more bays to connect the transmission-connected compensation).

- The second Cost Benefit Analysis examined the deployment of dispersed and centralised deployment of reactive compensation on the distribution system. It determined that a dispersed spread of reactive compensation on the distribution system should be chosen, if it is the lower cost option.

These CBAs are further supported by the Transmission Standard Design Costs as provided by TAO, which show the cost of a 110 kV reactor shunt bay as between €0.96m and €1.0m (depending on the type of station) while the equivalent 38 kV bay in

a 110 kV station would cost approximately €0.2 k. This is a cost difference of up to 80%. Furthermore, it is likely that at lower voltages (20 kV or 10kV), the equipment costs would be lower again.

Similarly, the cost of reactors at 110 kV (excluding the connecting 110 kV bay equipment) is approximately €0.94m, whereas a 38kV / MV transformer (including the connecting 38 kV bay equipment) costs appropriately €0.58m. Again, this highlights that a HV solution would cost significantly more.

In addition, one of the most likely location for this deployment of this requirement will be within the Dublin area, where the 110 kV network forms part of the distribution system. Hence, the cost difference between a 220 kV (TSO) solution versus a 110 kV (DSO) solution must be considered. Again, the difference between cost for the 110 kV and 220 kV favours the lower voltage solution, in this case the 110 kV solution.

Implementation of the Article 15.2 requirement:

The TSO expects that this requirement would be identified and applied during the connection application or modification process.

Currently under the Planning Code (PC) and Planning Code Appendix (PCA) section of the Grid Code, the DSO is required to apply to the TSO for the connection and provide the relevant information necessary to perform an assessment of the impact of their connection. In addition, the need for enhanced models of connecting party's equipment was introduced to the Grid Code (MPID 239) and can also be used to meet the requirements set out in Article 21 of the DCC.

It is envisaged by the TSO that the DSO could provide a model of the network which can be used to assess the MVAr flow onto the transmission system from the distribution system for 25 % loading of the MIC. In advance of submission to the TSO, this model could also be used by the DSO to examine the flow of MVAr into the transmission system and would enable the DSO to propose solutions to any MVAr flows. These proposals could then be included in the aggregated model and confirmed by the TSO as part of the application process.

Through the early identification of possible solutions to any MVAr flow issues, the DSO will be enable to identify the optimum technical and most cost effective connection method for the proposed connection.

It is hoped that the identification of the most cost effective connection method, that this would offset any additional modelling or study costs.

Finally, in the unlikely event that the application of the requirement is not appropriate for a project, a derogation can be sought under Article 52. However, the TSO would consider such a derogation to an exception, rather the norm.

4.2.3.5 Active Control of the Exchange of Reactive Power at the Connection Point of a Transmission-Connected Distribution System

Article 15.3

Non-mandatory being made mandatory

Applies to:

- Transmission-connected distribution systems

Requirement:

Article 15.3:

Without prejudice article 15.1 (b) (section 4.2.3.2), the 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 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.

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
active control of the exchange of reactive power at the connection point	TSO have the right to specify	Right to specify	15.3	TCDS	3

Table 14: Active Control of the exchange of reactive power at the connection point

Justification:

The TSO proposal is to retain the right to specify the requirements for the TCDS to actively control the exchange of reactive power at the connection point, taking into consideration that the specific requirements will be coordinated with the TCDS.

4.2.4 Power Quality

4.2.4.1 Power Quality

Article 20

Mandatory non-exhaustive parameter selection

Applies to:

- Transmission-connected demand facilities
- Transmission-connected distribution systems

Requirement:

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.

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Level of voltage distortion or fluctuation of the supply voltage at the connection point	Not specified	IEC/TR3 61000-3-6 (Harmonics) and IEC/TR3 61000-3-7 (Voltage fluctuation)	20	TCDF, TCDSO	1

Table 15: Level of voltage distortion or fluctuation of supply voltage

Justification:

Users shall ensure that their connection to the transmission system does not result in the level of distortion or fluctuation of the supply voltage on the transmission system, at the connection point, exceeding that allocated to them following consultation with the TSO. Distortion and fluctuation limits are outlined in IEC/TR3 61000-3-6 (Harmonics) and IEC/TR3 61000-3-7 (Voltage fluctuation). Users shall also operate their Plant in a manner which will not cause the requirements contained in CENELEC Standard EN 50160 to be breached.

4.3 Demand Response Control

The non-exhaustive and non-mandatory demand response control parameters cover a number of different requirements. The following sub-themes are discussed in the next sections:

- Demand Response Active Power Control, Reactive Power Control and Transmission Constraint Management,
- Frequency Control, and
- Demand Response very fast active power control.

4.3.1 Provisions for Demand Units with Demand Response Active Power Control, Reactive Power Control and Transmission Constraint Management

4.3.1.1 Demand response active power, reactive power control and transmission constraint management

Article 28.2 (a)

Non-exhaustive parameter selection

Applies to:

- Demand Units (DU) offering active power control, reactive power control and transmission constraint management

Requirement:

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

(a) be capable of operating across the frequency ranges specified in Article 12.1 and the extended range specified in Article 12.2; 18.8.2016 L 223/30 Official Journal of the European Union EN

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Be capable of operating across frequency ranges and extended frequency ranges	Articles12.1 and 12.2 (Annex 1)	See 4.1.1 Frequency ranges Articles12.1 and 12.2	28.2 (a)	DU offering DR (demand response)	N/A

Table 16: Capability to operate across frequency ranges and extended frequency ranges

Justification:

It is proposed to align the frequency requirements with those specified in Article 12.1 which are applicable to the following:

- Transmission-connected demand facilities;
- Transmission-connected distribution facilities;
- Distribution systems; and
- Demand units who provide demand response active power, reactive power control and transmission constraint management.

4.3.1.2 Demand response active power, reactive power control and transmission constraint management

Article 28.2(b)

Non-exhaustive parameter selection

Applies to:

- Demand Units (DU) offering active power control, reactive power control and transmission constraint management

Requirement:

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

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

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Be capable of operating across voltage ranges	Articles 13	See 4.2.1 Voltage ranges Article 13	28.2 (b)	DU offering DR	N/A

Table 17: Capability to operate across voltage ranges

Justification:

It is proposed to align the voltage requirements with those specified in Article 13 which are applicable to the following:

- Transmission-connected demand facilities;
- Transmission-connected distribution facilities;
- Distribution systems; and
- Demand units who provide demand response active power, reactive power control and transmission constraint management.

4.3.1.3 Demand response active power, reactive power control and transmission constraint management

Article 28.2(e) and (l)

Non-exhaustive parameter selection

Applies to:

- Demand units (DU) offering active power control, reactive power control and transmission constraint management

Requirement:

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

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

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

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Technical specification for the exchange of information	Not specified	TSO will make public all technical specifications to enable the transfer of information available for transmission -connected demand units	28.2(e) and (l)	DUs	3

Table 18: Demand response active power control, demand response reactive power control, or demand response transmission constraint management

Justification:

The detailed requirements for the specification of information exchange for Demand Units (DU) offering active power control, reactive power control and transmission constraint management will be determined as part of the implementation phase of the Demand Connection Code. Once determined, the specification will be made publically available on the EirGrid.

4.3.1.4 Demand response active power, reactive power control and transmission constraint management

Article 28.2(f) and (j)

Non-exhaustive parameter selection

Applies to:

- Demand Units (DU) offering active power control, reactive power control and transmission constraint management

Requirement:

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

(f) be capable of adjusting its power consumption within a time period specified by the relevant system operator or the relevant TSO. For demand units connected at a voltage level below 110 kV, these specifications shall, prior to approval in accordance with Article 6, be subject to consultation with the relevant stakeholders in accordance with Article 9(1);

(j) where the relevant system operator or the relevant TSO, directly or indirectly through a third party, command the modification of the power consumption, enable the modification of a part of its demand in response to an instruction by the relevant system operator or the relevant TSO, within the limits agreed with the demand facility owner or the CDSO and according to the demand unit settings;

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Definition of the period to adjust power consumption within agreed limits.	Not specified	Be capable of adjusting power consumption within a time period specified and within the limits agreed with the DFO or CDSO. To be agreed on a site specific basis.	28.2(f) and (j)	DUs	3

Table 19: The period to adjust power consumption within agreed limits.

Justification:

The adjustment of power consumption by the demand units is dependent on a number of factors, including but not limited to:

- the type of processes carried out by the demand unit;
- the site configuration.

As such, the time taken to adjust the power consumption will vary between demand unit to demand unit, as such the period to adjust power consumption within agreed limits will need to be agreed on a case-by-case basis.

4.3.1.5 Demand response active power, reactive power control and transmission constraint management

Article 28.2(i)

Non-exhaustive parameter selection

Applies to:

- Demand Units (DU) offering active power control, reactive power control and transmission constraint management

Requirement:

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

(i) notify the relevant system operator or relevant TSO of the modification of demand response capacity. The relevant system operator or relevant TSO shall specify the modalities of the notification;

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Definition of the modalities of notification in case of a modification of the DR capability	Not specified	TSO shall specify the modalities of the notification of modifications of demand response capacity	28.2(i)	DUs	3

Table 20: Modalities of notification in case of a modification of the DR capability

Justification:

The definition of the modalities of notification in case of a modification of DR capability for Demand Units (DU) offering active power control, reactive power control and transmission constraint management will be determined as part of the implementation phase of the Demand Connection Code. Once determined, the definition of the modalities of notification in case of a modification of the DR capability will be made publically available.

4.3.1.6 Demand response active power, reactive power control and transmission constraint management

Article 28.2 (k)

Non-exhaustive parameter selection

Applies to:

- Demand Units (DU) offering active power control, reactive power control and transmission constraint management

Requirement:

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

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

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Definition of maximum RoCoF	Not specified	2 Hz over 1 sec or 1 Hz over a 500 ms window	28.2(k)	DUs	1

Table 21: Definition of maximum RoCoF

Justification:

The proposal is to apply the “agreed in principle” Grid Code standard for RoCoF of 1 Hz/s over a 500 ms window. Please note that the “agreed in principle” Grid Code standard for RoCoF of 1 Hz/s over a 500 ms window has also been proposed as part of our parameter consultation on the RfG Network Code and is an exhaustive parameter in the HVDC Network Code.

4.3.2 Specific Provisions for Demand Units with Frequency Control

4.3.2.1 Frequency Control

Article 29.2 (a)

Non-exhaustive parameter selection

Applies to:

- Demand Units (DU) offering Demand Response (DR) System Frequency Control

Requirement:

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

(a) be capable of operating across the frequency ranges specified in Article 12(1) and the extended range specified in Article 12(2);

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Be capable of operating across frequency ranges and extended frequency ranges	Articles 12.1 and 12.2 (Annex 1)	See 4.1.1 Frequency ranges Articles12.1 and 12.2	29.2 (a)	DU offering DR	N/A

Table 22: Capability to operate across frequency ranges and extended frequency ranges

Justification:

It is proposed to align the frequency requirements with those specified in Article 12.1 which are applicable to the following:

- Transmission-connected demand facilities;
- Transmission-connected distribution facilities;
- Distribution systems; and
- Demand units who provide Demand Response (DR) System Frequency Control.

4.3.2.2 Frequency Control

Article 29.2 (b)

Non-exhaustive parameter selection

Applies to:

- Demand Units (DU) offering Demand Response (DR) System Frequency Control

Requirement:

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

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

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Be capable of operating across voltage ranges	Articles13	See 4.2.1 Voltage ranges Article 13	29.2 (b)	DU offering DR	N/A

Table 23: Capability to operate across voltage ranges

Justification:

It is proposed to align the voltage requirements with those specified in Article 13 which are applicable to the following:

- Transmission-connected demand facilities;
- Transmission-connected distribution facilities;
- Distribution systems; and
- Demand units who provide Demand Response (DR) System Frequency Control.

4.3.2.3 Frequency Control

Article 29.2 (d)

Non-exhaustive parameter selection

Applies to:

- Demand Units (DU) offering Demand Response (DR) System Frequency Control

Requirement:

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

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

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Define the insensitive dead band around the nominal system frequency	Not Specified	49.5Hz – 50.2Hz	29.2 (d)	DU offering DR	3

Table 24: Insensitivity dead band around the nominal system frequency

Justification:

The demand response system frequency control should only be activated during a frequency event. The definition of a frequency event, under the current version of the Grid Code, states “An event where the Transmission System Frequency deviates to a value below 49.5 Hz”. Unfortunately, this definition does not define an over-frequency event. However, in section CC.8.2.1 of the Grid Code defines the upper-frequency boundary for normal operating range as 50.2 Hz.

Based on these existing Grid Code requirements, it is proposed to set the insensitive dead band around of the nominal system frequency as 49.5 Hz to 50.2 Hz. This will ensure that the demand response Frequency Control will only be activated in the case of a frequency disturbance, for either an under- or over-frequency event.

4.3.2.4 Frequency Control

Article 29.2 (e)

Non-exhaustive parameter selection

Applies to:

- Demand Units (DU) offering Demand Response (DR) System Frequency Control

Requirement:

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

(e) be capable of, upon return to frequency within the dead band specified in paragraph 2(d), initiating a random time delay of up to 5 minutes before resuming normal operation. The maximum frequency deviation from nominal value of 50,00 Hz to respond to shall be specified by the TSO in coordination with the TSOs in the synchronous area. For demand units connected at a voltage level below 110 kV, these specifications shall, prior to approval in accordance with Article 6, be subject to consultation with the relevant stakeholders in accordance with Article 9(1). The demand shall be increased or decreased for a system frequency above or below the dead band of nominal (50,00 Hz) respectively;

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Define the maximum frequency deviation from which to respond	Not Specified	Under Frequency maximum frequency deviation – 48.9Hz Over Frequency maximum frequency deviation – 51.1Hz	29.2(e)	DU offering DR	3

Table 25: The maximum frequency deviation from which to respond

Justification:

The full provision of Demand Response (DR) System Frequency Control should be exhausted in advance of:

- any involuntary load shedding in the case of an under-frequency event, or
- any generation shedding in the case of an over-frequency event.

In the case of an under-frequency event, involuntary load shedding commences when the system frequency drops to 48.9 Hz. Hence, it is proposed to set the under-frequency maximum deviation to 48.9 Hz.

Similarly, in the case of an over-frequency event, the shedding of generation commences when the system frequency reaches 51.1 Hz. Hence, it is proposed to set the over-frequency maximum deviation to 51.1 Hz.

4.3.2.5 Frequency Control

Article 29.2 (g)

Non-exhaustive parameter selection

Applies to:

- Demand Units (DU) offering Demand Response (DR) System Frequency Control

Requirement:

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

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

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Specify rapid detection and response requirements	Not Specified	Rapid detection and response constitutes an initial time delay of active power response of 0 seconds There should be no delays other than those inherent in the design of the DRSFC system	29.2 (g)	DU offering DR	3

Table 26: Rapid detection and response requirements

Justification:

It is essential that in the event of a frequency event, either under- or over-frequency, Demand Response (DR) System Frequency Control is provided as quickly as possible in order to restore the system frequency. To that end, the initial time delay of active power response should be 0 seconds, other than those delays that are inherent in the design of the DRSFC system itself.

4.3.3 Specific Provisions for Demand Units with Demand Response Very Fast Active Power Control

4.3.3.1 Demand units with demand response very fast active power control

Article 30.2

Non-exhaustive parameter

Applies to:

- Demand facility owners or CDSO on contract to deliver demand response very fast active power control.

Requirement:

If the agreement referred to in paragraph 1 takes place, the contract referred to in paragraph 1 shall specify:

(a) a change of active power related to a measure such as the rate-of-change-of-frequency for that portion of its demand;
(b) the operating principle of this control system and the associated performance parameters;
(c) the response time for very fast active power control, which shall not be longer than 2 seconds.
(d) the response time for very fast active power control, which shall not be greater than 2 seconds.

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Provision of Demand response very fast active power control	N/A	To be agreed on an individual contract basis	30.1	DFO, CDSO	1
Change of active power	Not specified	To be agreed on an individual contract basis	30.2(a)	DFO, CDSO	1
Operating principle of control	Not specified	To be agreed on an individual contract basis	30.2(b)	DFO, CDSO	1
Respond time	Less than 2 sec	2 seconds or less	30.2(c)	DFO, CDSO	1

Table 27: Demand response very fast active power control

Justification:

Under DS3, a transmission-connection demand facility owner or a closed distribution system owner can contract to provide very fast active power response as a system service.

The details of the very fast active power response, including the change of active power and operating principle of control, are agreed between the TSO and the demand facility owner or a closed distribution system owner and documented in the subsequent system services contract.

The proposal is to continue to this individual contractual based specification going forward, as it allows the maximum flexibility for the contracting of Demand Response Very Fast Active Power Control.

4.4 System Restoration Theme

The non-exhaustive and non-mandatory System Restoration parameters are detailed below.

It is important to note that there is a separate Emergency Restoration Code, which contains further requirements in relation to the System Restoration and System Defence requirements.

4.4.1 Low Frequency Demand Disconnection Scheme

Article 19.1(a):

Non-mandatory non-exhaustive parameter selection

Applies to:

- Transmission-connected demand facilities
- Transmission-connected distribution systems

Requirement:

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 TSO may specify a disconnection trigger based on a combination of low frequency and rate-of-change-of-frequency;

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Definition of the capabilities of the low frequency demand disconnection scheme	Not specified	49.5 – 47.0 Hz	19.1(a)	TCDF, TCDS	2
Specification of the proportion of demand	Not specified	For TCDF, up to 100 % of the demand For TCDS, the proportion of demand agreed between the TSO and DSO.	19.1(a)	TCDF, TCDS	2
Use of combination of frequency and RoCoF thresholds for low frequency demand disconnection	Not specified	Not invoking at this time.	19.1(a)	TCDF, TCDS	N/A

Table 28: Low frequency demand disconnection scheme

Justification:

Article 19.1(a) - Definition of the capabilities of the low frequency demand disconnection scheme

The frequency control capabilities for demand units, as specified under Article 29.2, must be exhausted prior to the activation of the low frequency demand disconnection scheme. Under 29.2 the frequency control capabilities will be exhausted when the frequency drops to 48.9 Hz.

As such, the activation of the low frequency demand disconnection scheme for transmission-connected demand facility and transmission-connected distribution systems will be activated for frequency of 48.9 Hz or lower. The frequency at which a given transmission-connected demand facility and transmission-connected distribution system will be disconnected under the low frequency demand disconnection scheme will be agreed between the TSO and transmission-connected demand facility owner or transmission-connected distribution system owner.
Please note that the proposed parameter 49.5 – 47.0 Hz is a wider capability range than low frequency demand disconnection scheme settings currently in use.

Article 19.1(a) - Specification of the proportion of demand

The proportion of demand to be disconnected is highly dependent on a number of factors, including but not limited to:

- The site configuration;
- Critical loads, for example high priority customers or demand units on the transmission-connected distribution systems, e.g. major infrastructure.

Such factors will need to be taken into consideration when determining the proportion of demand to be disconnected.

Prior to the implementation of the low frequency demand disconnection scheme, the proportion of demand to be disconnected will be agreed between the TSO and transmission-connected demand facility owner and transmission-connected distribution system owner, taking all the relevant factors into consideration.

Please note that where necessary a multi stage low frequency demand disconnection scheme may be required. As above, the details of any multi stage low frequency demand disconnection scheme will need to be agreed between the TSO and the relevant transmission-connected demand facility owner and transmission-connected distribution system owner, prior to its implementation.

Article 19.1(a) - Use of combination of frequency and RoCoF thresholds for low frequency demand disconnection

The proposal is to not invoke the right to specify the use of the combination of frequency and RoCoF thresholds for low frequency demand disconnection at this time.

4.4.2 Low Voltage Demand Disconnection Scheme

Article 19.2

Non-mandatory non-exhaustive parameter selection being made mandatory

Applies to:

- Transmission-connected demand facilities
- Transmission-connected distribution systems

Requirement:

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

a. The 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 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 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.

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Definition of the capabilities of the low voltage demand disconnection scheme	Not Specified	Site Specific	19.2(a)	TCDS TC distribution facilities	1
Definition of the capabilities of the low voltage demand disconnection scheme	Not Specified	Site Specific	19.2(b)	TCDF TC demand facilities	1
On-load tapping changing blocking and Low Voltage demand disconnection (LVDD)	Right to specify or not specify	Right to specify	19.2(c) and (d)	TCDS	3

Table 29: Low voltage demand disconnection scheme

Justification:

Article 19.2(a) - Definition of the capabilities of the low voltage demand disconnection scheme

The low voltage demand disconnection scheme is currently used as a mechanism for disconnection of the transformers in the event that the transmission assets have become islanded. This also includes the trip in the event of low voltage at the connection point.

The TSO will maintain the right to specify the low voltage demand disconnection functional capabilities on a case by case basis in order to ensure a system voltage within the normal operating voltage range.

Article 19.2(b) - Definition of the capabilities of the low voltage demand disconnection scheme

The low voltage demand disconnection scheme is currently used as a mechanism for disconnection of the transformers in the event that the transmission assets have become islanded. This also includes the trip in the event of low voltage at the connection point.

The TSO will maintain the right to specify the low voltage demand disconnection functional capabilities on a case by case basis in order to ensure a system voltage within the normal operating voltage range.

Article 19.2 (c) and (d) - On-load tapping changing blocking and low voltage demand disconnection (LVDD)

The proposal is to invoke the right to specify the requirement for on-load tapping changing blocking (in conditions where low voltage demand disconnection schemes apply, but to advise on a case-by-case basis as per the System Defence Plan, as necessary, taking into consideration the specific requirements will be dependent on plant design and compatibility requirements.

If required, all necessary details would be made available in due time for plant design, which is intended to mean during the connection offer phase.

Please note that the on-load tapping blocking is not currently in use on the transmission system in Ireland but may be required in the future if identified by the relevant system security studies.

4.4.3 Definition of automatic on load tap changer blocking scheme

Article 19.3

Non-mandatory non-exhaustive parameter selection being made mandatory

Applies to:

- Transmission-connected demand facilities
- Transmission-connected distribution systems

Requirement:

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 TSO shall specify the automatic on load tap changer blocking functional capability.

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Definition of the automatic on load tap changer blocking scheme	Right to specify or not specify	Right to specify	19.3(b)	TC Distribution Facility	3

Table 30: Automatic on load tap changer blocking scheme

Justification:

Article 19.3 (b) - Definition of the automatic on load tap changer blocking scheme

The TSO proposal is to invoke the right to specify the requirement for on-load tap changing blocking and low voltage demand disconnection, but to advise on a case-by-case basis, as necessary, following consultation with the relevant stakeholders, and taking into consideration that the specific requirements will be dependent on plant design and compatibility requirements.

If required, all necessary details will be made available in due time for plant design, which is intended to mean during the connection offer phase.

Please note that the on-load tapping blocking is not currently in use on the transmission system in Northern Ireland but may be required in the future if identified by the relevant system security studies.

4.4.4 Conditions for reconnection post disconnection

Article 19.4

Mandatory non-exhaustive parameter selection (19.4 (a) and (b))

Non-mandatory non-exhaustive parameter selection (19.4 (c)) being made mandatory

Applies to:

- Transmission-connected demand facilities
- Transmission-connected distribution systems

Requirement:

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 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; 18.8.2016 L 223/25 Official Journal of the European Union EN
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 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. a transmission-connected demand facility or a transmission-connected distribution facility shall be capable of being remotely disconnected from the transmission system when required by the relevant TSO. If required, the automated disconnection equipment for reconfiguration of the system in preparation for block loading shall be specified by the relevant TSO. The TSO shall specify the time required for remote disconnection.

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Definition of the conditions for reconnection post disconnection	Not specified	To be specified as part of the System defence and/or System Restoration Plans	19.4(a)	TCDF, TCDS	3
Settings of the synchronisation devices(including frequency, voltage, phase angle range and deviation of voltage and frequency)	Not specified	Site specific	19.4(b)	TCDF, TCDS	1
Specification of the time required for remote disconnection	Not specified	0 Secs No time delays other inherent in the design of the relevant systems.	19.4(c)	TCDF, TCDS	3
Automated disconnection equipment for reconfiguration in preparation for block loading	Not specific	Site specific	19.4(c)	TCDF, TCDS	3

Table 31: Reconnection post disconnection

Justification:

Article 19.4 (a) - Definition of the conditions for reconnection post disconnection

The proposal is to include the necessary details regarding the reconnection of the users, both generation and demand, as part of the system defines and system restoration plans.

These plans are currently being drafted and will consist of the details of:

- All steps to be taken to prevent a partial or full system blackout,
- All steps to be taken to restore the system post a partial or full system blackout, including the conditions for the reconnection of both demand and generation users.

These plans are regularly tested and updated to reflect any changes to the transmission system or operational requirements.

Further details in relation to the system defines and system restoration plans will be available as part of the forthcoming Emergency Restoration Network Code Consultation.

Article 19.4 (b) - Settings of the synchronisation devices (including frequency, voltage, phase angle range and deviation of voltage and frequency)

The proposal is to specify the settings of the synchronisation devices on a site – specific or case-by-case basis, as this will allow for the following:

- consideration can be given to specific capabilities of the demand facility,
- consideration can be given to specific capabilities of the transmission and/or distribution Systems, and
- the controlled reconnection of demand on a system wide basis

The exact settings for the synchronisation devices for a transmission-connected demand facilities or transmission-connected distribution systems will be agreed as part of the overall agreement of protection and control settings.

Article 19.4 (c) - Specification of the time required for remote disconnection

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 and transmission-connected distribution system should disconnect from the transmission system without delay, other than any delay which is inherent in the disconnection system or process.

Note: The requirements specified in 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. However, these requirements may be required on a case-by-case basis in the future, if identified by the necessary system security studies, etc.

Article 19.4 (c) - Automated disconnection equipment for reconfiguration in preparation for block loading

The proposal is to specify the automated disconnection equipment for reconfiguration in preparation for block loading on a site – specific or case-by-case basis, as this will allow for the following to be taken into consideration:

- the capability with existing equipment,
- the specific capabilities of the demand facility, and
- the controlled reconnection of demand on a system wide basis.

4.5 Instrumentation, Simulation and Control Theme

The non-exhaustive and non-mandatory protection and instrumentation parameters cover a number of different requirements. The following sub-themes are discussed in the next sections:

- Electrical and control schemes and settings
- Information exchange
- Simulation models

4.5.1 Electrical protection Schemes and settings

Article 16.1

Mandatory non-exhaustive parameter selection

Applies to:

- Transmission-connected demand facility
- Transmission-connected distribution system

Requirement:

The 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 transmission-connected distribution system. The TSO sand 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.

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Electrical protection schemes and settings	Not Specified	Site specific	16.1	TCDF, TCDS	1

Table 32: Electrical protection schemes and settings

Justification:

The proposal is to specify the electrical protection schemes and settings for transmission-connected demand facilities and transmission-connected distribution systems on a case-by-case basis, as per existing practices.

This allows for the following to be taken into consideration when specifying these requirements:

- variation in the configuration of transmission-connected demand facilities and transmission-connected distribution systems;
- variations in the configuration of the transmission station that the demand facility or distribution system is connecting to;
- compatibility with existing equipment; and
- operational issues, such as local constraint management.

4.5.2 Specification and agreement of control schemes and settings

Article 17.1

Mandatory non-exhaustive parameter selection

Applies to:

- Transmission-connected demand facility owner
- Transmission-connected distribution system operator

Requirement:

The 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.

Proposal:

Requirement	Requirement in DCC	Proposal	Article Number	Type Applicability	Justification Code
Specification and agreement of control schemes and settings	Not specified	Site specific	17.1	TCDF, TCDS	1

Table 33: Control schemes and settings

Justification:

The proposal is to specify the control schemes and settings for transmission-connected demand facilities and transmission-connected distribution systems on a case-by-case basis, as per existing practices.

This allows for the following to be taken into consideration when specifying these requirements:

- variation in the configuration of transmission-connected demand facilities and transmission-connected distribution systems;
- variations in the configuration of the transmission station that the demand facility or distribution system is connecting to;
- compatibility with existing equipment; and
- operational issues, such as local constraint management.

4.5.3 Information Exchange

Article 18.3

Non-mandatory non-exhaustive parameter selection

Applies to:

- TSO

Requirement:

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

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Specification of information exchange standards	Not specified	The publication of the necessary standards to EirGrid Website	18.3	TSO	3

Table 34: Information exchange standards

Justification:

Under articles 18.1 and 18.2, transmission-connected demand facilities and transmission-connected distribution systems are required to be equipped according to the standards specified by the TSO in order to exchange information with the TSO, whilst under article 18.3, the TSO must make the standard for information exchange publicly available.

The proposal is to develop the necessary information exchange standard during the implementation phase of the network codes (both connection and operation codes) and to subsequently publish it to the EirGrid Website.

4.5.4 Content and format of simulation models

Article 21.3

Mandatory non-exhaustive parameter selection

Applies to:

- Transmission-connected demand facilities
- Transmission-connected distribution systems

Requirement:

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

(a) Steady and dynamic states, including 50 Hz component;
(b) Electromagnetic transient simulations at the connection point;
(c) Structure and block diagrams.

Proposal:

Requirement	Requirement in DCC	Proposal	Article Number	Type Applicability	Justification Code
Content and format of simulation models	To include: - Steady and dynamic states, including 50 Hz component; -Electromagnetic transient simulations at the connection point; -Structure and block diagrams.	The provided simulation models must include the following a. Steady and dynamic states, including 50 Hz component, suitable for load flow, fault level analysis (balanced and unbalanced faults) and RMS dynamic simulations; b. Electromagnetic transient simulations at the connection point; c. Structure and block diagrams. d. Harmonics, including harmonic impedance and harmonic emissions	21.3	TCDF, TCDS	1

Table 35: Simulation Models

*Please note that the existing simulation model requirements as detailed in Grid Code section PC.A8 also harmonic model requirements, as detailed in the approved Grid Code modification MPID 239, will also apply.

Justification:

The proposal under the DCC is in line with the current requirements under the Grid Code with the exception of (d) Harmonics including harmonic impedance and harmonic emissions. However, these harmonic requirements were included in the recent the approved Grid Code Modification MPID 239 and the intention is to retain these requirements for future transmission-connected demand facilities and transmission-connected distribution systems.

4.5.5 Recording requirements for comparison with the simulation models

Article 21.5

Mandatory non-exhaustive parameter selection

Applies to:

- Transmission-connected demand facilities
- Transmission-connected distribution facilities

Requirement:

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

Proposal:

Parameter	Parameter in DCC	Proposal	Article Number	Type Applicability	Justification Code
Recording requirements	Not specified	Application - specific	21.5	TCDFs, TCDSs	1

Table 36: Recording Requirements

Justification:

EirGrid currently installs power quality and event recorders at various points around the transmission system for the purpose of monitor and recording a number of conditions, including but not limited to the following:

- system oscillations,
- harmonic distortion levels,
- system disturbances, and
- the compliance and performance of various users, including both demand and generation users.

These power quality and event recorders can also be also be used for the comparison and verification of models.

However, the data recorded by the power quality recorders can vary quite widely, from the data being recorded to the resolution of the recording itself, depending on its intended use.

As a result, the exact specification of the power quality and event recorders will be dependent on the intended application.

6. Conclusion

This concludes EirGrid's submission to the Commission for the Regulation of Utilities of the TSO's proposals for the general application of technical requirements in accordance with Articles 12 – 21 and Articles 27 – 30 of the Commission Regulation (EU) 2016/1388 establishing a Network Code on Demand Connection.

EirGrid, in its role as the TSO, or where applicable as the RSO, would now like to request the approval of the CRU for each of the requirements proposed in this document.

7. Appendix

The following appendix holds the submissions from industry in relation to the Consultation on the proposals within this document.

Response to Consultation on DCC Parameter Selection

from

Bord na Móna

10th August 2018

Bord na Móna
Naturally Driven

Overview & Recommendations

Bord na Móna are pleased to have the opportunity to respond to this joint consultation, and welcome both the TSO and DSO working together on the Network Code on Demand Connection (DCC).

In making our response we have restricted our comment to very high level feedback, in preference to responding directly to the prescribed questions (below).

The DCC network codes clearly are intended to facilitate the achievement of the three objectives of the Third Package:

- The secure operation of European power systems;
- The integration of large volumes of low carbon generation; and
- The creation of a single European electricity market

Eigrid conducted a public consultation on DCC in August 2017 wherein it was stated, in relation to Demand Side response, that 'DCC should provide requirements for DSR ….from domestic level upwards'.

We do not have visibility of DSR being supported from a domestic level up across both TSO and DSO operators. To further support the three objectives of the Third Package, both the TSO and DSO need to have a role in supporting, enabling and remunerating flexible demand response.

Recommendations:

Bord na Móna believes that the breadth of the current Consultation Questions below would be well served by being broadened and aligned more closely with those of other EU Transmission and Distribution system operators. A cursory review of the headings in the ENTSOE NCC DCC Explanatory Note highlight such a wider perspective.

In this regard, and in the context of comment above, we support the broader position being taken by other European DSO operators and consequently recommend that further consideration be given to recognising and supporting realisation of the flexibility that could be afforded to the overall system from Demand Response and from better integration and utilisation of the Distribution network (as mentioned above).

Specifically we recognise and highlight that to further support the three objectives of the Third Package, both the TSO and DSO need to have a role in supporting, enabling and remunerating flexible demand response.

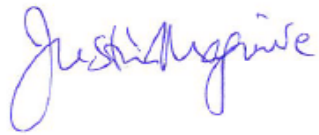
SUMMARY OF CONSULTATION QUESTIONS

Do you agree with the proposed values for each of the specific parameters as set out in this paper?

1. Do you think that other values should have been selected for any of the parameters?
2. f yes, please explain what values you would have proposed for the specific parameters.
3. If yes, please explain why you would have proposed the value including any costs/benefits/saving you believe will materialise from your proposal.
4. Do you believe that any non-exhaustive parameters have been excluded from this document incorrectly?
5. If yes, please detail the DCC reference.
6. Do you believe that any non-mandatory requirements have been excluded from this document incorrectly?
7. If yes, please detail the DCC reference.

To conclude, we thank you for the opportunity to respond to this consultation.

We would welcome discussing any aspect of our response.



Regulatory and Compliance
Bord na Móna PowerGen
Main Street
Newbridge
Co Kildare

Demand Connection Code Consultation

ESB Networks Response

Status:	Submitted
Date:	10.08.2018

Contents

1. Background and purpose of this document

As distribution system operator (DSO), distribution asset owner (DAO) and transmission asset owner (TAO), ESB Networks (ESBN) works to meet the needs of all Irish electricity customers, safely providing universal affordable access to the electricity system, by delivering and managing the performance of a system of:

- c. 155,000 km of overhead networks,
- over 23,000 km of underground cables,
- over 646 high voltage substations,
- approaching 2.3 million demand customers,
- almost 300 generation customers.

On the 7 September 2016, the Commission Regulation (EU) 2016/1388 establishing a network code on requirements for demand connection (hereafter referred to as "DCC") entered in force.

On 6 July 2018, the Irish transmission system operator (TSO, EirGrid), published a consultation document detailing proposals for the general application of technical requirements in accordance with Articles 12 – 30 of the DCC. ESBN herein notes that this document does not represent the views of the DSO. This publication was not a DSO approved proposal document.

A number of proposals in this document are of particular concern given their likely impact on capital projects' scope and cost. ESBN has consistently proposed an alternative, collaborative and more proportionate approach. The TSO has communicated that at this time it does not see the merit of a collaborative approach.

The purpose of this document is to formally respond to the consultation, highlighting ESBN's material concerns regarding a number of proposals, and recommending that the CRU does not approve them.

2. Consultation proposals of concern

The DCC applies across the European Union, but provides that some of the requirements for general application are to be specified at National level, i.e. by TSO, DSO or relevant system operator (RSO) of the member state, rather than at EU level. Such National level specification is subject to public consultation, wherein stakeholders have an opportunity to engage and contribute on a national level to system specific proposals which will affect them.

To give effect to this concept, the DCC contains requirements that are commonly described as either mandatory or non-mandatory. A non-mandatory requirement is one which is not considered at European level to warrant universal application in Europe. The TSO, DSO or RSO, as appropriate, may choose to seek to apply these requirements, and in such cases must engage in meaningful consultation, engaging and considering the merit of stakeholders concerns and proposals.

In the Consultation Proposal document, the TSO has proposed to make non-mandatory requirements in Articles 15.2, 15.3 and 15.4, which relate to reactive power requirements, mandatory. ESBN does not consider this a necessary, proportionate or appropriate measure.

ESBN would be concerned if the TSO were to consider any prior consultation, in Brussels or elsewhere in Europe, over the period when these non-mandatory proposals were being developed by the ENTSO-E, to represent sufficient consultation. ESBN would be concerned if the TSO considers that further meaningful consideration of established approaches at a national level is somehow less necessary as a result.

Applicability

It is set out in DCC that "this Regulation should apply to …..new distribution systems" and "this Regulation should not apply to …existing distributions systems.". The Irish distribution system is an existing distribution system, whose development is by extension of the existing interconnected system, rather than by establishing new distribution systems.

The only other conditions in which DCC would only apply are in case regulatory approval were obtained for a TSO application to retrospectively impose the DCC, based on a full cost-benefit analysis, or in cases of substantial modernisation of the distribution system.

Regarding the former, ESBN understands that the TSO is not seeking to pursue retrospective application of the DCC. Regarding the latter, ESBN is advised that this refers to very significant modernisation of the whole distribution system.

As such it is unclear that there are any conditions in which the DCC would apply to the distribution system in Ireland. This point notwithstanding, ESBN believes it necessary to clarify a number of concerns regarding these proposals, in case any conditions should arise in future wherein they might be considered applicable. These concerns apply in all cases, though in particular they refer to any proposals affecting the development, modernisation or extension of the existing distribution system.

Approach

ESBN acknowledges that there may be locations and conditions where the TSO faces challenges managing reactive power transfer between the transmission and distribution systems. ESBN notes that to date the TSO and DSO have worked collaboratively to identify the most economic and effective solution to system challenges involving both transmission and distribution systems and resources. ESBN considers it appropriate that such an approach should continue, and represents the best interest of Irish electricity system users. ESBN would support a cooperative, evidenced based, balanced approach to the challenge of managing reactive power challenges.

3. Specific Concerns with the TSO Proposal

i. **The proposal lends itself to unnecessarily high investment**

ESBN does not consider it appropriate to approach reactive power management challenges pertaining to a very small volume of very high value projects without considering the specific projects themselves on a case by case basis, as has been proposed. Such case by case analysis should consider the range of options available to address the challenge. These options include both capital solutions and the use of system services. Costs and practical considerations require the expertise and knowledge of both TSO and DSO, particularly insofar as they relate to distribution station specific design and delivery costs.

As such, ESBN has proposed that in cases where the TSO identifies reactive power management challenges, joint analysis involving both TSO and DSO, based on site specific design considerations and actual costings should be taken.

ESBN's understanding is that the TSO considers a standalone desktop electrical study, undertaken by the TSO a number of years ago as adequate justification for its proposals, which would apply universally going forward. This approach fails to acknowledge the real life conditions which drive costs in electricity infrastructure delivery. In practice these civil and structural issues can have at least as significant an impact on project costs as pure electrical capacity and connectivity considerations.

Furthermore, ESBN notes that the solutions to any given system challenge may be efficiently met by service based solutions. ESBN does not consider it prudent to pre-judge the effectiveness with which system service based solutions might offer a cost effective alternative to the approach proposed over the coming years.

In summary, given the substantial cost of capital works in existing high voltage stations on the Irish distribution system, ESBN does not consider it realistic or efficient to prejudge that a given technical

solution (additional capital investment on the distribution system) will in all, or almost all, cases prove the most cost effective. Given the low volume of projects involved, ESBN does not consider it excessive that case by case joint analysis would be undertaken.

ii. There is no practical need.

ESBN has stated and demonstrated previously that it will undertake or facilitate measures agreed with the TSO, where they are judged and agreed by both parties to be the most economic technically acceptable solution.

Irrespective of the provisions of the EU Network Codes, ESBN has stated that it will continue to facilitate the best technical and economic solution, where the Commission for Regulation of Utilities (CRU) has approved the associated cost as efficient and allowed the requisite funding. ESBN remains committed to cooperating with the TSO to develop solutions to system wide issues. Furthermore, the regulation and governance of the relationship between TSO and DSO, in their respective roles and responsibilities, will continue to mandate such cooperation into the future. Experience to date has demonstrated the effectiveness of joint TSO/DSO delivery of cooperative solutions where such system wide issues required it.

There is no risk, precedent, or practical need to impose a legal obligation for ESBN to undertake something it would do anyway, where it is jointly agreed as the right thing to do.

iii. There is no legal need.

The proposals in question are not mandatory in the EU Code. They are options, which the TSO on this occasion has chosen to pursue. Both TSO and DSO have repeatedly confirmed to industry throughout the process of introducing the EU Network Codes that they do not intend on using the implementation of the EU Network Codes as a vehicle to impose new rules or obligations. To introduce these discretionary requirements in DCC would fail to respect the commitment which the TSO and DSO have made to industry.

iv. There could be a significant cost impact for electricity system users.

ESBN does not believe that it would be proportionate or in the interests of electricity customers to require structural compensation or active control of reactive power by default. It would drive additional costs for new or modified demand or mixed demand-generation connections, and for DUoS customers when investment is needed to support local and regional growth. Decisions with this kind of investment cost impact warrant case by case consideration; a collaborative, analytical approach would be more prudent than a rules based approach.

Regarding Article 15.3, reactive power management may offer a resource of value to the TSO, but retained in DSO management, it also has the potential to help release local capacity for demand or

generation customers. ESBN does not consider it appropriate or in customers' interests to forfeit this value on their behalf, without careful, case by case joint consideration, consultation and agreement.

An agreed protocol on the treatment of reactive power from Distributed Energy Resources (DERs) is already in place between the TSO and DSO, which recognises how topology and electrical distance from the TSO-DSO boundary inform how and by whom, reactive power is treated. The resulting spectrum of implementations, ranging from direct control by TSO, to some shared control by means of a "Nodal Controller", to static or dynamic agreed power factor ranges, to designation for use by DSO only, is one of the key achievements in system operation in Ireland in recent years.

v. Planning and delivery challenges and delays

In case of Article 15.2 being made mandatory as proposed, the TSO has suggested that it would determine on a case by case basis whether to invoke the associated requirement, when distribution system planned projects are identified. ESBN's project selection is typically based on an options analysis of a range of technical solutions. As such, having identified a preferred solution, the ex-post imposition of reactive power obligations (and thus project costs) could mean that a given proposal is no longer the Least Cost Technically Acceptable Option, and the development of an alternative Planning Design in cases where the proposal substantially alters the planned costs of a project.

Furthermore, in cases where reactive power compensation or other measures are required as part of project costs, ESBN is concerned that this may drive additional construction time, and the lead times associated with additional procurement. As such, ESBN considers it appropriate that any such additional investment is justified and agreed on a case by case basis.

4. Conclusion

ESBN strongly opposes the proposal to make the non-mandatory requirements in Articles 15.2, 15.3 and 15.4 mandatory.

ESBN wishes to reiterate its commitment to cooperating with the TSO to develop solutions to system wide issues and will facilitate the best technical and economic solution. ESBN would welcome any further queries or comments the TSO or the CRU may have with regard to this response.

Further information submitted by ESBN

ESBN position on Articles 15.2, 15.3 and 15.4:

ESBN recommends that the proposal from Eirgrid to make the non-mandatory requirements in Articles 15.2, 15.3 and 15.4 mandatory be rejected.

ESBN strongly opposes the proposal on the basis that we do not believe it represents the best interests of Irish electricity customers or the Irish electricity system. ESBN is proposing an alternative, and more efficient, proportionate and justified approach. In case there are concerns of a technical nature, ESBN's reasoning is set out below and as per its response to the relevant consultation (see appendix).

Justification

ESBN reasons for opposing the making mandatory of Articles 15.2, 15.3 and 15.4:

ESBN does not consider it necessary, proportionate or appropriate to make non-mandatory requirements in Articles 15.2, 15.3 and 15.4 mandatory for the following reasons:

i. The proposal lends itself to unnecessarily high investment.
ii. There is no practical need.
iii. There is no legal need.
iv. There could be a significant cost impact for electricity system users.
v. Planning and delivery challenges and delays.
vi. Proposed collaborative approach in GB.

i. The proposal lends itself to unnecessarily high investment

ESBN does not consider it appropriate to approach reactive power management challenges pertaining to a very small volume of very high value projects without considering the specific projects themselves on a case by case basis, as has been proposed. Such case by case analysis should consider the range of options available to address the challenge. These options include both capital solutions and the use of system services. Costs and practical considerations require the expertise and knowledge of both TSO and DSO, particularly insofar as they relate to distribution station specific design and delivery costs.

As such, ESBN has proposed that in cases where the TSO identifies reactive power management challenges, joint analysis involving both TSO and DSO, based on site specific design considerations and actual costings should be taken.

ESBN's understanding is that the TSO considers a standalone desktop electrical study, undertaken by the TSO a number of years ago as adequate justification for its proposals, which would apply universally going forward. This approach fails to acknowledge the real life conditions which drive costs in electricity infrastructure delivery. In practice these civil and structural issues can have at least as significant an impact on project costs as pure electrical capacity and connectivity considerations.

Furthermore, ESBN notes that the solutions to any given system challenge may be efficiently met by service based solutions. ESBN does not consider it prudent to pre-judge the effectiveness with which system service based solutions might offer a cost effective alternative to the approach proposed over the coming years.

In summary, given the substantial cost of capital works in existing high voltage stations on the Irish distribution system, ESBN does not consider it realistic or efficient to prejudge that a given technical solution (additional capital investment on the distribution system) will in all, or almost all, cases prove the most cost effective. Given the low volume of projects involved, ESBN does not consider it excessive that case by case joint analysis would be undertaken.

ii. There is no practical need.

ESBN has stated and demonstrated previously that it will undertake or facilitate measures agreed with the TSO, where they are judged and agreed by both parties to be the most economic technically acceptable solution.

Irrespective of the provisions of the EU Network Codes, ESBN has stated that it will continue to facilitate the best technical and economic solution, where the CRU has approved the associated cost as efficient and allowed the requisite funding. ESBN remains committed to cooperating with the TSO to develop solutions to system wide issues. Furthermore, the regulation and governance of the relationship between TSO and DSO, in their respective roles and responsibilities, will continue to mandate such cooperation into the future. Experience to date has demonstrated the effectiveness of joint TSO/DSO delivery of cooperative solutions where such system wide issues required it.

There is no risk, precedent, or practical need to impose a legal obligation for ESBN to undertake something it would do anyway, where it is jointly agreed as the right thing to do.

iii. There is no legal need.

The proposals in question are not mandatory in the EU Code. They are options, which the TSO on this occasion has chosen to pursue. Both TSO and DSO have repeatedly confirmed to industry throughout the process of introducing the EU Network Codes that they do not intend on using the implementation of the EU Network Codes as a vehicle to impose new rules or obligations. To introduce these discretionary requirements in DCC would fail to respect the commitment which the TSO and DSO have made to industry.

iv. There could be a significant cost impact for electricity system users.

ESBN does not believe that it would be proportionate or in the interests of electricity customers to require structural compensation or active control of reactive power by default. It would drive additional costs for new or modified demand or mixed demand-generation connections, and for DUoS customers when investment is needed to support local and regional growth. Decisions with this kind of investment cost impact warrant case by case consideration; a collaborative, analytical approach would be more prudent than a rules based approach.

Regarding Article 15.3, reactive power management may offer a resource of value to the TSO, but retained in DSO management, it also has the potential to help release local capacity for demand or generation customers. ESBN does not consider it appropriate or in customers' interests to forfeit this value on their behalf, without careful, case by case joint consideration, consultation and agreement.

An agreed protocol on the treatment of reactive power from Distributed Energy Resources (DERs) is already in place between the TSO and DSO, which recognises how topology and electrical distance from the TSO-DSO boundary inform how and by whom, reactive power is treated. The resulting spectrum of implementations, ranging from direct control by TSO, to some shared control by means of a "Nodal Controller", to static or dynamic agreed power

factor ranges, to designation for use by DSO only, is one of the key achievements in system operation in Ireland in recent years.

v. Planning and delivery challenges and delays.

In case of Article 15.2 being made mandatory as proposed, the TSO has suggested that it would determine on a case by case basis whether to invoke the associated requirement, when distribution system planned projects are identified. ESBN's project selection is typically based on an options analysis of a range of technical solutions. As such, having identified a preferred solution, the ex-post imposition of reactive power obligations (and thus project costs) could mean that a given proposal is no longer the Least Cost Technically Acceptable Option, and the development of an alternative Planning Design in cases where the proposal substantially alters the planned costs of a project.

Furthermore, in cases where reactive power compensation or other measures are required as part of project costs, ESBN is concerned that this may drive additional construction time, and the lead times associated with additional procurement. As such, ESBN considers it appropriate that any such additional investment is justified and agreed on a case by case basis.

vi. Collaborative approach in GB

ESBN notes the approach in GB, wherein a collaborative approach requiring agreement between SOs has been approved by the Authority OFGEM. By introducing the phrase "*where agreed with the Network Operator who is an EU Code User*", OFGEM has provided a simple solution wherein the objective of Article 15.2 can be achieved through agreement between the TSO ("NGET") and the DSO ("the Network Operator").

Grid Code modifications have been published on 7 September 2018 to reflect this. As ESBN's proposal, this approach achieves the intent of Articles 15.2, 15.3 and 15.4 with regard to system performance, but on the premise of a collaborative approach which is not provided for in the TSO's proposal for the relevant articles of the DCC.

The current GB Grid Code (published on 7th September 2018) covering Articles 15.2, 15.3 and 15.4 are reproduced below.

ECC.6.4.5.2 Where agreed with the **Network Operator** who is an **EU Code User** and justified though appropriate **System** studies, **NGET** may reasonably require the **Network Operator** not to export **Reactive Power** at the **EU Grid Supply Point** (at nominal voltage) at an **Active Power** flow of less than 25 % of the **Maximum Import Capability**. Where applicable, the **Authority** may require **NGET** in coordination with **the Relevant Transmission Licensee** to justify its request through a joint analysis with the relevant **Network Operator** and demonstrate that any such requirement is reasonable. If this requirement is not justified based on the joint analysis, **NGET** in coordination with the **Relevant Transmission Licensee** and the **Network Operator** shall agree on necessary requirements according to the outcomes of a joint analysis.

ECC.6.4.5.3 Not withstanding the requirements of ECC.6.4.5.1(b) and subject to agreement between **NGET** and the relevant **Network Operator** there may be a requirement to actively control the exchange of **Reactive** P**ower** at the **EU Grid Supply Point** for the benefit of the **Total System**. **NGET** and the relevant **Network Operator** shall agree on a method to carry out this control, to ensure the justified level of security of supply for both parties. Any such solution including joint study work and

timelines would be agreed between **NGET** and the relevant **Network Operator** as reasonable, efficient and proportionate.

ECC.6.4.5.4 In accordance with ECC.6.4.5.3, the relevant **Network Operator** may require **NGET** to consider its **Network Operators System** for **Reactive Power** management. Any such requirement would need to be agreed between **NGET** and the relevant **Network Operator.**

Source: https://www.nationalgrid.com/uk/electricity/codes/grid-code?code-documents

ESBN suggested solution for Articles 15.2, 15.3 and 15.4:

ESBN proposed that the solution adopted in GB, by the introduction of "*where agreed with the DSO who is an EU Code User and justified through appropriate System studies*" offers a balanced and proportionate approach.

As such, ESBN's suggested solution is that in cases where the TSO identifies reactive power management challenges in a specific grid location, agreement should be reached by the TSO and DSO, where judged necessary, through joint analysis involving both TSO and DSO. Such analysis, where agreed necessary, must account for site specific design considerations and actual costings.

This approach achieves the intent of Articles 15.2, 15.3 and 15.4 with regard to system performance, but on the premise of a collaborative approach which is not provided for in the TSO's proposal for the relevant articles of the DCC.

In developing high value projects, paid for by electricity system users, it is strongly in the interests of customers to pursue a whole system approach. This means trying to identify and deliver the least cost solution available on a case by case basis. ESBN notes that on this occasion, a case by case approach is practical as Article 15.2 is likely to arise very infrequently in practice. Any additionally analysis arising of the DSO proposal periodically is unlikely to exceed the necessary due diligence required in any capital project.

Naturally, ESBN would welcome the opportunity to engage with the TSO on developing the necessary processes and requirements, to deliver this in an efficient and repeatable manner.