Distribution Code

Approved by CRU

Version: **8.0**

Date: **22.02.2023**

Issued by: **Distribution System Operator**
ESB Networks DAC

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Preface

a) Industry Structure

The **Electricity Industry** comprises the following principal bodies:-

a) The **TSO** operates the **Transmission System**. The **Transmission System** transports the electricity, generated by **Generating Units**, to and from the **Distribution System**, through which most **Customers** will be supplied. Some **Generating Plant** is connected directly to the **Distribution System** and is referred to as generation. **EirGrid** holds the **TSO Licence.**

b) The **Transmission System Asset Owner** (**TAO**) owns the **Transmission System**. **ESB** holds the **TAO Licence**.

c) The **DSO** is responsible for operating and maintaining a secure, reliable and efficient electricity **Distribution System** in accordance with its **DSO Licence** obligations. The **Distribution System** transports electricity to or from the **Transmission System** or from **Generation Units** to the final **Customer**. **ESB Networks Ltd.** holds the **DSO Licence.**

d) The **Distribution System Asset Owner** (**DAO**) owns the **Distribution System**. **ESB** holds the **DAO Licence**.

e) **Suppliers** supply electricity to **Customers**. For this purpose, **Suppliers** will be entitled to use both the **Transmission System** and the **Distribution System** for the transport of electricity from **Generating Units** to **Customers**.

f) **Generators** generate electricity which is fed onto the **Transmission** or **Distribution Systems**. **Generating Units** are classified according to their voltage, output power and whether or not they are subject to **Central Dispatch** by the **TSO**.

g) **Customers** purchase electricity from **Suppliers**. Some **Customers** have their own **Generating Plant** for supplying all or part of their own needs. These are referred to as **Customers** with **CHP** or **Customers with Auto-production**.

h) **Dispatchable Demand Customers** are **Customers** who are subject to **Central Dispatch** and have a **Demand Reduction** capability of 4**MW** or more.

i) **Demand Response Service Providers** are a party who contracts with the **DSO** to provide a demand response service.

j) The **Commission for Energy Regulation** was established by the **Act** to regulate the new electricity industry. This later became the **Commission for Regulation of Utilities (CRU).**

k) The **Single Electricity Market** (**SEM**) is the wholesale all-island electricity market.

b) Use of the Distribution System

Use of the **Distribution System** may involve any of the following transactions:

a) A connection at entry to or exit from the **Distribution System**. An entry point is the connection between the **Distribution System** and the **Transmission System** or a **Generating Plant**. An exit point is the connection between the **Distribution System** and the **Customer's** premises.

b) Use of the **Distribution System** to transport electricity between entry and exit points.

c) Construction of a **Connection Point**.

d) Work and / or **Operation** associated with **Equipment** at the interface with the **Distribution System**.

c) Distribution Code and Other Documentation

The **Distribution Code** has been prepared by **ESB Networks Ltd.** under the terms of the **Act**. This defines the technical aspects of the working relationship between **DSO** and all **Users** of the **Distribution System**, to ensure an efficient, co-ordinated and economical system for electricity distribution. It also enables **ESB Networks Ltd.** to comply with its obligations under its **DSO Licence** and the **Grid Code**.

The relationship between the **Grid Code** and **Distribution Code** is shown diagrammatically in Figure 1.

Users connected to the **Distribution System** shall comply with the relevant sections of the **Distribution Code**. The categories of **Users** of the **Distribution System** are described in Figure 2 and the sections of the code which apply to each **User** is shown in Figure 3. **Users** shall also comply with the requirements of the **Act** and other relevant legislation, which from time to time comes into force. They shall also be required to enter into technical and other agreements. **Customers** and **Generators** shall be required to have **Connection Agreements** with the **DSO** and **Suppliers** shall be required to enter into use of system agreements with the **DSO**.

There are a number of technical documents annexed to the **Distribution Code**. **Users** are bound to comply with the requirements of these documents as appropriate to their circumstances.

d) Structure of Distribution Code

The **Distribution Code** is divided into five parts as follows:

a) The **Distribution General Conditions (DGC)** sets out the legal framework guiding the **Operation** of the **Distribution Code**.

b) The **Distribution Planning Code (DPC)** contains details of the standard of supply offered as well as the design principles to which the **Distribution System** is constructed. The **DPC** enables **Users** to obtain from **DSO** certain information on the **Distribution System** in certain circumstances.

c) The **Distribution Connection Conditions** (**DCC**) provides details of the technical and other requirements to be met by those requiring connection to the **Distribution System**. Special conditions pertaining to **Generators** are contained in **DCC**10, **DCC**11 and **DCC**12.

d) The Distribution Operating Code (DOC) deals with the various operational matters affecting **Users** such as providing forecasts of **Demand**, planning **Distribution System** outages, generation outages, **Transmission System** outages, reporting of operational changes and **Events**, safety matters and procedures for dealing with emergency situations.

e) The **Distribution Data Registration Code** summarises in tabular form the data requirements under the **Distribution Code**.

e) Assumptions and Commentary

The **DSO** fully reserves its right to seek additions and amendments to the draft code at any time through the appropriate channels.

f) The Distribution Code and Grid Code Boundaries

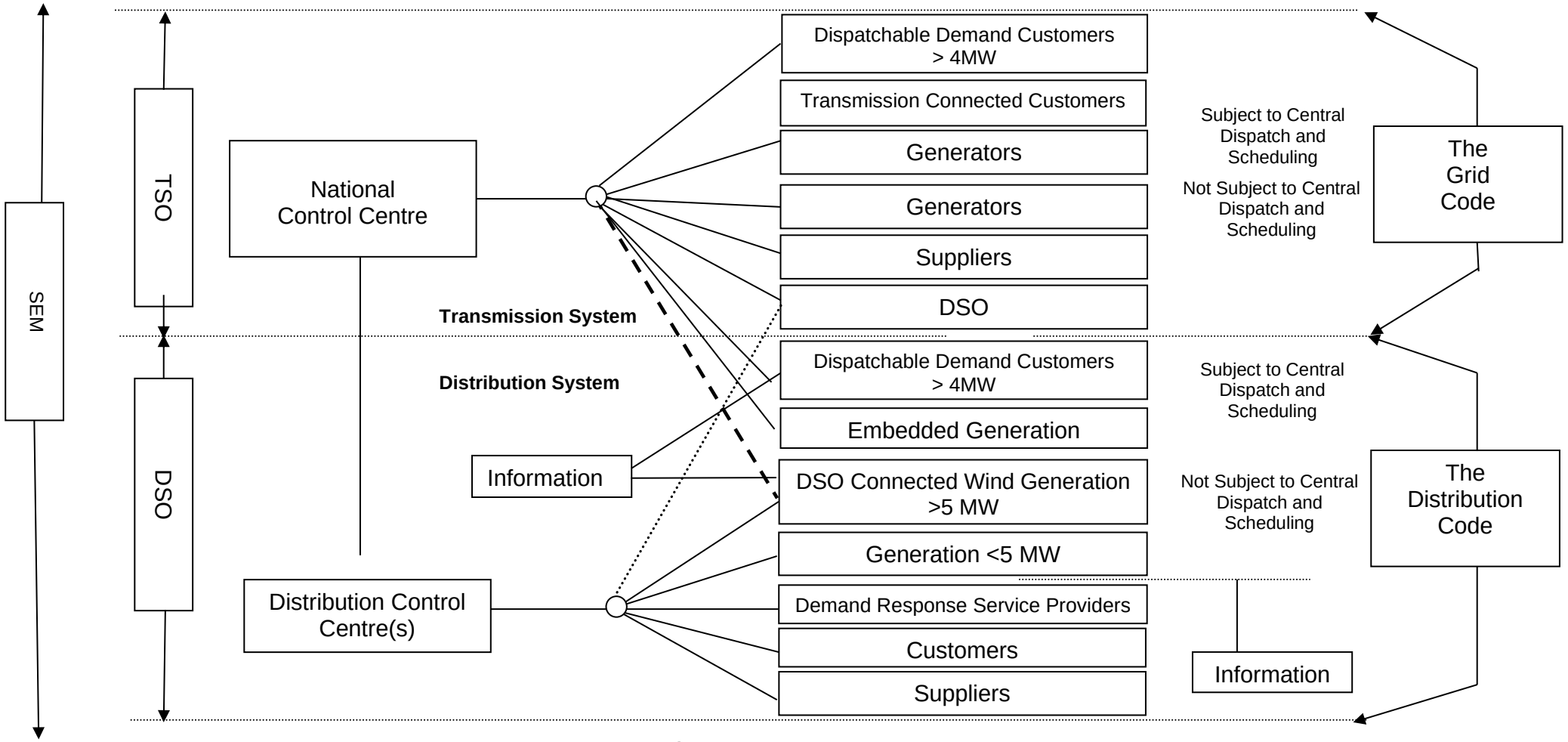


Figure 1

g) Categories of Users of the Distribution System

A1. **Generating Plant** >10**MW** and subject to **Central Dispatch**

A2. **Generating Plant** >2**MW** and not subject to **Central Dispatch**

A3. **Generators** <2**MW**

A4. **Customers** with **CHP** or **Customers with Auto-production**

A5. **Customers** with stand-by **Generators**

B1. **Major Customers** (**Customers** connected at **High Voltage**)

B2. **Customers** connected at **Medium Voltage**

B3. Industrial and commercial **Customers** connected at **Low Voltage**

B4. Domestic **Customers**

B5. **Dispatchable Demand Customers**

B6. **Demand Response Service Providers**

C. **Suppliers**

D. The **DSO**

Figure 2

h) Sections of the Distribution Code applying to particular categories of Users of the Distribution System

CATEGORY OF USERS

D Code Ref	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	C	D
DGC	D	D	D	D	D	D	D	D	D	D	D	D	D
DPC1	R	R	R	R	R	R	R	R	R	R	R	R	R
DPC2	R	R	R	R	R	R	R	R	R	R	R	R	R
DPC3	R	R	R	R	R	R	R	R	R	R	R	R	R
DPC4	R	R	R	R	R	R	R	R	R	R	R	R	D
DPC5	D	D	D	D	D	D	D	D	R	D	D	R	D
DCC1	R	R	R	R	R	R	R	R	R	R	R	R	R
DCC2	R	R	R	R	R	R	R	R	R	R	R	R	R
DCC3	R	R	R	R	R	R	R	R	R	R	R	R	R
DCC4	D	D	D	D		D	D	D	D	D	D	R	D
DCC5	D	D	D	D		D	D	R	R	D	D	R	D
DCC6	D	D	D	D		D	D	D	D	D	D	R	D
DCC7	D	D	D	D		D	D	R	R	D	D	R	D
DCC8						D	D	D	D	D	D	R	D
DCC9	D	D	D	D	D	D	D	D		D	D	R	R
DCC10	D	D	D	D	D					D	D		D
DCC11	D	D	D	D	D					D	D	R	D
DCC12	D	D	D	D	D					D	D	R	D
DCC13	D	D	D	D	D	D	D	D	D	D	D	R	D
DOC1		D				D	D			D	D		D
DOC2		D	D	D		D				D	D		D
DOC5	R	R	R	R	R	R	R	R	R	R	R		D
DOC7	D	D	D	R		D				D	D		D
DOC8	D	D	D	R		D				D	D		D
DOC9	D	D	D	R		D				D	D	R	D
DOC10	D	D	D	D	D	D	D	D	D	D	D	R	D
DOC11	D	D	D	D	D	D	D	D	D	D	D	R	D
DDRC	D	D	D	D	D	D	D				D		D

Figure 3

Not Applicable
D Applicable with specific obligations
R Relevant for information but no specific obligations

Note:

1. **Customers** represented in Categories A4 and A5 must comply with the code sections relevant to that category and additionally to the relevant sections of the category of **Customer** to which they belong.
2. Sections of the Distribution Code applying to particular categories of Users of the Distribution System are indicative only.

i) Demarcation of Requirements

Requirements which are not marked by any of the symbols or vertical lines shown below, apply to all Users.

Requirements which are marked by any of the symbols or vertical lines shown below, apply to different Users as depicted in Table 1 below.

Table 1

Symbol	Applicable to	Comment
	**All Users**	Changed content from previous Version
	**RfG Generation Units and DCC Units**	New content from previous Version
	**Non-RfG Generation Units**	
	**RfG Generation Units**	
	**Non-DCC Demand Units**	
	**DCC Demand Units**	

Distribution General Conditions

DGC DISTRIBUTION GENERAL CONDITIONS

DGC1 INTRODUCTION

DGC1.1 Whilst each code in the **Distribution Code** contains the rules and provisions relating specifically to that code, there are provisions which are of more general application. These are covered in the code, **Distribution General Conditions (DGC).**

DGC2 OBJECTIVE

DGC2.1 The **Distribution General Conditions** contain provisions that are of general application to all provisions of the **Distribution Code**. Their objective is to ensure, to the extent possible, that the various sections of the **Distribution Code** apply consistently to all electricity **Customers**.

DGC3 SCOPE

DGC3.1 The Distribution General Conditions apply to all **Users**.

DGC4 ASSISTANCE IN IMPLEMENTATION

DGC4.1 The **DSO Licence** imposes a duty upon the **DSO** to implement and enforce the **Distribution Code**. In order to do this the **DSO** may need access across boundaries, services, and facilities from **Users** or to issue instructions to **Users**, for example to isolate or disconnect **Plant** or apparatus. It is considered that these cases will be exceptional, and it is not, therefore, possible to envisage precisely or comprehensively what the **DSO** might reasonably require in order to carry out its duty to implement and enforce the **Distribution Code**.

DGC4.2 All **Users** are required to abide by the **Distribution Code** and also to provide the **DSO** with such rights of access, services and facilities and to comply with such instructions as it may reasonably require to implement and enforce the **Distribution Code**.

DGC5 UNFORESEEN CIRCUMSTANCES

DGC5.1 If circumstances arise which the provisions of the **Distribution Code** have not foreseen, the **DSO** shall to the extent reasonably practicable in the circumstances, consult promptly and in good faith with affected **Users** in an effort to reach agreement as to what should be done. If agreement cannot be reached in the time available the **DSO** will determine what is to be done.

DGC5.2 Whenever the **DSO** makes a determination, it shall have regard, wherever possible to the views expressed by **Users**, and in any event, to what is reasonable in all the circumstances.

DGC5.3 Each **User** shall comply with all instructions given to it by the **DSO** following such a determination provided that the instructions are consistent with the then current technical parameters of the particular **User's** system registered under the **Distribution Code**. The **DSO** shall promptly refer all such unforeseen circumstances and any such determination to the **Distribution Code Review Panel (DCRP)** in accordance with **DGC**7.2.

DGC6 HIERARCHY

DGC6.1 In the event of any conflict between the provisions of any direction of the **Commission for Regulation of Utilities** on the one hand and the provisions of the **Distribution Code** on the other, the provisions of such direction shall prevail (provided that such direction or ruling is binding upon the person to whom it is addressed).

DGC6.2 In the event of any conflict between the provisions of the **Distribution Code** and any contract, agreement or arrangement between the **DSO** and a **User**, the provisions of the **Distribution Code** shall prevail unless the **Distribution Code** expressly provides otherwise.

DGC7 DISTRIBUTION CODE REVIEW PANEL

DGC7.1 The **DSO** shall establish and maintain a **Panel** which, shall be a standing body, to carry out the functions referred to in **DGC**7.2

DGC7.2 The **Panel** shall:

a) Keep the **Distribution Code** and its working under review.
b) Review all suggestions for amendments to the **Distribution Code** which the **Commission for Regulation of Utilities** or any **User** may submit to the **DSO** for consideration by the **Panel** from time to time.
c) Recommend to the **DSO** amendments to the **Distribution Code** that the **Panel** feels are necessary or desirable and the reasons for the recommendation.
d) Issue guidance in relation to the **Distribution Code** and its implementation, performance and interpretation when asked to do so by any **User**.
e) Consider what changes are necessary to the **Distribution Code** arising out of any unforeseen circumstances referred to it by the **DSO** under **DGC**5.

DGC7.3 The **Panel** shall consist of:

a) Chairperson and two persons appointed by, and representing the **DSO**,
b) One person appointed by and representing the **Commission for Regulation of Utilities**,
c) One person representing the **TSO**,
d) One person representing **Generators** with Embedded Generation,
e) One person representing **Major Customers**,
f) One person representing Public Electricity **Supplier**
g) One representative of the Electro Technical Council of Ireland (**ETCI**).
h) One representative of independent **Suppliers**.
i) Representatives of other **Users** of the **Distribution System** as proposed by the **Panel** and approved by the **Commission for Regulation of Utilities**.

DGC7.4 The **Panel** shall establish and comply at all times with its own rules and procedures relating to the conduct of the business, such rules and procedures to be known as the Constitution and Rules of the **Panel**, which shall be approved by the **Commission for Regulation of Utilities**.

DGC7.5 The **DSO** shall submit all proposed amendments to the **Distribution Code** (regardless of which party proposes such amendments) to the **Panel** for discussion.

DGC7.6 The **DSO** shall, from time to time or at the behest of the **Commission for Regulation of Utilities,** having regard to the recommendations of the **Panel**, submit a revised **Distribution Code** to the **Commission for Regulation of Utilities for** approval.

DGC8 COMMUNICATIONS BETWEEN THE DSO AND USERS

DGC8.1 Unless otherwise specified in the **Distribution Code** the methods of operational communication and data transfer shall be agreed between the **DSO** and **Users** from time to time.

DGC9 EMERGENCY SITUATIONS

DGC9.1 **Users** should note that the provisions of the **Distribution Code** may be suspended, in whole or in part, pursuant to any directions given and / or orders made by the Minister under the provisions of the **Act**.

DGC10 CODE RESPONSIBILITIES

DGC10.1 The **Distribution Code** sets out the procedures and principles governing the relationship between the **DSO** and all **Users** of the **Distribution System**.

DGC11 DEROGATIONS

DGC11.1 **Single Derogations**

If a **User** finds that it is, or will be unable to comply with any provision of the **Distribution Code**, then it shall without delay report such non-compliance to the **DSO** and shall, subject to the provisions of **DGC**11.2 make such reasonable efforts as are required to remedy such non-compliance as soon as reasonably practicable.

DGC11.1.1 Where the non-compliance is:

a) with reference to **Plant** and / or apparatus connected to the **Distribution System** and is caused solely or mainly as a result of a revision to the **Distribution Code**; or

b) with reference to **Plant** and / or apparatus which is connected, approved to connect, or for which approval to connect to the **Distribution System** is being sought;

and the **User** believes either that it would be unreasonable (including cost and technical considerations) to require it to remedy such non-compliance or that it should be granted an extended period to remedy such non-compliance it shall promptly submit to the **Commission for Regulation of Utilities** a request for a single derogation from such provision in accordance with the requirements of **DGC**11.3 and shall provide the **DSO** with a copy of such application.

DGC11.2 Class Derogations

If a **User** believes that:

(a) a Class of Persons who are **Users**; or

(b) persons using a Class of Plant and/or Apparatus connected to the Distribution System;

is, or are, or will be, unable to comply with any provision of the Distribution Code they should promptly submit a request for a class derogation to the DCRP.

DGC11.2.1

If the DCRP believes either that it would be unreasonable (including cost and technical considerations) to require the relevant Class of Persons, or persons using the relevant Class of Plant and/or Apparatus (collectively “the Class”), to remedy such non-compliance or that the Class should be granted an extended period to remedy such non-compliance the DCRP on behalf of (a) or (b) above shall promptly approve the submission of a Class Derogation request covering (a) or (b) above to the DSO for assessment. The DSO will request an assessment from the TSO and assess the Class Derogation request themselves.

(a) If the DSO supports the request for a Class Derogation, the DSO will submit the Class Derogation request including the DSO and TSO assessment to the Commission for Regulation of Utilities in accordance with the requirements of DGC11.3. or

(b) If the DSO does not support the request for a Class Derogation, the DSO will refer the request for a Class Derogation back to the DCRP.

DGC11.3 A request for derogation from any provision of the **Distribution Code** shall contain:

a) the issue number and the date of the **Distribution Code** provision against which the non-compliance or predicted non-compliance was identified;
b) identification of the **Plant** and / or apparatus the Class of Persons who are **Users**, or the Class of Plant and/or Apparatus in respect of which a derogation is sought and, if relevant, the nature and extent to which the non-compliance exists;
c) identification of the provision with which the **User** is, or will be, unable to comply;
d) the reason for the non-compliance; and
e) the date by which compliance will be achieved (if remedy of the non-compliance is possible) subject to **DGC**11.2 (b).

A standard **Distribution Code** derogation application forms are included in Annex 2.

DGC11.4 If the **DSO** finds that it is, or will be, unable to comply with any provision of the **Distribution Code**, then it shall, subject to the remaining provisions of **DGC**11 make such reasonable efforts as are required to remedy such non-compliance as soon as reasonably practicable.

DGC11.5 In the case where the **DSO** requests a derogation, the **DSO** shall submit the information set out in **DGC**11.3 to the **Commission for Regulation of Utilities.**

DGC11.6 On receipt of any request for derogation, the **Commission for Regulation of Utilities** shall promptly consider such request and provided that the **Commission for Regulation of Utilities** considers that the grounds for the derogation are reasonable, the **Commission for Regulation of Utilities** shall grant such derogation unless the derogation would, or it is likely that it would have a material adverse impact on the security and **Stability** of the **Distribution System** and/to the **Transmission System** or imposes unreasonable costs on the **Operation** of the **Distribution System** or **Transmission System** or on other **Users**. In its consideration of a derogation request by a **User**, the **Commission for Regulation of Utilities may** contact the relevant **User** and / or the **DSO** to obtain clarification of the request to discuss changes to request. Where the derogation may have an impact on the **Transmission System**, the **DSO** shall liaise with the **TSO** prior to providing an assessment to the **Commission for Regulation of Utilities.**

Derogation from any provision of the **Distribution Code** shall contain:

a) The issue number and the date of the **Distribution Code** provision against which the derogation applies;
b) Identification of the provision with which the derogation applies;
c) Identification of the Class of Persons who are **Users**, Plant and / or apparatus in respect of which a derogation applies and, if relevant, the nature and extent to which the derogation applies including alternate compliance provision;
d) The reason for the non-compliance requiring derogation;
e) The date by which the derogation ends if compliance will be achieved, or by which such derogation expires.

DGC11.7 To the extent of any derogation granted in accordance with this **DGC**11, the **DSO** and / or the **User** (as the case may be) shall be relieved from its obligation to comply with the applicable provision of the **Distribution Code** and shall not be liable for failure to so comply but shall comply with any alternate provision as set forth in the derogation.

DGC11.8 **DSO** shall:

a) Keep a register of all derogations which have been granted, identifying the name of the person, or the Class of Persons who are **Users** or Class of Plant and/or Apparatus, in respect of whom the derogation has been granted, the relevant provision of the **Distribution Code** and the period of the derogation; and
b) On request from any **User**, provide a copy of such register of derogations to such **User**.

DGC11.9 Where a material change in circumstance has occurred a review of any existing derogations, and any derogations under consideration, may be initiated by the **Commission for Regulation of Utilities at** the request of the **Commission for Regulation of Utilities, DSO**, or **Users.**

DGC12 RfG Unit or DCC Unit Derogation Procedure

DGC12.1 Power to Grant Derogations

CRU may, at the request of a Generator, or Demand Unit, or the DSO, grant a Generator, or Demand Unit, or the DSO derogations from one or more RfG Generation Unit clauses in the Distribution Code for RfG Generation Units and Non-RfG Generation Units; or Demand **Response Service Provider** clauses in the **Distribution Code** for **DCC Units**; in accordance with DGC12.2, DGC12.3 and DGC12.4. Derogations may be granted and revoked in accordance with DGC12.2, DGC12.3 and DGC12.4 by other authorities than the CRU.

DGC12.2 General Provisions

DGC12.2.1 The criteria specified by CRU to assess derogations pursuant to DGC12.3 and DGC12.4 are specified in form DIST NCDF1 and DIST NCDF2 respectively.

DGC12.2.2 If CRU deems that it is necessary due to a change in circumstances relating to the evolution of system requirements, it may review and amend at most once every year the criteria for granting derogations as referenced in DGC12.2. Any changes to the criteria shall not apply to derogations for which a request has already been made.

DGC12.2.3 CRU may decide that Generation Units, or Demand Units for which a request for a derogation has been filed pursuant to DGC12.3 or DGC12.4 do not need to comply with RfG Generation Unit clauses or **Demand Response Service Provider** clauses in the Distribution Code from which a derogation has been sought from the day of filing the request until the CRU's decision is issued.

DGC12.3 Request for a Derogation by a Generator or Demand Unit

DGC12.3.1 Generators or Demand Units may request a derogation to one or several RfG Generation Unit clauses or **Demand Response Service Provider** clauses in the Distribution Code for Generation Units or Demand Units within their Facility.

DGC12.3.2 A request for a derogation shall be filed with the DSO using form DIST NCDF1 and include:

(a) an identification of the Generator, or Demand Unit owner, and a contact person for any communications;

(b) a description of the Generation Unit(s) or Demand Unit(s) for which a derogation is requested;

(c) a reference to the RfG Generation Unit or Demand Response Service Provider clauses in the Distribution Code from which a derogation is requested and a detailed description of the requested derogation;

(d) detailed reasoning, with relevant supporting documents and cost-benefit analysis;

(e) demonstration that the requested derogation would have no adverse effect on cross-border trade.

DGC12.3.3 Within two weeks of receipt of a request for a derogation, the DSO shall confirm to the Generator or Demand Unit whether the request is complete. If the DSO considers that the request is incomplete, the Generator or Demand Unit shall submit the additional required information within one month from the receipt of the request for additional information. If the Generator or Demand Unit does not supply the requested information within that time limit, the request for derogation shall be deemed withdrawn.

DGC12.3.4 The DSO shall assess the request for derogation and the provided cost-benefit analysis, taking into account the criteria determined by the CRU pursuant to DGC12.2.

DGC12.3.5 Within six months of receipt of a request for derogation, the DSO shall forward the request to the CRU and submit the assessment(s) prepared in accordance with DGC12.3.4. That period may be extended by one month where the DSO seeks further information from the Generator or Demand Unit .

DGC12.3.6 The CRU shall adopt a decision concerning any request for derogation within six months from the

day after it receives the request. That time limit may be extended by three months before its expiry where the CRU requires further information from the Generator, or Demand Unit, or from any other interested parties. The additional period shall begin when the complete information has been received.

DGC12.3.7 The Generator or Demand Unit shall submit any additional information requested by the CRU within two months of such a request. If the Generator or Demand Unit does not supply the requested information within that time limit, the request for derogation shall be deemed withdrawn unless, before its expiry:

(a) the CRU decides to provide an extension; or
(b) the Generator or Demand Unit informs the CRU by means of a reasoned submission that the request for a derogation is complete.

DGC12.3.8 The CRU shall issue a reasoned decision concerning a request for derogation. Where the CRU grants a derogation, it shall specify its duration.

DGC12.3.9 The CRU shall notify its decision to the relevant Generator or Demand Unit and the DSO.

DGC12.3.10 The CRU may revoke a decision granting a derogation if the circumstances and underlying reasons no longer apply or upon a reasoned recommendation of the European Commission or reasoned recommendation by ACER pursuant to DGC12.6.2.

DGC12.3.11 For a Type A **PGM(s)** or **Demand Unit(s)** connected at **LV**, a request for a derogation may be made by a third party on their behalf. The third party may substitute their details in form DIST NCDF1 as per **DGC**12.3.2 (a), specifying the cumulative maximum capacity if requesting a derogation for multiple units.

DGC12.4 Request for a Derogation by the DSO

DGC12.4.1 The DSO may request derogations for classes of Generation Units or Demand Units connected or to be connected to their Network.

DGC12.4.2 The DSO shall submit their requests for derogations, using form DIST NCDF2, to the CRU. Each request for a derogation shall include:

(a) identification of the DSO, and a contact person for any communications;
(b) a description of the Generation Units or Demand Units for which a derogation is requested and the total installed capacity and number of Generation Units or Demand Units ;
(c) the RfG Generation Unit clauses or Demand Response Service Provider clauses in the Distribution Code for which a derogation is requested, with a detailed description of the requested derogation;
(d) detailed reasoning, with all relevant supporting documents;
(e) demonstration that the requested derogation would have no adverse effect on cross-border trade;
(f) a cost-benefit analysis.

DGC12.4.3 The CRU shall adopt a decision concerning a request for derogation within six months from the day after it receives the request.

DGC12.4.4 The six-month time limit referred to in DGC12.4.3 may, before its expiry, be extended by an additional three months where the CRU requests further information from the DSO requesting the derogation or from any other interested parties. That additional period shall run from the day following the date of receipt of the complete information.

DGC12.4.5 The DSO shall provide any additional information requested by the CRU within two months from the date of the request. If the DSO does not provide the requested additional information within that time limit, the request for derogation shall be deemed withdrawn unless, before expiry of the time limit:

(a) the CRU decides to provide an extension; or
(b) the DSO informs the CRU by means of a reasoned submission that the request for derogation is complete.

DGC12.4.6 The CRU shall issue a reasoned decision concerning a request for derogation. Where the CRU grants a derogation, it shall specify its duration.

DGC12.4.7 The CRU shall notify its decision to the DSO and ACER.

DGC12.4.8 The CRU may lay down further requirements concerning the preparation of requests for derogation by the DSO. In doing so, the CRU shall take into account the delineation between the transmission system and the distribution system at the national level and shall consult with system operators, Generators, or Demand Facilities and stakeholders, including manufacturers.

DGC12.4.9 The CRU may revoke a decision granting a derogation if the circumstances and underlying reasons no longer apply or upon a reasoned recommendation of the European Commission or reasoned recommendation by ACER pursuant to DGC12.6.2

DGC12.5 Register of Derogations

DGC12.5.1 The CRU shall maintain a register of all derogations they have granted or refused and shall provide ACER with an updated and consolidated register at least once every six months, a copy of which shall be given to ENTSO for Electricity.

DGC12.5.2 The register shall contain, in particular:
(a) the requirement or requirements for which the derogation is granted or refused;
(b) the content of the derogation;
(c) the reasons for granting or refusing the derogation;
(d) the consequences resulting from granting the derogation.

DGC12.6 Monitoring of Derogations

DGC12.6.1 ACER shall monitor the procedure of granting derogations with the cooperation of the CRU. The CRU shall provide ACER with all the information necessary for that purpose.

DGC12.6.2 ACER may issue a reasoned recommendation to the CRU to revoke a derogation due to a lack of justification. The European Commission may issue a reasoned recommendation to the CRU to revoke a derogation due to a lack of justification.

DGC12.6.3 The European Commission may request ACER to report on the application of DGC12.6.1 and DGC12.6.2 and to provide reasons for requesting or not requesting derogations to be revoked.

Distribution Planning Code

DPC DISTRIBUTION PLANNING CODE

DPC1 INTRODUCTION

DPC1.1 The **Distribution Planning Code (DPC)** specifies the technical and design criteria and the procedures to be complied with by the **DSO** in the planning and development of the **Distribution System**. It also applies to **Users** in the planning and development of their installations in so far as they affect the **Distribution System**.

DPC1.2 The **Users'** requirements may necessitate the reinforcement of, or an extension, to the **Distribution System** and for reinforcement of, or extension to, the relevant transmission / distribution interface capacity, such work being identified by the **DSO** or **TSO** as appropriate.

DPC1.3 The time required for the planning and development of the **Distribution System** and any consequential requirement of the interface with the **Transmission System**, shall depend on the type and extent of the necessary reinforcement and / or extension work, the time required for obtaining planning permission and wayleaves, including any associated hearings, and the degree of complexity in undertaking the new work while maintaining satisfactory security and quality of supply.

DPC1.4 Reference is made in the **DPC** to the **DSO** supplying information or advice to **Users**. For avoidance of doubt, unless the context otherwise requires, such information or advice shall be provided by the **DSO** as soon as practical following a request by the **User** (whether during the application for connection process or otherwise).

DPC2 OBJECTIVES

DPC2.1 The objectives of the **Distribution Planning Code** are to:

a) Enable the **Distribution System** to be planned, designed and constructed to operate economically, securely and safely.
b) Facilitate the use of the **Distribution System** by others and to specify a standard of supply to be provided.
c) Provide sufficient information for a **User** to assess opportunities for connection and to plan and develop the **User's** installation so as to be compatible with the **Distribution System**.
d) Formalise system planning data requirements.

DPC3 SCOPE

DPC3.1 The **Distribution Planning Code** specifies the planning and design requirements for the **Distribution System**.

DPC3.2 The **Users** to whom the **Distribution Planning Code** applies are those who use or intend to use the **Distribution System** and comprise the following:

a) All **Generators**
b) All **Customers** connected to the **Distribution System**
c) **Suppliers**
d) **TSO**

DPC4 DESIGN STANDARDS

DPC4.1 Frequency

DPC4.1.1 The **Frequency** of supply is outside the control of the DSO however the expected standard **Frequency** range is as follows:

The **Transmission System Frequency** is nominally 50Hz:

- Normal operating range: 49.8Hz to 50.2Hz
- During system disturbances: 48.0Hz to 52.0Hz
- During exceptional system disturbances 47.0Hz to 52.0Hz

DPC4.2 Voltage

DPC4.2.1 The **Distribution System** includes networks operating at the following nominal and Declared Supply voltages:

Table 2 – DISTRIBUTION NOMINAL VOLTAGES

	Nominal Voltages	Declared Supply Voltages
Low Voltage (LV)	230 volts – phase to neutral 400 volts – phase to phase	230 volts – phase to neutral 400 volts – phase to phase
Medium Voltage (MV)	10,000 volts (10kV) 20,000 volts (20kV)	11,000 volts (11kV) 21,000 volts (21kV)
High Voltage (HV)	38,000 volts (38kV) 110,000 volts (110kV)	40,000 volts (40kV) 110,000 volts (110kV)

DPC4.2.2 The **DSO** shall operate the **Distribution System** so as ensure that the voltage at the supply terminals, as defined in EN 50160, complies with +/- 10% of the Declared Supply Voltages given in Table 2 above. The Low Voltage range tolerance shall be 230V +/- 10%. The resulting voltage at different points on the system depends on several factors, but at the **Connection Point** with **Customers** can be expected to be in accordance with Table 3 under steady state and normal operating conditions.

Table 3 – OPERATING VOLTAGE RANGE

Nominal voltage	**Highest voltage**	**Lowest voltage**
230V	253V	207
400V	440V	360
10kV	11.1kV	Variable according to operating conditions. Information on particular location on request by the **User** concerned
20kV	22.1kV	
38kV	43kV	
110kV	120kV	

Higher maximum voltages can arise at the **Connection Point** with **Generators** as per Table 7 in clause **DCC**10.5.

DPC4.2.3 The **Distribution System** and any **User** connections to that system shall be designed to enable normal operating **Frequency** and voltages supplied to **Customers** to comply with European Standard EN 50160:1995 *Voltage Characteristics of Electricity Supplied by Public Distribution System*. Characteristics of the voltage, **Frequency**, dips, interruptions, **Unbalance** and **Harmonics** are set out in this **CENELEC** approved standard (Item 1, in Annex 1). It should be noted that the standard describes the main characteristics of the voltage that may be expected at the supply terminals under 'normal' operating conditions.

DPC4.2.4 For the avoidance of doubt, any per unit voltage values stated in any **Connection Network Code**, shall be deemed to refer to declared supply voltage given in Table 2 above. Operational voltages shall be kept within the limits given in Table 3, Table 7 and Figure 13 respectively.

DPC4.3 Earthing Requirements

DPC4.3.1 The treatment of the neutral is different for the various supply voltages. The present treatments are described below but these could change in the future.

DPC 4.3.2 The electrical installations of all new consumers connected at **Low Voltage** shall be protected by the **TN-C-S** system unless otherwise advised in line with the requirements of the *National Rules for Electrical Installations* – **ETCI** (Item 14, Annex1).

DPC4.3.3 The main **Earthing** terminal block shall be connected via an appropriately sized main protective conductor to the incoming **DSO** neutral conductor. An **Earthing** conductor of appropriate size should be taken from the main **Earthing** terminal to the consumer's earth electrode.

DPC4.3.4 For voltages above LV the following applies:

Voltage Neutral Treatment

10kV	**Isolated** neutral throughout the country except in parts of Dublin and Cork City where it is either directly earthed or earthed through a 2 Ohm or 4 Ohm resistor so as to limit single-phase earth fault current to 1500 Amps (typical).
20kV	Earthed through a 20 Ohm resistor which limits earth fault current to 500 amps.
38kV	Earthed through an arc suppression coil (series inductance) at source 110kV substations.
110kV	Effectively earthed neutral system with an earth fault factor less than 1.4.

DPC4.3.5 With the exception of **LV** networks where the **TN-C-S** system is permitted, multiple zero phase sequence paths are currently prohibited in the design of the **Distribution System**.

DPC4.4 Security of Supply

DPC4.4.1 The security standard for the **Distribution System** is set out in *Distribution System Security and Planning Standards* (Item 11, Annex 1).

DPC4.4.2 The **DSO** shall use reasonable endeavours to maintain a supply from the system. This cannot be ensured, since faults, planned **Maintenance** and new works outages and other circumstances outside **DSO's** control can cause interruptions. On such occasions, the **DSO** shall use reasonable endeavours to restore the supply or connection as soon as practicable but shall be under no liability for any direct or indirect damage or associated loss incurred by the **User**.

DPC4.4.3 Restoration times are cited in the *Customer Charter* (Item 2, Annex 1). Guidelines for different outage types are as follows:

Fault Outages:	The **DSO** shall endeavour to restore access to the system within twenty-four hours. In major storm conditions the outage duration may be longer and, in such circumstances, the **DSO** shall endeavour to keep the **User** advised of progress.
Planned Outages:	The **DSO** shall endeavour to give three days' notice of planned supply interruptions. In some situations, to facilitate emergency repairs or local outages affecting a small number of **Customers**, shorter notice may be given.

Supply Curtailments: In some circumstances, it may be necessary to request **Customers** to reduce load or to use standby supplies where appropriate. In these situations, the **DSO** shall endeavour to maintain access to the system. In extreme cases where this may not be possible the **DSO** shall endeavour to provide two days' notice to the **User**.

Load Shedding: In extreme situations there may be generation shortages and load shedding may be required. In these circumstances the **DSO** shall notify **Customers** if possible but as this is an emergency situation this may not be possible.

DPC4.4.4 The **DSO** may disconnect **Users** under certain circumstances. These circumstances shall include:

a) Where the **Customer's** installation or use of electricity is such as to interfere with the satisfactory **Operation** of the **Distribution** or **Transmission System** or to cause electrical disturbance to other **Customers**.
b) Where the **DSO** considers that the **Customer's** installation is in a potentially dangerous condition.
c) Where alterations, repairs, renewal or **Maintenance** of the **Distribution System** or **DSO** assets or means of connection require the de-energisation of the **Connection Point**.
d) Where a **Customer** extends supply for use by another party whom the **DSO** considers to be a separate **Customer**.
e) In any other circumstances in which discretion is necessary or appropriate to enable the **DSO** to comply with the **Distribution Code** and / or to operate the **Distribution System** in accordance with **Good Industry Practice** or is required by any law, direction, rule or regulation having the force of law.

DPC5 TRANSFER OF PLANNING DATA

DPC5.1 Planning Information to be provided by Users

DPC5.1.1 **Users** of the **Distribution System** shall provide sufficient planning data / information as can reasonably be expected to be made available, when requested by the **DSO** from time to time to enable the **DSO** to comply with the requirements under its **DSO Licence**.

DPC5.1.2 **Generators**, **Customers** connected to the **Distribution System** including **Dispatchable Demand Customers** and **Suppliers** shall provide planning data for specific future time periods updated annually as necessary and including projected **Demand** requirements, anticipated changes in maximum **Demand**, or generating capacity, as appropriate. The data and timescales over which the data is required is given in Distribution Operating Code 1 (DOC1) and the associated data schedule is Schedule 2 of the **Distribution Data Registration Code (DDRC)**.

DPC5.1.3 In addition to periodic updates of planning information a **User** shall give adequate notice of any significant change to their system or operating regime to enable the **DSO** to prepare its development plans and implement any necessary system modifications. In the event of unplanned changes in a **User's** system or operating regime a **User** shall notify the **DSO** as soon as is practically possible to ensure any necessary measures can be implemented.

DPC5.1.4 **Users** shall also provide details of reactive compensation **Plant** directly or indirectly connected to the **Distribution System** other than at **Low Voltage**, including its rating and operational control.

DPC5.1.5 **Users** may be required to provide the **DSO** with detailed data relating to the interface between their system and that of the **Distribution System** covering circuit parameters, switchgear and **Protection** arrangements of **Equipment** directly connected to or affecting the **Distribution System** to enable the **DSO** to assess any implications associated with these points of connection.

DPC5.2 Information to be Exchanged

DPC5.2.1 On the request of a **User**, the **DSO** shall provide such information, as may be reasonably required, on the design and other characteristics of the **Distribution System**.

DPC5.2.2 Where the **DSO** proposes to make certain modifications to its system or where it has received information from a **User** under **DPC**5.1 above, which may impact on other **User** installations then the **DSO** will notify **Users** of the proposal, subject to any constraint of confidentiality or timing.

DPC5.2.3 The **DSO** shall provide information on request to **Users** regarding the local network conditions to enable them to determine their **Protection** requirements.

DPC5.2.4 Where the **Users** installation is connected to the busbars of the **Distribution System** sufficient details may need to be exchanged with respect to **User** / the **DSO Ownership Boundary** to enable an assessment to be made of transient over-voltage effects. The request for information may be initiated by either the **DSO** or the **User**.

DPC5.2.5 Information may be exchanged between the **DSO** and the **User** on fault infeed levels at the feeding busbar or point of connection to the **Distribution System** as appropriate, in the form of

- Three phase and single phase earth short circuit infeed.
- The X/R ratio under three phase fault conditions.

DPC5.2.6 Information shall be exchanged between the **DSO** and **User** on **Demand** transfer capability where the same **Demand** can be supplied from alternate **User** points of supply. This shall include the proportion of **Demand** normally fed from each point of supply and the arrangements (manual or automatic) for transfer under planned/fault outage conditions.

DPC5.3 Planning Studies

DPC5.3.1 In order to facilitate connections to the **Distribution System** the **DSO** shall prepare on request a study showing the implications of a connection at a particular point on the system.

DPC5.3.2 Under the terms of the **DSO Licence** a reasonable charge may be levied by the **DSO** for the planning study. Details of these charges are set out in *Guide to the Process for connection to the Distribution System* (Item 3, Annex 1).

DPC5.3.3 **Users** or potential **Users** shall provide to the **DSO** information regarding the proposed facility including load details, interface arrangements, proposed **Connection Point** and import / export requirements.

DPC5.3.4 The studies shall normally be prepared within 28 days after the date of receipt of the information or the agreement of the person making the request to pay the cost of the study, whichever is the longer. In the case of **Generators** and **Major Customers** seeking connection, depending on the nature and complexity of the request, this period may extend up to 100 days or a further 28 days from the receipt of planning information from the **TSO** whichever is the greater.

DPC5.3.5 Details of the procedures for application for connection to the **Distribution System** are contained in *Guide to the Process for connection to the Distribution System* (Item 3, Annex 1).

DPC5.3.6 Rules applied by the **DSO** in determining the connection requirements are outlined in the *Distribution System Security & Planning Standards* (Item 11, Annex 1).

DPC5.3.7 Where such information is available the **DSO** shall provide on request a statement of present and future circuit capacities, forecast power flows and loadings on part or parts of the **Distribution System** specified in the request and shall include **Fault Levels** at each distribution node covered by the request. The **DSO** may levy a charge for the provision of this statement as approved by the **Commission for Regulation of Utilities on** account of the reasonable costs incurred by the **DSO** in preparing this statement. The statement shall be prepared within 28 days after the date of receipt of the information or the agreement of the person making the request to pay the cost of the statement, whichever is the longer. In the case of **Generators** and **Major Customers** seeking connection this period may extend up to 110 days depending on the nature and complexity of the request.

DPC5.3.8 The dates given in this **DPC**5.3 are target dates only and do not constitute a legal commitment. The **DSO** shall however use reasonable endeavours to abide by them

Distribution Connection Conditions

DCC DISTRIBUTION CONNECTION CONDITIONS

DCC1 INTRODUCTION

DCC1.1 It is necessary to require certain minimum technical, design and operational criteria to be met by **Users' Plant** and apparatus in order to maintain, insofar as is permitted by **Good Industry Practice**, **Stable** and secure **Operation** of the **Distribution System** for the benefit of all **Users** and for the **Protection** of the **Distribution System** and **Users' Plant** and apparatus directly connected to the **Distribution System**.

DCC1.2 The **Distribution Connection Conditions** (**DCC**) establish certain principles and standards relating to the provision of the connection, method of connection, and technical and performance standards.

DCC1.3 The **DCC** specifies the information to be provided by **Users** to ensure that adequate provision can be made by the **DSO** for new connections or increases in existing load. It also applies to **Generators** who operate in parallel with the **Distribution System**, where a connection is required.

Prospective **Users** shall provide to the **DSO** in good time all the details set out in this section.

DCC1.4 In conjunction with the connection conditions, there are **Connection Agreements**, which are bilateral agreements between the **DSO** and each **User**, and which contain the detail specific to each **User's** connection to and use of the **Distribution System**. The **Connection Agreement** requires the **User** and the **DSO** to comply with the terms of the **Distribution Code**.

DCC2 OBJECTIVE

DCC2.1 The connection conditions define the minimum standards for the method of connection to the **Distribution System** and the technical, design and operational standards to which **Users** connecting to the **Distribution System** shall comply.

DCC2.2 The connection conditions specify the technical arrangements required at the **Ownership Boundary** between the **Distribution System** and the installation of the **User** and is applicable at all voltage levels covered by the **Distribution Code**.

DCC2.3 The connection conditions outline the types of signals and indications that will be required to be made available to the **DSO** by each **User.**

DCC3 SCOPE

DCC3.1 The connection conditions apply to the DSO and to all **Users** connected to or planning a connection to the Distribution System

DCC4 INFORMATION REQUIRED FOR CONNECTION

DCC4.1 For connections at **Low Voltage** it is possible in most cases to assess whether a proposed connection is acceptable, and to determine the necessary supply arrangements, from analysis of the following data:

a) Maximum **kVA** requirements.
b) Type and electrical loading of **Equipment** to be connected, such as number and size of motors, cookers, showers, space and water electrical heating loads and nature of **Disturbing Loads** e.g. welding **Equipment**.
c) The date when connection is required.

If a preliminary examination of this data indicates that more detailed information is reasonably required, then it shall be provided to the **DSO** upon request.

DCC4.2 Information Requirements and timeframes for quotation and connection are provided in *Guide to the Process for connection to the Distribution System (*Item 3, Annex 1). This also contains

references to the application forms that **Users** requiring a connection or extension to the **Distribution System** are obliged to complete. Copies of this document are available on request from the **DSO** or by download from *www.esb.ie/esbnetworks*.

DCC4.3 For connections at **High** and **Medium Voltages** the provisions of **DCC**4.1 also apply. Additionally, the following information may be required as detailed in the **Distribution Data Registration Code (DDRC)** Schedule 5.

a) All Types of Demand

(i) Maximum **Active Power** requirements.
(ii) Maximum and minimum **Reactive Power** requirement.
(iii) Type of load and control arrangements (e.g. type of motor start, controlled rectifier or large motor drives).
(iv) Maximum load on each phase.
(v) Maximum **Harmonic** currents that may be imposed on the **Distribution System**.
(vi) Details of cyclic load variations or fluctuating loads (as below).

b) Disturbing Loads

Comprehensive schedule of installed new **Equipment** including details of **Disturbing Loads**. These are loads which have the potential to introduce **Harmonics**, **Flicker** or **Unbalance** to the system. This could adversely affect the supply quality to other **Customers**. **Disturbing Loads** could be non-linear loads, power converters/regulators and loads with a widely fluctuating **Demand**. The type of load information required for motive power loads, welding **Equipment**, **Harmonic** producing or non-linear loads and generating **Equipment** can be obtained from the **DSO** on request.

In the case of compensating **Equipment** associated with **Disturbing Loads**, details and mode of **Operation** to be provided so as to ensure compliance with emission limits specified in **DCC**6.8.3.

c) Fluctuating Loads

Details of cyclic variation, and where applicable the duty cycle, of **Active Power** (and **Reactive Power** if appropriate), in particular:

(i) The rates of change of **Active Power** and **Reactive Power**, both increasing and decreasing;
(ii) The shortest repetitive time interval between fluctuations in **Active Power** and **Reactive Power**; and
(iii) The magnitude of the largest **Step Changes** in **Active Power** and **Reactive Power**, both increasing and decreasing

DCC4.4 In some cases, more detailed information may be required to permit a full assessment of the effect of the **User's** load on the **Distribution System**. Such information may include an indication of the pattern of build-up of load and a proposed **Commissioning** programme. This information shall be specifically requested by the **DSO** when necessary and shall be provided by the **User** within a reasonable time.

DCC4.5 **Users** shall contact the **DSO** in advance if it is proposed to make any significant change to the connection, electric lines or electric **Equipment**, install or operate any generating **Equipment** or do anything else that could affect the **Distribution System** or require alterations to connection.

DCC4.6 **Users** shall provide to the **DSO** any information reasonably required by the **DSO** about the nature, or use by the **User**, of electrical **Equipment** on the **Users'** premises

DCC5 CONNECTION ARRANGEMENTS

DCC5.1 Connection Voltage

DCC5.1.1 During the application for connection process the **DSO** shall, in consultation with the **User**, specify the voltage level to which a **User** will be connected in accordance with normal practice for the type of load to be supplied and network characteristics.

DCC5.1.2 Generally, the voltage level will be the minimum nominal voltage in standard use on the system, (subject to **DCC**5.1.3), assessed against:

a) Satisfactory **Operation** of the installation
b) Isolation of disturbance from other **Customers**
c) Lifecycle costs
d) Cost of connection

DCC5.1.3 Ongoing development of the **Distribution System** is leading to a newer and more efficient voltage regime. The 10kV nominal system is being converted progressively to 20kV while the 38kV system is being curtailed in favour of the 110kV and 20kV systems. Because of this:

- Connections at 10kV shall have provision for conversion to 20kV at the same time as the local network is being converted.

- The **DSO** shall advise prospective **Customers** at the time of application if there are firm plans to change from 38kV to 110kV or 20kV **Operation** at a future date. In such cases **Customers** shall make provision for such a changeover.

DCC5.1.4 The **DSO** may, on occasion, specify a different connection voltage from normal in order to avoid potential disturbances caused by the **User's** apparatus to other **Users** of the **Distribution System** or for other technical reasons or may agree alternative methods for minimising the effects of **Disturbing Loads**.

DCC5.2 Information provided by DSO

Based on the information provided by the **User** for a connection to the **Distribution System**, the **DSO** shall prepare a statement containing as many of the following elements as are necessary for, or relevant to, the proposed installation:

a) Nominal voltage at which connection will be made
b) Method of connection, extension and / or reinforcement details
c) The normal impedance to source at the point of connection
d) Method of **Earthing**
e) Maximum import capacity
f) Individual **Customer** limits relating to:

   (i) **Harmonic** distortion
   (ii) Voltage **Flicker**
   (iii) **Unbalance**

g) Expected lead time of providing connection (following formal acceptance of terms for supply).
h) Cost of connection

DCC5.3 Ownership Boundaries

DCC5.3.1 The point at which supply is given or taken between the **Distribution System** and **User's** installation shall be agreed between the **DSO** and the **User** as required.

DCC5.3.2 For **LV** supplies the **DSO's** responsibility extends up to the **Customer's Connection Point** which is normally:

a) In major installations:
At the main fuses on the supply side of **Customer's** main **Circuit Breaker**.
b) In single domestic premises at the **Connection Point** of **Customers** tails on the supply side of special isolator.

The *National Code of Practice for Customer Interface* (Item 4, Annex 1) contains the rules for interface connections and **Users** shall comply with its provisions.

DCC5.3.3 For **High Voltage** supplies the ownership boundaries shall be subject to specific agreement between the parties in each case. Changes in the boundary arrangements proposed by either party shall be agreed in advance.

DCC5.3.4 All **Equipment** at the **Ownership Boundary** shall meet the design principles contained in **DPC**4 and **DCC**5. Connections for entry to and exit from the **Distribution System** shall incorporate a means of disconnection of the **User's** installation by the **DSO**.

DCC5.3.5 The respective ownership of **Plant** or apparatus shall be recorded in a written agreement between the **DSO** and the **User** or in diagrammatic form, as required. In the absence of a separate agreement between the parties to the contrary, construction, control, **Operation** and **Maintenance** responsibilities follow ownership.

DCC6 TECHNICAL REQUIREMENTS FOR CONNECTIONS

DCC6.1 Connection Standards

DCC6.1.1 A connection to the **Distribution System** may be by means of an overhead line, an underground cable or a combination of both. The network configuration at the **Connection Point** may take a number of forms suitable to the nature of the load and network arrangements.

DCC6.1.2 All **Equipment** in an installation connected to the **Distribution System** shall be designed, manufactured, tested and installed in accordance with all applicable statutory obligations and shall conform to the relevant **ETCI**, **CENELEC** or **IEC** standards current at the time of the connection of the installation to the **Distribution System**.

DCC6.1.3 If there is no relevant European specification, such other relevant standard which is in common use in the European Union, as current at the date of the **User's** applicable **Connection Agreement**, shall apply. If the **DSO** considers it necessary, however, the **DSO** may notify **Users** that supplemental specifications and / or standards shall be complied with, in which case **User Plant** and apparatus shall so comply.

DCC6.1.4 All **Equipment** in an installation connected to the **Distribution System** shall be suitable for use at the operating **Frequency** of the **Distribution System** and at the voltage and short-circuit rating of the **Distribution System** as shown in Table 4, at the **Connection Point**. The **DSO** may require certification that the **Equipment** has been designed and installed in a satisfactory manner. The **DSO** may also seek evidence that the **Equipment** has been tested for conformance with the standards.

DCC6.1.5 For **Users** connected at **Low Voltage**, installations shall comply with the *National Rules for Electrical Installations* produced by the **ETCI** (Item 14, Annex 1) and any other rules and regulations issued by **ETCI** from time to time. **Users** complying with these rules and regulations shall be deemed to comply with the requirements of the **Distribution Code** as regards design and safety. The **DSO** may seek evidence that the **Equipment** has been tested for compliance with standards.

DCC6.1.6 Before entering into a **Connection Agreement** it will be necessary for the **DSO** to be reasonably satisfied that the **User's** system at the boundary with the **Distribution System** shall comply with the appropriate requirements of the **Distribution Code** and when applicable the *National Code of Practice for Customer Interface*.

DCC6.2 Protection Requirements

DCC.6.2.1 **Users** shall ensure that faults in the **User's Plant** and apparatus do not unreasonably cause disturbances to the **Distribution System** or to other **Users**. Without limiting this obligation, a **User**

shall prior to connection of the **User's** installation to the **Distribution System**, install the **Protection Equipment** specified in **DCC**6.2.4.

DCC6.2.2 Faults on the **Distribution System** can cause damage to **User's Plant** and apparatus. These faults could result in a loss of a phase, over voltage, or under voltage. The **User** shall take account of the established practices of the particular network to which a connection is to be made and ensure that **Protection** installed by the **User** is compatible with that used by the **DSO**. The adequacy of the **Protection** installed by the **User** is the **User's** responsibility.

DCC6.2.3 The **User's Protection** arrangements at the **Ownership Boundary** including types of **Equipment** and **Protection** settings, shall be compatible with existing system conditions and the **Distribution System Protection** practice as specified by the **DSO** at the time of application. In particular

a) The maximum clearance times (from fault current inception to arc extinction) shall be within the limits established by the **DSO** in accordance with **Protection** and **Equipment** short circuit rating policy adopted for the **Distribution System**.

b) In connecting to the **Distribution System,** the **User** should be aware that fast and slow speed automatic reclosing is a feature of power system **Operation**. This is characterised by sudden de/re-energisation of the power supply. Dead times are typically 0.3s, 1s and 10s at **Medium Voltage** and 3s and 60s on 38kV systems. All tripping and high-speed reclosing on the 110kV system is three poles with a dead time of approximately 400mS.

c) **Users** should also be aware that disconnection of one or two phases only of a three phase system may be affected by distribution **Protection** arrangements for certain types of faults.

DCC6.2.4 The minimum **Protection** required for a **User** installation connected to the **Distribution System** will vary according to type, size, method of connection (loop/tail/tee) and **Earthing** of the **User** system. **Low Voltage Customers** shall comply with The *National Code of Practice for Customer Interface* (Item 4, Annex 1). Other **User** installations will vary. It is anticipated that a new connection may require all or some of the following **Protection** facilities:

a) Three phase overcurrent
b) Earth fault **Protection** (suited to the local supply system)
c) Distance
d) Inter-tripping
e) Other

DCC6.2.5 Interface **Circuit Breakers** shall be fitted with relays of a type acceptable to the **DSO**. These relays shall have three phase overcurrent elements and one earth fault element and shall have time-current characteristics complying with standard types A, B and C of **IEC**255. Maximum permissible relay settings at the **Ownership Boundary**, necessary to provide selectivity with the distribution **Equipment**, will be provided by the **DSO**., and these settings may be reviewed at any time in the future by the **DSO**. Distribution **Protection** aims to minimise the impact of faults including **Voltage Dip** duration and must not be adversely affected by the **Customer's Protection** limitations.

a) In order to ensure satisfactory **Operation** of the **Distribution System**, **Protection** systems, operating times, discrimination, and sensitivity at the **Ownership Boundary** shall be agreed between the **DSO** and the **User** during the application for connection process, and may be reviewed from time to time by the **DSO**.

b) In order to cover a **Circuit Breaker**, or **Equipment** having similar function, failing to operate correctly to interrupt fault current on the system, **Back-up Protection** by **Operation** of other **Circuit Breakers** or **Equipment** having a similar function shall normally be provided.

c) Unless the **DSO** advises otherwise, it is not acceptable for **Users** to limit the fault current infeed to the **Distribution System** by the use of **Protection** and associated **Equipment** if the failure of that **Protection** and associated **Equipment** to operate as intended in the

event of a fault, could cause **Equipment** owned by the **DSO** to operate outside its short-circuit rating.

DCC6.2.6 **Protection** relays shall be commissioned on site by the **User** who shall ensure that the settings are below the maximum permitted levels. In certain cases, the **DSO** may wish to witness these tests and it shall be the responsibility of the **User** to ensure that sufficient notice is given to the **DSO** in such cases. **Users** shall ensure that the **Protection** settings remain below the maximum permitted levels. This may require regular testing of the relays.

DCC6.3 Earthing

DCC6.3.1 **Earthing** of the part of the **User's** installation that is connected to the **Distribution System** shall comply with the requirements of **DPC**4.3.

DCC6.3.2 The arrangements for connecting the **User's** installation with earth shall be designed to comply with relevant **ETCI** requirements. For **Medium Voltage Users** and for **High Voltage Users** *Conditions Governing Connection to the **Distribution System**: Connections at MV and 38kV and **Generators** at LV, MV and 38kV* (Item 7, Annex 1) applies.

DCC6.3.3 The method of **Earthing** the **Distribution System**, for example, whether it is connected solidly to earth or through an impedance, shall be advised by the **DSO**. The specification of associated **Equipment** shall meet the voltages which will be imposed on the **Equipment** as a result of the method of **Earthing**.

DCC6.3.4 **Users** shall take precautions to limit the occurrence and effects of circulating currents in respect of neutral points connected with earth where there is more than one source of energy.

DCC6.4 Voltage Regulation and Control

Extensions or connections to the **Distribution System** shall be designed such that they do not prevent the necessary control of voltage on the **Distribution System**. Information on the voltage **Regulation** and control arrangements shall be made available by the **DSO** if requested by the **User**.

DCC6.5 Short-Circuit Levels

DCC6.5.1 The short circuit rating of **User's Equipment** at the **Connection Point** shall not be less than the design **Fault Level** of the **Distribution System** as shown in Table 4 below. The choice of **Equipment** for connection at **Low Voltage** may take into account attenuation in the service lines. The **DSO** shall take into account the contribution to **Fault Level** of the **User's** connected system and apparatus in the design of its system.

Table 4 – SHORT CIRCUIT RATINGS

Connection Voltage	Short Circuit Level (RMS Symmetrical) Normally	Short Circuit Level (RMS Symmetrical) Certain Designated Areas
LV (Domestic)	9.0kA	
LV (Ind/Comm)	37.0kA	
10kV	12.5kA	20kA
20kV	12.5kA	20kA
38kV	12.5kA	20kA
110kV	26.0kA	31.5kA

In certain 220kV/110kV substations at 110kV busbars the design short circuit level is 40kA.

DCC6.5.2 The **User's** incoming supply shall be controlled by the **User's** main **Circuit Breaker** which shall be in accordance with a recognised international standard acceptable to the **DSO**

DCC6.6 Insulation levels

DCC6.6.1 The design of an operators **Equipment** connected to the **Distribution System** shall be such as to enable it to withstand, under test, the AC and impulse (1.2/50 μs) voltages indicated in Table 5 below.

Table 5 – INSULATION LEVELS

Voltage of Equipment	AC Withstand Level	Impulse Level
LV	3kV	
10kV	50kV	125kV
20kV	50kV	125kV
38kV	95kV	250kV
110kV	230kV	550kV

DCC6.7 Capacitive and Inductive Effects

DCC6.7.1 The **User** shall, when applying to make a connection, provide the **DSO** with information as detailed in **DPC**4. Details shall be required of any capacitor banks and reactors connected at **High Voltage**, which could affect the **Distribution System** and which it is proposed to connect if agreed with the **DSO**. When requested by the **DSO**, details shall also be provided of distributed circuit capacitance and inductance. Sufficient detail is required for the following:

a) To verify that controlling **Equipment** of the **Distribution System** is suitably rated;
b) To show that the performance of the **Distribution System** will not be impaired; and
c) To ensure that arc suppression coils on the **Distribution System** neutral are correctly installed and operated.

DCC6.8 Voltage Disturbances

DCC6.8.1 **Users** of the **Distribution System** should not generate voltage disturbances at a level that would affect other **Users**. **Users** should in their own interest select **Equipment** that is capable of functioning satisfactorily in the presence of disturbances at the levels permitted by EN50160.

DCC6.8.2 It is a condition of connection that **Equipment** connected directly or indirectly to the **Distribution System** shall conform to the requirements of EU Directive 89/336/EEC (the EMC Directive) as amended.

DCC6.8.3 Loads and installations shall comply with the following emission limits. Special conditions for **Generators** are outlined in **DCC**10.6.1

a) Voltage Flicker

(i) **Frequency** of occurrence: 0.22 per min – 600 per min

Voltage Level	P_{st}	P_{lt}
38kV, MV, LV	0.7	0.5

P_{st}: Short term **Flicker** severity
– an index of visual severity evaluated over a 10 minute period.

P_{lt}: Long term **Flicker** severity
– an index of visual severity evaluated over a 2 hour period.

(ii) **Frequency** of occurrence: 0.02 per min – 0.22 per min
Magnitude of up to 3% is permitted.

(iii) **Frequency** of occurrence: =< 0.02 per min
Magnitude of up to 5% is permitted.

b) Harmonic Distortion

(i) Individual **Harmonic** Orders:

% **Harmonic** Voltage Distortion
(RMS voltage as a % of RMS value of the fundamental component)

Harmonic Order	LV	MV	38kV
2	0.70	0.50	0.25
3	0.75	0.50	0.25
4	0.70	0.50	0.25
5	2.00	1.00	0.50
6	0.50	0.50	0.30
7	2.00	1.00	0.50
8	0.50	0.50	0.30
9	0.50	0.50	0.25
10	0.50	0.75	0.25
11	1.50	1.50	0.75
12	0.50	0.50	0.30
13	1.50	1.50	0.75
14	0.50	0.50	0.50
15	0.50	0.75	0.25
16	0.75	0.75	0.25
17	0.75	0.75	0.50
18	0.50	0.50	0.25
19	1.00	0.50	0.25

(ii) For **Generators** the Total **Harmonic** Voltage Distortion (THVD) limit is given in the table below:

Voltage Level	% Harmonic Voltage Distortion
LV	2.5
MV	2.0
38kV	1.5

c) Voltage Unbalance

The **Unbalance** caused by the connection of an individual installation shall not exceed 1.3% at the **Point of Common Coupling (PCC)**.

DCC6.8.4 Under fault and circuit switching conditions the rated **Frequency** component of voltage may fall or rise transiently. The rise or fall in voltage will be affected by the method of **Earthing** of the neutral point of the **Distribution System** and voltage may fall transiently to zero at the point of fault. Sections 2 and 3 of EN 50160, as amended from time to time, contains additional details of the variations and disturbances to the voltage which shall be taken into account in selecting **Equipment** from an appropriate specification for installation on or connected to the system.

DCC6.9 Power Factor and Phase Balance

DCC6.9.1 The **Customer** shall take all reasonable steps to operate the **Plant** and the facility to keep the power factor of the total load at the **Connection Point** for imported electricity between 0.90 lagging and unity and for exported electricity between 0.95 lagging and unity.

DCC6.9.2 **DSO** phase balance requirements are covered in EN50160.

DCC7 METERING / TELEMETRY

DCC7.1 The **User** may be required to provide such voltage, current, **Frequency**, **Active Power** and **Reactive Power** pulses that are considered necessary by the DSO to ensure adequate system monitoring. Details will be specified in the **User**'s Connection Agreement.

DCC7.2 **Centrally Dispatched Users** shall provide signals to the **TSO** as required by the **Grid Code**.

DCC7.3 If it is agreed between the **DSO** and the **User** that the **DSO** shall control the switchgear on the **User's** system, the **DSO** shall install the necessary telecontrol outstation. Notwithstanding the above, it shall be the responsibility of the **User** to provide the necessary control interface for the switchgear of the **User** which is to be controlled.

DCC7.4 Metering principles applying to certain **Users** connected to the **Distribution System** are specified in the Metering Code.

DCC7.5 Specific metering arrangements depend on the load type, size and nature of the installations being connected. A consensus document has been agreed between the **DSO** and Consultants / Contractors Associations and this comprises the *National Code of Practice for Customer Interface* (Item 4, Annex 1).

DCC7.6 Personnel carrying out design or installation work for the **Customer** / operator interface with the **DSO** should familiarise themselves with and work to this code. Unusual situations may arise which are not covered by the code. In such circumstances the **DSO** will be available to deal with queries.

DCC8 SPECIFIC ARRANGEMENTS

DCC8.1 The specific arrangements for connection, including substation layout requirements, **User Equipment** and tariffs and metering are set out clearly in a number of documents. Annex 1 contains a list of these documents which are available from the **DSO** on request of the **User** or by download from *www.esb.ie/esbnetworks*. **Users** must comply with the provisions of the documents relevant to their installations.

a) *Conditions for Connection to the Distribution System* and *General Conditions for Connection of Industrial and Commercial Customers and Generators to the Distribution System* (Items 5 & 6, Annex 1)
b) *Conditions Governing Connection to the Distribution System: Connections at MV and 38kV and Generators at LV, MV and 38kV* (Item 7, Annex 1)
c) *General Specification for MV Substation Buildings (Spec. No.13320)* (Item 8, Annex 1)

DCC8.2 Service standards relating to **Low Voltage** (230 / 400V) supplies are covered in:

a) *Customer Charter* - ESB Networks Ltd. (Item 2, Annex 1)

The rules for **Low Voltage** supplies are published in somewhat greater detail in three other documents:

b) *Conditions for Connection to the Distribution System* and *General Conditions for Connection of Industrial and Commercial Customers and Generators to the Distribution System* (Items 5 & 6, Annex 1)
c) *Domestic Supply: Procedures and Conditions for Supply to New House from Overhead Networks* (Item 9, Annex 1)
d) *Domestic Supply: Specification of Requirements for Supply to Housing Schemes*. (Item 10, Annex 1)

Please note that all the documents referred to in **DCC**8 are subject to updating and change. At the time of any proposed new connection, only the up-to-date versions of these documents should be used.

DCC9 ADDITIONAL REQUIREMENTS FOR ALL 110kV CONNECTED USERS

DCC9.1 Plant Designations

DCC9.1.1 The name of the **User** site shall be designated by the **User** and subsequently approved by the **DSO**.

DCC9.1.2 The designation and proposed nomenclature of **User Plant** and apparatus connected to **Distribution System** shall be in accordance with the **DSO** standard practice which, in particular, is designed to ensure that designation and nomenclature avoids confusion. The **User** shall notify the designation and proposed nomenclature of **Users**' **Plant** and / or apparatus to the **DSO** who may, if the **DSO** determines that such proposed designation may lead to confusion or does not conform to the **DSO** standard practice, notify a substitute designation which shall apply to such **User Plant** and / or apparatus.

DCC9.1.3 The **DSO** standard practice currently requires that, unless otherwise agreed with the **DSO**, the standards outlined in schedule 6 shall apply.

DCC9.1.4 Every **User** shall be responsible for the provision, erection and **Maintenance** of clear and unambiguous labelling showing the designation and nomenclature of its **Plant** and apparatus at the **User** site.

DCC9.2 Earthing

DCC9.2.1 The **Earthing** of all **Users Plant** and apparatus and provision of an **Earthing** system shall as a minimum requirement be in accordance with the recommendation contained in the *Guide for Safety in Alternating Current Substations*, ANSI/IEEE No. 80 1986

DCC9.2.2 The **DSO** shall consult with each **User** regarding the specification of the **Earthing** grid to be provided.

DCC9.2.3 Each **User's** earth disconnects must be earthed directly to the main station earth grid.

DCC9.2.4 The **User** will be obliged to certify (by a competent body) that the remote earths have been **Isolated** from the **User's** site plus any other affected third party sites and that adequate precautions shall be taken by the **User** to ensure that dangerous grid potential rises are not transferred outside the **Earthing** zone. The distribution station cannot be energised until this certification has been received by the **DSO**.

DCC9.2.5 Each **User's Earthing** system shall be bonded to the distribution station earth grid so that both **Earthing** systems are effectively integrated.

DCC9.3 Design

DCC9.3.1 **User Plant** and apparatus shall be designed with the following minimum capabilities:

Parameter (minimum)	**mm**
Clearance outdoor in air of live metal parts phase to earth	1100
Height of live parts above pedestrian passageways	3400
Height of bottom of unscreened live bushings above ground	2300
Height of live conductors above roadways	8000

DCC9.3.2 LV Cables and Wiring

DCC9.3.2.1 All multi-core control and **Protection** cables shall be provided with a suitable metallic screen. Facilities for **Earthing** these screens at the base of cabinets shall be provided.

DCC9.3.2.2 **LV** supply cable and auxiliary wiring shall be routed from the distribution station to each **User's** control building through a mutually agreed cable corridor. The cables will be laid in concrete troughs with reinforced concrete covers, or as mutually agreed, to the **User's** Marshalling rack, which will be situated near the distribution station.

DCC9.3.3 Locking

DCC9.3.3.1 The facility to lock in the open/closed position and interlocking facilities shall be provided by each **User** on appropriate disconnects and / or **Circuit Breakers** (with withdraw facilities) in order to ensure that the incoming feeder(s) to the facility can be safely **Isolated** when required by the **DSO**. The specific details of this requirement will be outlined at the design phase.

DCC9.3.4 110kV Step-up Transformers

DCC9.3.4.1 **Generators** shall provide on-load tap-changing (OLTC) facilities for all **Generator** transformers. **Demand User** are advised to provide on-load tap-changing (OLTC) facilities for all 110kV step-up transformers. All **Users** shall liaise with the **DSO** on the design specification for the performance of the tap-changing facility on 110kV connecter transformers.

DCC9.3.4.2 **Generator** transformer windings shall be connected in star (with the star point or neutral brought out) on the **High Voltage** side and in delta on the **Low Voltage** side.

Other 110kV step-up transformers may be connected either:

a) In delta on the **Low Voltage** side and in star (with the star point or neutral brought out) on the **High Voltage** side; or
b) In star on both **High** and **Low Voltage** sides with a delta tertiary winding provided.

DCC9.3.4.3 Provision should be made for the **Earthing** of the neutral of each transformer connected to the 110kV system by bringing out the neutral and ensuring that the insulation is such that the transformer can be operated unearthed.

DCC9.3.4.4 The **DSO** will provide the facility for the tripping of the 110kV step-up transformer **HV Circuit Breaker** from the **User's** transformer **Protection**.

DCC9.4 User Protection

DCC9.4.1 Every **User** shall, acting in accordance with **Good Industry Practice**, be responsible, insofar as is reasonably practicable, for ensuring that faults on **Plant** and apparatus cause minimal disturbance to the power system. Faults on **Plant** and / or apparatus connected to the **Distribution System** should be cleared as soon as possible with no deliberate time delay introduced and, in any event, should be cleared within a maximum time of 120 milliseconds on the 110kV system.

DCC9.4.2 In order to ensure the secure **Operation** of the **Distribution System** and correct co-ordination and discrimination between faults on the **Transmission System** and **Distribution System** and the **User's** system, settings for the **User's Protection** systems that may have an **Operational Effect**, shall be notified to the **DSO** and it will be necessary for the **DSO** to, and the **DSO** may, prohibit the settings of some **User Protection** systems within certain ranges. **Protection** system where such limitations will apply include, but are not limited to:

a) **Generation Unit** under-frequency, over-current or distance **Protection**;
b) Transformer over-fluxing, over-current or distance **Protection**
c) Loss-of-mains **Protection**

A mechanism for the notification and where applicable approval and determination, of such settings will be set out in the **User's Connection Agreement** or other agreements.

DCC9.4.3 The **DSO** shall provide the **User** the information and signals necessary for the interface co-ordination and **Operation** of the **User's Protection**, in accordance with the relevant provisions of the **Connection Agreement**, other agreements and **DCC**9.3.4.4.

DCC9.4.4 Where it is feasible to do so **DSO** shall provide **Circuit Breaker** fail **Protection** on Grid **Connection Point Circuit Breakers** installed in new 110kV stations.

DCC9.5 Power Quality

DCC9.5.1 **Users** shall ensure that their connection to the **Distribution System** does not result in the level of distortion or fluctuation of the supply voltage on the **Distribution System**, at the **Connection Point**, exceeding that allocated to them following consultation with the **DSO**. Distortion and fluctuations limits are outlined in **IEC**/TR3 61000-3-6 (**Harmonics**) and **IEC**/Tr3 61000-3-7 (**Voltage Fluctuation**). **Users** shall operate their **Plant** in a manner which will not cause the requirements contained in **CENELEC** standard EN 50160 to be breached.

DCC9.6 Signals to be provided by the User

DCC9.6.1 Each **User** shall provide such signals and indications in relation to the **User's Plant** and apparatus as are required by the **DSO** (acting reasonably) in accordance with the **Connection Agreement**.

DCC9.6.2 Signals and indications required to be provided by **Users** will include but shall not be limited to the following:

a) **LV** switchgear positions to the status of each 110kV connected transformer through a set of two potential free auxiliary contacts (one contact open and one contact normally closed when the **Circuit Breaker** is open) for each **Circuit Breaker**;
b) kV at transformer **Low Voltage** terminals; and
c) A minimum of four sets of normally open potential free auxiliary contacts in each transformer **LV** bay for fault indication.

d), e), f), g) and h) are applicable to **Generators** only:

d) **MW** and +/-**MVAr** at alternator terminals of each **Generation Unit**;
e) kV at **Generator** transformer **LV** terminals
f) **Generator** transformer tap position
g) Measured or derive **MW** output on each fuel, from **Generation Units** that can continuously fire on more than one fuel simultaneously; and
h) Where it is agreed between the **DSO** and the **Generator** that signals are not available on the **HV** terminals, +/-**MW** and +/-**MVAr** shall be provided at the 110kV connecter transformer **Low Voltage** terminals.
i) Status of governor control system and any load limiters.

j) and k) are applicable to **Demand Customers** only:

j) **MW** and +/- **MVAr** at the **HV** terminals of the 110kV step-up transformer.
k) 110kV connecter transformer tap position.

DCC9.6.3 Where signals or indications required to be provided by the **User** under **DCC**9.6.2 become unavailable or do not comply with applicable standards due to failure of the **User's** technical **Equipment** or any other reason under the control of the **User**, the **User** shall, acting in accordance with **Good Industry Practice**, restore or correct the signals and / or indications as soon as possible.

DCC9.6.4 Signals to be provided to the **User** shall be presented in such form as is nominated by the **DSO** or **TSO** where appropriate.

DCC9.6.5 Where, the **DSO**, acting reasonably, determines that because of a modification to the **Distribution System** or otherwise to meet a **Distribution System** requirement, additional signals and / or indications in relation to the **User's Plant** and apparatus are required, the **DSO** shall notify that requirement to the **User**. On receipt of such a notification the **User** shall promptly, and in accordance with **Good Industry Practice**, ensuring that such signals and / or indications are made available at the relevant marshalling rack.

DCC9.7 Power Supplies

DCC9.7.1 Each **User** shall provide:

a) 400V / 230V AC power supplies as required by the **DSO** for distribution station facilities, the capacity and detail of which shall by specified by the **DSO** and provided for in the **User's Connection Agreement**.

b) A standby supply for all ac power supplies for distribution station facilities by a diesel **Generator**, unless alternative means are agreed with the **DSO**, such agreement not to be unreasonably withheld. In the event of loss of mains, standby supplies shall be capable of being sustained for a minimum of 10 hours.

DCC9.8 Commissioning and Notification

DCC9.8.1 The **DSO** and the **User** shall, in accordance with the provisions set out in the **Connection Agreement**, meet to discuss **Commissioning**, including **Commissioning** tests and **Grid Code** tests. The **User's** obligations in relation to testing set out in this **DCC**9.8 are in addition to the requirements under the **Connection Agreement**.

DCC9.8.2 **Users** are required to carry out such tests (which are defined to be **Grid Code** tests) as required in order to confirm that the **User's Plant** and apparatus meets all requirements of the **Grid Code** which must be met prior to operational date. The **DSO** may, under the **Connection Agreement**, notify to the **User** such **Grid Code** tests as it requires the **User** to carry out. The **DSO** may not necessarily test for **DCC**9.10.1.1 a), b), c), d) and e) but reserve the right to test to establish design and operational compliance. For the avoidance of doubt, it is the responsibility of **Users** at all times to ensure their compliance with the **Grid Code** and testing successfully or otherwise shall not in any way diminish or reduce such responsibilities.

DCC9.8.3 Where **Commissioning** is likely to involve a requirement for a **Dispatch** for test purposes, the **User** shall, as soon as possible, notify the **TSO** of this requirement, including reasonable details as to the duration and type of testing required. **Users** shall give the **TSO** reasonable advance notice (being not less than fifteen (15) business days) of the time of carrying out of the **Commissioning** tests. The time and date of such **Commissioning** shall be reconfirmed not less than three (3) business days before the time of carrying out such tests. In the event that, having given such confirmation the **User** (acting reasonably) determines that such tests must be carried out prior to the time and date previously confirmed, then provided the **User** gives the **TSO** reasonable notice of the re-scheduled tests, the **User** shall not be deemed to have failed to give the notice required. The **User** shall as soon as it becomes aware of the same, subsequently notify the **TSO** of any material changes in the requirement and details so notified.

DCC9.8.4 The information provided under **DCC**9.8.3 is for indicative purposes only, and the **User** shall subsequently make a formal request to the **TSO** for a **Commissioning** test requiring a **Dispatch** in accordance with the following provisions of the **DCC**9.8, and shall not carry out such a **Commissioning** test except as **Dispatched** in accordance with **DCC**9.8.

DCC9.8.5 Commissioning Test

DCC9.8.5.1 **Users** shall make a request in writing to the **TSO** for every **Commissioning** test requiring **Dispatch**, in accordance with **DCC**9.8.4. Such request to include the following information:

DCC9.8.5.2 Details of the proposed **Commissioning** test;

DCC9.8.5.3 **Dispatches**, where necessary, required by the **User** for completion of the **Commissioning** test, if any, including the duration of the **Dispatch**. Where the **User** may not know the entire **Dispatches** required for completion of the test until part of the test is completed then the **User** when proposing the test shall:

a) Divide the **Commissioning** test in sections as appropriate;
b) Indicate and discuss which sections of the **Commissioning** tests can be completed in stages and which cannot;

c) Indicate possible variations of the **Commissioning** test for the sections which be completed in stages.

Additionally, the factors which influence the completion of the stages should be outlined to the **TSO**, (namely, if the procedure to be followed for a certain stage depends on the outcome of a previous stage);

DCC9.8.5.4 The preferred time or times for the **Commissioning** test.

DCC9.8.5.5 The milestones for individual sections of **Commissioning** test (if any) which can be completed separately, and / or do not require to be repeated if the **Commissioning** test is interrupted by the **TSO** after the completion of each section.

DCC9.8.6 **Generators** will be subject to the **Scheduling** and **Dispatch Codes** a minimum of seven (7) days prior to the operational date and the **Generation Unit** will be available for **Dispatch** from the operational date.

DCC9.8.7 Following the connection date but not later that the operational date **Users** shall verify (by giving the **TSO** such evidence as it may reasonably require including, without limitation, the results of the relevant **Commissioning** test or **Grid Code** test) technical data provided under the Planning Code and other technical data which the **TSO** reasonably requires to be verified to assess the compliance with the **Grid Code** or the **Connection Agreement**.

DCC9.8.8 The values as confirmed or verified under **DCC**9.8 shall be included in the **User's** registered operating characteristics and **Registered Data**.

DCC10 GENERAL REQUIREMENTS FOR GENERATORS

DCC10.1 Introduction

DCC10.1.1 **Distribution Connection Code** 10 (**DCC**10) is applicable to all existing or prospective **Generators**, including **Customers** with **CHP**, **Customers with Auto-production** and **Generators** using renewables or alternative sources of energy who are connected to the **Distribution System**. **Customers** with stand-by **Generators** who are connected to the **Distribution System** must comply with clause **DCC**10.9.

DCC10.1.2 In addition to meeting the requirements of **DCC**10, **Generators** shall also comply with the requirements of the general conditions, the Planning Code, the connection conditions and other relevant sections of the **Distribution Code**. **Generators** that are subject to **Central Dispatch** shall additionally have to comply with relevant sections of the **Grid Code**.

DCC10.1.3 If existing **Generating Plant** does not comply with the standards set down in, or cannot comply (for technical or economic or other reasons) with, the requirements of this section, they shall seek a derogation from the provision from the **Commission for Regulation of Utilities** .

DCC10.1.4 The **Generator** shall initiate discussions at a sufficiently early stage in design to allow the **DSO** to examine the impact of the **Generating Unit(s)** on the **Distribution System**.

DCC10.1.5 The **DSO** may refuse permission for the connection of a **Generating Unit** at a point on the **Distribution System** or require revision to design or technical parameters of the **Generation Unit**, or impose certain restrictions in order to ensure that security and quality of supply standards as specified in **DPC**4 are maintained. In such instances, the **DSO** shall provide sufficient supporting information to justify the refusal or the required revisions.

DCC10.1.6 Requirements for **RfG Generation Units** will be considered based on the **Registered Capacity**, as categorised in Table 6.

Table 6

Type	Registered Capacity
A	800W up to 0.09MW
B	0.1MW up to 4.9MW
C	5MW up to 10MW
D	Greater than 10MW

(Note all generation connected at 110 kV or higher is automatically considered as Type D)

DCC10.2 Specific Rules for Generators

DCC10.2.1 The integrity of the **Distribution System** and the security and quality of supply to existing **Users** shall not fall below standard as a result of **Generators** operating in parallel (synchronised) with the **Distribution System**. Conditions for **Operation** shall guarantee the safety of:

- Members of general public
- Personnel
- Distribution **Equipment**

Supply quality to other **Customers** shall not fall below standard as a result of the presence or **Operation** of **Generating Units**.

DCC10.2.2 **Generating Units** connecting to the **Distribution System** and operating in parallel with, or which are capable of being operated in parallel with the **Distribution System** shall comply with *Conditions Governing Connection to the **Distribution System**: Connections at MV and 38kV and **Generators** at LV, MV and 38kV* (Item 7, Annex 1). This document sets out the conditions to which **Generating Units** operating in parallel to the **Distribution System** shall comply.

DCC10.2.3 **Protection** conditions and requirements set down in *Conditions Governing Connection to the **Distribution System**: Connections at MV and 38kV and Generators at LV, MV and 38kV* (Item 7, Annex 1) are to protect the **Distribution System**. The **Generator** is responsible for **Protection** of their personnel and **Equipment** and the efficient **Operation** of their **Generating Unit**.

DCC10.2.4 Where a **Generator Unit** is to be installed in a premises the **DSO** shall be informed. The **DSO** shall have the right to inspect generating installations to ensure that the requirements are met. In some cases, the **DSO** may require a demonstration by **Operation** of the **Generator**. Such demonstrations shall be by agreement with the **User**.

DCC10.3 Provision of Information

DCC10.3.1 Information required from Generators

Generators shall apply and provide to the **DSO**, via the application form process, information on the **Generating Plant** and the proposed interface arrangements between the **Generating Plant** and the **Distribution System**. The information required by the **DSO** before entering into an agreement to connect any **Generating Plant** to the **Distribution System** is shown below and is detailed in Schedules 1 (a), 1 (b) and 1 (c) in the **Distribution Data Registration Code (DDRC)**.

a) Generating Plant Data:

(i) Terminal Volts(kV)
(ii) Rated **kVA**
(iii) Rated kW
(iv) Maximum **Active Power** sent out (kW), **Reactive Power** requirements (kVAr)
(v) Type of **Generating Plant** – synchronous, asynchronous, etc.
(vi) Type of prime mover;
(vii) Anticipated operating regime of generation e.g. continuous, intermittent, peak lopping;
(viii) **Fault Level** Contribution – a calculation sheet showing the fault current available from the **Generators** due to a metallic three-phase short circuit at the main incoming **Circuit Breaker** when all the **Generators** are operating. Account should be taken of any large motors in the installation (ref: **IEC** 909).
(ix) Method of voltage control
(x) **Generator** transformer details, as applicable; and
(xi) Requirements for Top-up Supplies and / or Standby Supplies

Details will also be required on the following parameters:

(i)	Inertia Constant	**MW** secs/**MVA** (whole machine)
(ii)	Stator resistance	
(iii)	Direct Axis Reactance	Sub-transient Transient Synchronous
(iv)	Time Constants: Direct Axis	Sub-transient Transient
(v)	Zero Sequence	Resistance Reactance
(vi)	Negative Sequence	Resistance Reactance
(vii)	**Generator** Transformer	Resistance Reactance **MVA** Rating Tap Arrangement Vector Group **Earthing**

b) Other Plant and Equipment Details:

A comprehensive schedule of installed new **Equipment** including details of **Disturbing Loads** as per **DCC**4 is required.

c) Interface Arrangements:

(i) The means of synchronisation between the **DSO** and **User**;
(ii) Details of arrangements for connecting with earth that part of the **Generating Plant** directly connected to the **Distribution System**;
(iii) The means of connection and disconnection which are to be employed; and
(iv) Precautions to be taken to ensure the continuance of safe conditions if any earthed neutral point of the **Generators** system operated at **High Voltage** become disconnected from earth.

DCC10.3.2 The details of information required will vary depending on the type and size of the **Generating Unit** or the point at which connection is to be made to the **Distribution System**. This information shall be provided by the **Generator** at the reasonable request of the **DSO**.

DCC10.3.3 The **DSO** will use the information provided to model the **Generator Unit** to determine a technically acceptable method of connection. If the **DSO** reasonably concludes that the nature of the proposed connection or changes to an existing connection requires more detailed analysis, then further information than that specified in **DCC**10.3.1 may be required.

DCC10.3.4 Additional information may be required from **Generators** larger than 2**MW** or connected at a voltage level above 20kV. This may include:

a) Technical Data

(i) **Generating Plant** information (impedance per unit on rating)

Type of prime mover
Rated **MVA**
MW
Type of excitation system

(ii) Automatic Voltage Regulator (**AVR**)

- A block diagram for the model of the **AVR** system including the data on the gains, forward and feedback gains, time constraints and voltage control limits.

(iii) Speed governor and prime mover data

- A block diagram for the model of the **Generating Plant** governor detailing the governor flyball, if applicable, and system control and turbine rating.

(iv) **Generator** excitation system

b) Capacity and standby requirements

(i) **Registered Capacity** and minimum generation of each **Generating Unit** and **Power Station** in **MW**.
(ii) **Generating Unit** and **Power Station** auxiliary **Demand** (**Active** and **Reactive Power**) in **MW** and **MVAr**, at **Registered Capacity** conditions.
(iii) **Generating Unit** and **Power Station** auxiliary **Demand** (**Active** and **Reactive Power**) in **MW** and **MVAr**, under minimum generation conditions.

DCC10.3.5 In normal circumstances the information specified above will enable the **DSO** to assess the connection requirements. Occasionally additional information may be required. In such circumstances, the information shall be made available by the **Generator**, at the reasonable request of the **DSO**.

DCC10.4 Information Provided by the DSO

DCC10.4.1 The **DSO** shall prepare a statement as per **DCC**5.2. for **Generators** applying for connection to the **Distribution System**.

DCC10.4.2 Where **Generator** paralleling or power export is intended the following additional information shall be provided including:

a) Interface **Protection** settings
b) **Equipment**, cabling, switchgear, metering requirements
c) Substation site and building requirements (dimensions, access, planning permission, **Earthing**, lighting and heating)

DCC10.5 Technical Requirements

DCC10.5.1 **Generating Plant** Performance Requirements

a) All **Centrally Dispatched Generating Units** shall comply with the relevant sections of the **Grid Code**;

b) For **Generators** not subject to **Central Dispatch** the electrical parameters to be achieved at the **Generating Unit** terminals shall be specified by the **DSO** with the offer for connection;

c) **Protection** associated with **Generating Plant** shall be required to co-ordinate with the **Distribution System Protection** regarding:

(i) Clearance times for fault currents
(ii) Co-ordination with auto-recloser requirements
(iii) **Protection** settings of the controlling **Circuit Breaker**

Protection settings shall not be changed without agreement from the **DSO**.

These **Protection** requirements are additional to normal interface **Protection** requirements of the **User**;

d) The emission limit for **Voltage Fluctuations** and **Flicker** at the **PCC** caused by switching or continuous **Operation** of wind / wave turbine installations is P_{st} = 0.35 and P_{lt} = 0.35 where:

P_{st}: Short term **Flicker** severity
– an index of visual severity evaluated over a 10 minute period.

P_{lt}: Long term **Flicker** severity
– an index of visual severity evaluated over a 2 hour period.

These values are consistent with **IEC** 1000-3-7;

e) For **Generators** the Total **Harmonic** Voltage Distortion (THVD) limit is given in the table below:

Voltage Level	Total Harmonic Voltage Distortion (%)
LV	2.5
MV	2.0
38kV	1.5

A schedule of individual **Harmonic** distortion limits shall be provided by the **DSO** where appropriate;

f) The maximum voltage at the **Connection Point** with a **Generator** is as per Table 7.

Table 7 – MAXIMUM VOLTAGE AT CONNECTION POINT WITH GENERATORS

Nominal voltage	Highest voltage
230V	253V
400V	440V
10kV	11.3kV
20kV	22.5kV
38kV	43.8kV
110kV	120kV

g) Each Generation Unit shall, as a minimum, operate continuously at normal rated output at the **Distribution System** Frequencies in the range of 49.5Hz to 50.5Hz. This requirement does not apply for Automatic **Mains Failure Mode** or **Lopping Mode** connections;

h) Each Generation Unit shall, as a minimum, remain synchronised to the **Distribution System** at **Distribution System** Frequencies within the range of 47.5Hz and 52.0Hz for a duration of 60 minutes. This requirement does not apply for Automatic **Mains Failure Mode** or **Lopping Mode** connections;

i) Each Generation Unit shall, as a minimum, remain synchronised to the **Distribution System** at **Distribution System** Frequencies within the range of 47.0Hz and 47.5Hz for a duration of 20 seconds required each time the **Frequency** is below 47.5Hz. This requirement does not apply for Automatic **Mains Failure Mode** or **Lopping Mode** connections;

j) Each Generation Unit shall, as a minimum, remain synchronised to the **Distribution System** during a **Rate of Change of Frequency** of values up to and including plus or minus 1.0 Hz per second measured as a rolling average over 500 ms. **Voltage dips** may cause localised **Rate of Change of Frequency** values in excess of 1 Hz per second for short periods, and in these cases, the clause **DCC**10.5.1(l) supersedes this clause (**DCC**10.5.1(j)). The **DSO** may require lower or higher values to be used for **Protection** settings. This requirement does not apply for Automatic **Mains Failure Mode** or **Lopping Mode** connections;

k) Each Generation Unit shall, as a minimum, remain synchronised to the **Distribution System** at normal rated output at **Distribution System** voltages within the ranges in Figure 13 for **Step Changes** in the **Distribution System** voltage of up to 10%. This requirement does not apply for generator less than 100kW, Automatic **Mains Failure Mode** or **Lopping Mode** connections;

l) Each Generation Unit shall, as a minimum, rremain synchronised during **Voltage Dips** at the **HV** terminals of the **Generator** transformer of 95% of nominal voltage (5% retained) for a duration of 150 milliseconds and remain synchronised during **Voltage Dips** at the **HV** terminals of the **Generator** transformer of 50% of nominal voltage (50% retained) for a duration of 450 milliseconds. This requirement does not apply for generators less than 100kW, Automatic **Mains Failure Mode** or **Lopping Mode** connections;

DCC10.5.2 **RfG Generation Units** shall also meet the following technical requirements.

m) Each **PGM** shall, as a minimum, remain synchronised to the **Distribution System** at **Distribution System Frequencies** within the ranges and time periods specified in in Table 8. This requirement does not apply for **Automatic Mains Failure Mode** or **Lopping Mode** connections.

Table 8

Frequency Range	Time Period
47 – 47.5 Hz	20 seconds
47.5 – 48.5 Hz	90 minutes
48.5 – 49 Hz	90 minutes
49 – 51 Hz	Unlimited
51 – 51.5 Hz	90 minutes
51.5 – 52 Hz	60 minutes

n) For each **PGM** the maximum admissible **Active Power** reduction from **Registered Capacity** with falling frequency shall be no greater than;

- Steady State Domain: 2% of the **Registered Capacity** at 50 Hz, per 1 Hz frequency drop, below 49.5 Hz; and
- Transient Domain: 2% of the **Registered Capacity** at 50 Hz, per 1 Hz frequency drop, below 49 Hz.

For **PGMS** using gas as a fuel source at the time of the Low Frequency Event, the standard ambient conditions for the measurement of admissible Active Power reduction will be 10°C, 70 % relative humidity and 1013 hPa.

o) Type A, B & C **PGM**s shall be capable of connecting automatically to the network once the maximum admissible gradient of increase in power is no greater than 10% of Pmax per minute.

p) For **DSO** type C & D **PGM**s, following a request from the **DSO**, a responsible operator shall be present at the **Connection Point** without undue delay and in any case within 1 hour and shall be capable of taking any required appropriate actions. The responsible operator shall be contactable 24 hours a day, 365 days a year.

q) Type B **PGM**s, shall be equipped with an interface (input port) in order to be able to reduce active power output following an instruction at the input port. **DSO** to specify requirements for further equipment to allow active power output to be remotely operated in due time for plant design.

DCC10.5.3 **RfG Generation Units** shall also meet the following technical requirements, the specifics of which will be dealt with on a case by case basis.[1]

r) Type C & D **PGM**s shall be equipped with a facility to provide fault recording and monitoring of dynamic system behaviour. This facility shall record voltage, active power, reactive power & frequency. The **DSO** in coordination with the **TSO** shall have the right to specify quality of supply parameters to be complied with on condition that reasonable prior notice is given. The settings of the fault recording equipment, including triggering criteria and the sampling rates shall be agreed between the **Generator** and **DSO** in coordination with **TSO**. It shall also include an oscillation trigger specified by the **DSO** in coordination with the **TSO**, with the purpose of detecting poorly damped power oscillations. This requirement will need to be implemented on a site-specific basis. The facilities for quality of supply and dynamic system behaviour monitoring shall include arrangements for the **Generator**, **DSO** and **TSO** to access the information. The communications protocols for recorded data shall be agreed between the **Generator**, **DSO** and **TSO**.

s) For type C & D **PGM**s, with regard to the installation of devices for system operation and devices for system security, if the **DSO** or **TSO** considers that it is necessary for a **Generator** to install additional devices in order to preserve or restore system operation or security, the **DSO** or **TSO** and **Generator** shall investigate that matter and agree on an appropriate solution.

t) Type C & D **PGM**s shall be capable of disconnecting automatically from the **Distribution System** in order to help preserve system security or to prevent damage to the **Generation Unit**. The Generator and the **DSO** or **TSO** shall agree on the criteria for detecting loss of angular stability or loss of control.

DCC10.6 Islanding

DCC10.6.1 It is conceivable that a part of the **Distribution System**, to which **Generators** are connected can, during emergency conditions, become detached from the rest of the system. The **DSO** may decide, dependent on local network conditions, if it is desirable for the **Generators** to continue to generate onto the islanded **Distribution System**.

[1] These requirements will be highly dependent on the type of **Generating Unit**, location of the connection etc.

DCC10.6.2 If not facilities exist for the subsequent resynchronisation with the rest of the **Distribution System** then the **Generator** shall under **DSO** instruction ensure that the **Generating Plant** is disconnected for resynchronisation.

DCC10.6.3 Under emergency conditions there is an expectation that some generation will continue to operate outside the statutory **Frequency** limits. However, for **Generators** connected to the **Distribution System** it is likely that this could mean connection within an automatic low **Frequency** load disconnection zone. Consequently, **Generators** should ensure that all **Protection** on **Generating Plant** should have settings to co-ordinate with those on the low **Frequency** load disconnection **Equipment** which will be detailed by the **DSO** on request.

DCC10.7 Black Start Capability

DCC10.7.1 **Generators** shall notify the **DSO** if its **Generating Plant** has a restart capability without connection to an external power supply, unless the **Generator** has previously notified the **TSO** accordingly under the **Grid Code**.

DCC10.8 Generating Plant Commissioning Tests

DCC10.8.1 Where the **Generating Plant** requires connection to the **Distribution System** in advance of the **Commissioning** date, for the purposes of testing, the **Generator** shall comply with the requirements of the **Connection Agreement**. The **Generator** shall provide the **DSO** with a **Commissioning** programme, approved by the **DSO** if reasonable in the circumstances, to allow **Commissioning** tests to be co-ordinated.

DCC10.9 Standby Generators

DCC10.9.1 Parallel **Operation** with the **Distribution System** is generally not permitted for standby **Generators**. Specific agreement of the **DSO** is required for parallel **Operation**.

DCC10.9.2 **Customers** with standby generation shall ensure that any part of the installation supplied by the **Generating Plant** has first been disconnected from the **Distribution System** and remains disconnected while the **Generating Plant** is connected to the installation. Methods of changeover and interlocking shall meet these requirements. See *National Rules for Electrical Installations,* Part 3.7 “Supplementary Requirements for **Low Voltage** synchronous **Generator** installations” (Item 15, Annex1).

DCC10.9.3 **Low Voltage Generating Units** must comply with the relevant requirements published by the **ETCI** and the *National Code of Practice for Customer Interface* (Item 4, Annex 1). **Medium** and **High Voltage** standby **Generating Units** are rare and requirements shall be provided by the **DSO** on application.

DCC10.10 Additional Requirements for 110kV Connected Generators > 2MW

DCC10.10.1 Operational Requirements

DCC10.10.1.1 Each **Generation Unit** shall, as a minimum, have the following capabilities:

a) Sustained **Operation** at the specified minimum generation within the range 49.8 to 50.1Hz;

b) Sustained **Operation** in accordance with the **Reactive Power** capability as required by **DCC**11.11.2 at **Distribution System** voltages within the ranges specified in **DPC**4.2.2, unless otherwise specified.

c) Remain synchronised to the **Distribution System** during a negative phase sequence load **Unbalance** in accordance with **IEC** 60034-1.

d) **Minimum Load** Not greater than 50% of **Registered Capacity** for **CCGT Installations** and not greater than 35% of **Registered Capacity** for all other **Generation Units**.

e)	**Ramp up capability**	Not less than 1.5% of **Registered Capacity** per minute when the unit is in the Normal **Dispatch** Condition.
f)	**Ramp down capability**	Not less than 1.5% of **Registered Capacity** per minute when the unit is in Normal **Dispatch** Condition.
g)	**Minimum up-time**	Not greater than 4 hours for thermal units
h)	**Minimum down-time**	Not greater than 4 hours for thermal units
i)	Forbidden Zones	Within the range between normal **Minimum Load** plus 5% and **Registered Capacity** less 10%, not more than 2 specified zones each not greater than 10% of **Registered Capacity**.
j)	Block Loading	Not greater than 10% of **Registered Capacity**
k)	Time off-load before going into longer standby conditions	Remain in a hot condition for at least 12 hours and remain in a warm condition for at least 60 hours.
l)	Time to Synchronise (from instruction)	Hot: Not greater than 3 hours Warm: Not greater than 8 hours Cold: Not greater than 12 hours
m)	(i) Time from Synchronising to **Minimum Load**	Hot: Not greater than 40 Minutes Warm: Not greater than 90 minutes Cold: Not greater than 180 minutes
	(ii) Time to de-load from **Minimum Load** to De-Synchronising	Hot: Not greater than 40 minutes Warm: Not greater than 90 minutes Cold: Not greater than 180minutes

n) **Operating Reserve**

(i) **POR** (not less than 5% **Registered Capacity**)

To be provided, at a minimum, at **MW** outputs in the range from 50% to 95% **Registered Capacity**, with provision in the range of 95% to 100% **Registered Capacity** to be not less than that indicated by a straight line with unity decay from 5% of **Registered Capacity** at 95% output to 0 at 100% output.

(ii) **SOR** (not less than 5% **Registered Capacity**)

To be provided, at a minimum, at **MW** outputs in the range from 50% to 95% **Registered Capacity**, with provision in the range of 95% to 100% **Registered Capacity** to not less than that indicated by a straight line with unity decay from 5% of **Registered Capacity** at 95% output to 0 at 100% output.

(iii) **TOR1**

To be provided, at a minimum, at **MW** outputs in the range from 50% to 92% **Registered Capacity**, with provision in the range of 92% to 100% **Registered Capacity** to be not less than that indicated by a straight line with unity decay from 8% of **Registered Capacity** at 92% output to 0 at 100%.

(iv) **TOR2**

To be provided, at a minimum, at **MW** outputs in the range from 50% to 90% **Registered Capacity**, with provision in the range of 90% to 100% **Registered Capacity** to be not less than that indicated by a straight line with unity decay from 10% of **Registered Capacity** at 90% to 0 at 100%

o) The **DSO** may request **Generation Units** of **Registered Capacity** greater than or equal to 60**MW** to have the capacity to operate under **SFRS** at all loads between **SFRS Minimum Load** and **SFRS Maximum Load**.

DCC10.10.1.2 Notwithstanding **DCC**10.11.1.1 **Combustion Turbine Unit**, hydro or other technology-based **Generation Units** shall as appropriate, register and perform to **Operating Characteristics** giving maximum flexibility of **Operation**, consistent with their type and model of **Generation Plant**, in accordance with **Good Industry Practice**. Where appropriate, **Operating Characteristics** and in particular start times, should be registered separately for normal (planned) starts, and for starts required under conditions of system stress, such as following the loss of a **Generation Unit**. The **Generator** will maintain operational procedures and practices, which ensures that there are no unnecessary delays in responding to **Dispatch** instructions in accordance with the technical capabilities of the **Generation Plant**.

DCC10.10.1.3 Where the **TSO** or **DSO** approaches a **Generator**, the **Generator** will co-operate with the **TSO** or **DSO** in the development of procedures and facilities to improve the response of each **Generation Unit** during conditions of system stress, including for example, automatic start-up of fast-start **Generation Units** following a loss of a **Generation Unit(s)** or in advance of an anticipated loss of a **Generation Unit(s)**. This shall be subject to agreement of the **Generator** that the procedures are consistent with secure **Operation** of the **Generator's Plant**, such agreement not to be reasonably withheld.

DCC10.10.1.4 Where start-up time of **Generation Units** exceeds 30 minutes, they shall be designed to have the capability, where supply from the **Distribution System** is lost, to reduce output to match house load an sustain **Operation** (i.e. tripping to Auxiliaries).

DCC10.10.1.5 Control synchronising shall be provided by **Generators** at **Circuit Breakers** identified by the **DSO**, which, depending on the **Plant** configuration may include:

a) The **Generation Unit Circuit Breaker**
b) The **Generator** transformer **LV** and **HV Circuit Breakers**

The **DSO** will provide to the **Generator** signals from the **DSO** operated **Plant** and apparatus as are required to facilitate synchronising on the **Generator** transformer **HV Circuit Breaker**, in accordance with the relevant provisions of the **Connection Agreement**.

DCC10.10.1.6 The synchronising facilities in **DCC**10.11.1.6 shall facilitate synchronising under the following conditions:

a) **Distribution System Frequency** within the limits 48.0Hz to 52.0Hz
b) **Distribution System** voltage within the limits 99kV to 123kV notwithstanding **DCC**10.11.2.

DCC10.10.1.7 Each **Generation Unit** shall be designed, where practicable, to mitigate the risk of common failure with other **Generation Units**. In particular each **Generation Unit** shall be designed so that it can operate with its essential auxiliaries supplied through the unit transformer which shall be connected between the **Generation Unit Circuit Breaker** and the **Generator** transformer **LV** terminals, or from another secure source as agreed with the **DSO**. Auxiliary **Suppliers** may, provided that they are in accordance with **Good Industry Practice**, be taken from an alternative source during **Commissioning**, testing, start-up or emergencies.

In the case of a **CCGT installation**, this applies to the **Combustion Turbine Units** only.

DCC10.10.2 Reactive Power Capability

DCC10.10.2.1 Each **Generation Unit** shall have the following **Reactive Power** capability as measured at their alternator terminals:

Voltage Range	Connected at:	At 100% Registered Capacity	At 35% of Registered Capacity
99kV ≤ V ≥ 123kV	110kV	0.93 power factor leading to 0.85 power factor lagging	0.7 power factor leading to 0.4 power factor lagging
85kV ≤ V ≥ 99kV		Unity power factor to 0.85 power factor lagging	0.7 power factor leading to 0.4 power factory lagging

DCC10.10.2.2 At between **Registered Capacity** and 35% **Registered Capacity**, **MVAr** capability to be not less than indicated by a straight line drawn between the two points from the above, on a plot of **MVAr** capability against **MW** output.

DCC10.10.2.3 At below 35% **Registered Capacity**, **MVAr** capability to be not less than that at 35% **Registered Capacity**.

DCC10.10.2.4 The **Generator** transformer shall be designed such that the **Reactive Power** capability is possible over the full range of **Distribution System** voltages (Specified in **DCC**10.11.2.1)

DCC10.10.2.5 The **DSO** and the **Generator** will liaise on matters related to **DCC**10.11.2 at the design stage.

DCC10.10.3 Each **Generation Unit** must be fitted with a fast acting proportional turbine speed governor and unit load controller or equivalent control device to provide **Frequency Response** under normal operating conditions in accordance with OC4 of the **Grid Code**.

DCC10.10.4 All **Generation Units** shall be capable of contributing to control of the **Distribution System** voltage by continuous modulation of **Generator** voltage by means of a suitable continuous acting **Automatic Voltage Regulation (AVR)** which shall comply with BS4999 part 140 or equivalent European Standards and the characteristics of which have been accepted by the **DSO** prior to the connection date, such acceptance not to be unreasonably withheld.

DCC10.10.5 Each **Generator** transformer shall have on-load tap-changing (OLTC). The tap step shall not alter the voltage ratio at the **HV** terminals by more than 2.5% on the 110kV system.

DCC10.10.6 Protection

DCC10.10.6.1 **Generators** will provide:

a) Differential **Protection** on the **Generator** transformer. The connections between the Grid **Connection Point Circuit Breaker** and the **HV** terminals of the **Generator** transformer shall be included in the protected zone of this differential **Protection**.
b) Backup **Protection** (to the **Distribution System**) on **Generation Units**. The **DSO** acting reasonably shall require one or more of the following to be installed: **Generator** overcurrent **Protection**, voltage controlled **Generator**, overcurrent **Protection** or **Generator** distance **Protection**;
c) Under **Frequency Protection**; and
d) **Generation Unit** loss of excitation **Protection**.

DCC10.10.6.2 The **DSO** may require an individual **Generator**, or group of **Generators**, to install additional **Protection** and / or control schemes, where the **DSO** can reasonably show that it is prudent or necessary to do so. These schemes may include but are not limited to:

a) **Generation Unit** over/under-voltage **Protection**
b) **Generation Unit** over-frequency **Protection**

c) **Generation Unit** transformer neutral displacement voltage detection.
d) Loss of mains **Protection** (**Rate of Change of Frequency** or vector shift)
e) **Generation Unit** pole slip **Protection**
f) Power system stabiliser

DCC10.10.6.3 Distance **Protection** shall be provided by the **DSO** at the **Connection Point Circuit Breaker** of the **Generator** transformer.

DCC11 ADDITIONAL REQUIREMENTS FOR POWER PARK MODULES [PPMs]

DCC11.1.1 Objective

The primary objective of **DCC**11 is to establish the technical rules to which **PPMs** must comply in order to ensure that the **DSO** and the **TSO** can operate the **Distribution System** and **Transmission System** reliably, maximising non-synchronous Generation penetration on both systems.

DCC11.1.2 Scope

DCC11 applies wholly or in part to the following **Users**:

a) As depicted in Table 9, **PPM**s with **Registered Capacity** of 1 **MW** or more.

b) As depicted in Table 9, **PPM**s with **Registered Capacity** less than 1 **MW** due to be developed on a **Contiguous PPM Site** where the development of the **PPM** results in the total **Registered Capacity** of **PPM**s on the **Contiguous PPM Site** exceeding or remaining above 1 **MW** unless the **DSO** agrees that the proposed **PPM** is unrelated and independent of the **PPM**s already present in the **Contiguous PPM Site.**

DCC11.1.3 Applicability

DCC11.1.3.1 Generator Topologies

For the avoidance of doubt, where there is a conflict between the provisions of **DCC**11 and any other part of the **Distribution Code** this section (**DCC**11) shall take precedence**.**

An applicability matrix, which details the extent of application of **DCC**11 to various categories of **PPMs**, is given in Table 9[2] and Table 9x. For the purposes of this section, five categories of **PPMs** connection topologies are identified for reference.

For the avoidance of doubt, the figures below are for illustrative purposes only. In case of conflict, the accompanying text shall take precedence.

The topologies are defined as follows:

Connection Topology 1

PPMs are classed as being connection topology 1 when connected, at 110kV to a **DSO** operated 110kV busbar, which, in turn, is galvanically connected to the TSO operated 110kV system outside of the Dublin City DSO operated 110kV network.

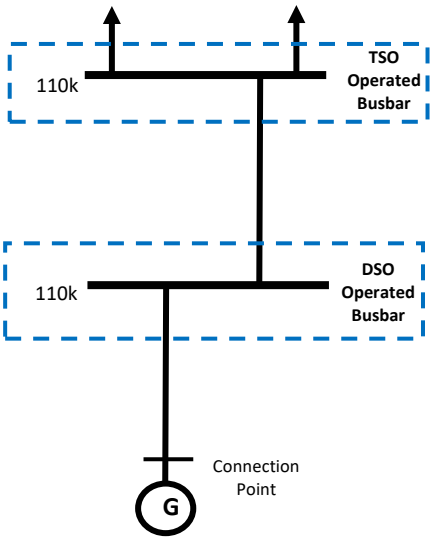


Figure 4

[2] Units permanently restricted by MEC to less than 5 MW shall not need to be controllable.

Connection Topology 1A

PPMs are classed as being connection topology 1A when connected, at 110kV to a **DSO** operated 110kV busbar, which, in turn, is part of the Dublin City DSO operated 110kV network.

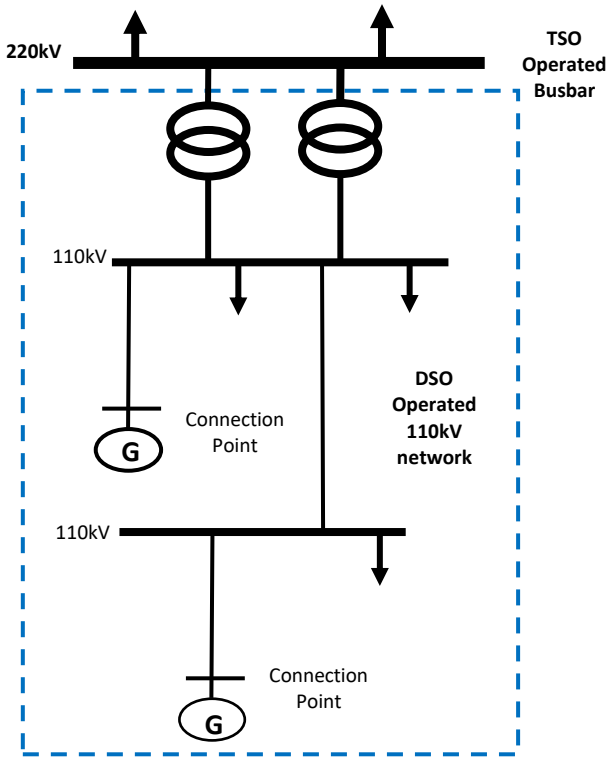


Figure 5

Connection Topology 2

PPMs are classed as being connection topology 2 when connected at a **Distribution System** voltage (≤ 38 kV) to a dedicated **PPM(s)** 110kV or 38kV station.

There are no load **Customers** connected to the **DSO** operated 38/20/10kV busbar(s).

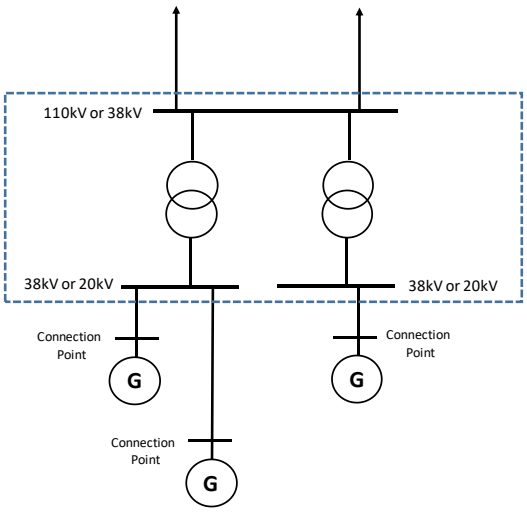
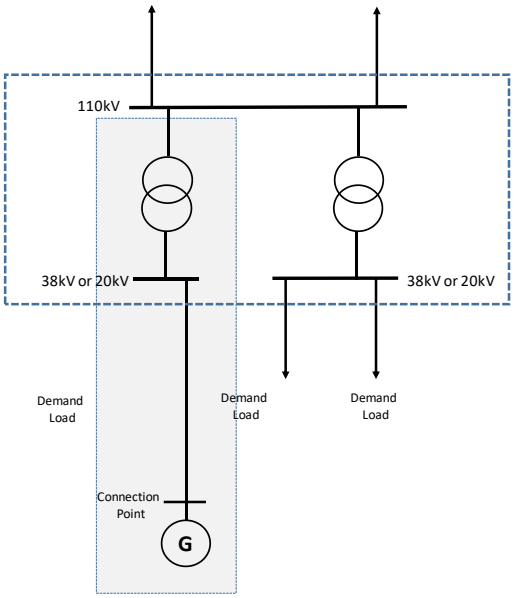


Figure 6

Connection Topology 2A

PPMs are classed as being connection topology 2A when connected at a **Distribution System** voltage (≤ 38 kV) to a dedicated transformer in an existing 110kV station. There are no load **Customers** connected to the lower voltage busbar or bus section of the dedicated transformer.



Connection Topology 3

PPMs are classed as being connection topology 3 when connected to the lower voltage busbar of an existing 110kV station or teed onto an existing 38kV line.

There is demand load connected to the same lower voltage busbar or 38kV line.

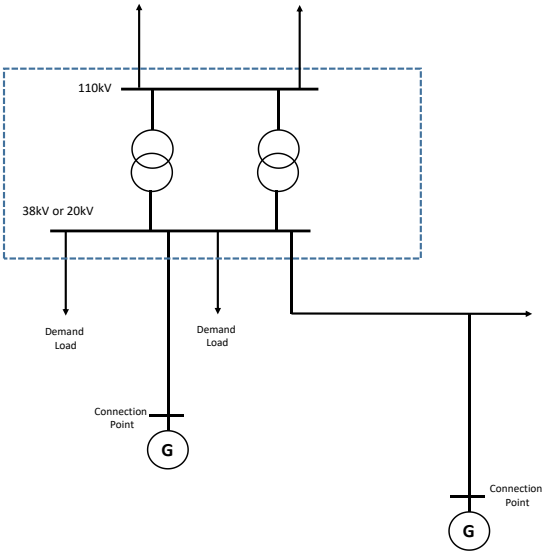


Figure 7

Connection Topology 4

PPMs are classed as being connection topology 4 when connected to the **Distribution System** via a dedicated 38kV, 20kV or 10kV feeder into an existing 38kV distribution station.

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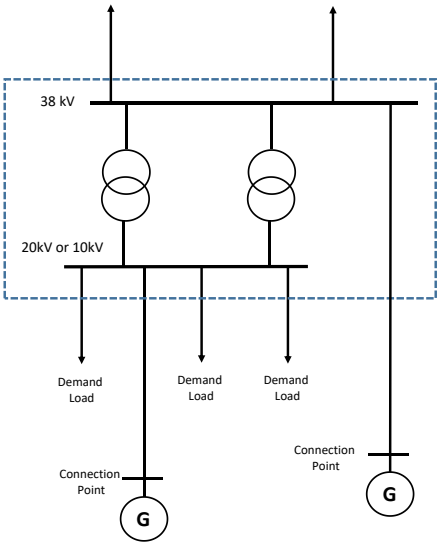


Connection Topology 5

PPMs are classed as being connection topology 5 when connected to an existing distribution line [20kV or 10kV] emanating from a Distribution demand sub-station which has other loads connected to it.

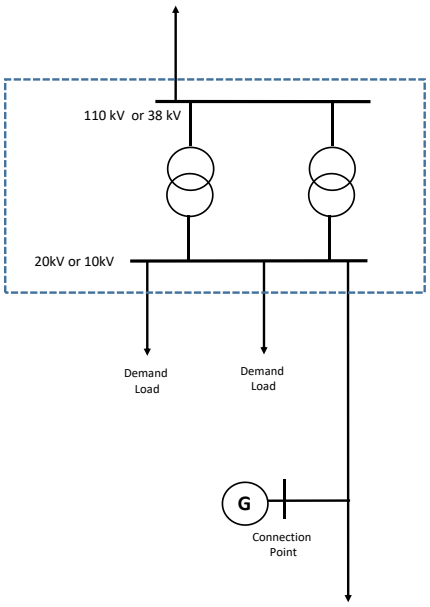


Figure 8

Table 9 and Table 9x indicates how the various requirements outlined in **DCC**11, will apply to the connection topology described above. In addition, centrally dispatched **PPMs** must comply with **DCC**10.5.1a. For avoidance of doubt, the **MW** shown in Table 9 and Table 9x refer to:

1. The **MW** of generation of an individual **PPM**; or
2. The sum of the **MW** of generation of **Contiguous PPM Site** that are not deemed to be independent.

DCC11.1.3.2 Generator Types

Requirements for **RfG Generation Units** will be considered based on **Registered Capacity** as categorised in in Table 6.

Table 9– APPLICABILITY MATRIX: Applies to all PPMs which are <u>not</u> included in Class Derogation against Mod #36

	Section	TOPOLOGY 1	TOPOLOGY 2	TOPOLOGY 3/ TOPOLOGY 2A	TOPOLOGY 4	TOPOLOGY 5
		REGISTERED CAPACITY				
Fault Ride-Through	DCC11.2	All	≥ 1 MW	≥ 1 MW	≥ 1 MW	≥ 1 MW
FREQUENCY						
Tolerance over Frequency Range	DCC11.3.1	All	All	All	All	All
Participation in High Frequency Control	DCC11.3.2.3	All	≥1 MW	≥1 MW	≥1 MW	≥1 MW
Participation in Low Frequency Control	DCC11.3.2.3	All	≥1 MW	≥1 MW	≥1 MW	≥1 MW
Adherence to Maximum Ramp Rates	DCC11.3.4	All	≥1 MW	≥1 MW	≥1 MW	≥1 MW
Active Power Control Participation	DCC11.3.2.2	All	≥1 MW	≥1 MW	≥1 MW	≥1 MW
Limited Frequency Sensitive Mode – Over Frequency[4]	DCC11.3.6	All	All	All	All	All
Limited Frequency Sensitive Mode – Under Frequency[4]	DCC11.3.7	≥5 MW	≥5 MW	≥5 MW	≥5 MW	≥5 MW
Frequency Sensitive Mode[4]	DCC11.3.8	≥5 MW	≥5 MW	≥5 MW	≥5 MW	≥5 MW
VOLTAGE						
Voltage Control	DCC11.4 DCC11.6.2.3	All	≥5 MW	N/A	N/A	N/A
Voltage Range	DCC11.4.2.1	All	N/A	N/A	N/A	N/A
REACTIVE POWER						
Power Factor Range	DCC11.5.1.1	N/A	< 5MW	All	All	All
Power Factor Range	DCC11.5.1.2	N/A	N/A	N/A	N/A	All
Reactive Power Range	DCC11.5.2	All	≥5 MW	N/A	N/A	N/A
Reactive Power Control Modes[3]	DCC11.5.3	≥5 MW	≥5 MW	≥5 MW	≥5 MW	≥5 MW
SIGNALS/COMMUNICATIONS/CONTROL						
Signal List 1	DCC11.6.1.1	All	≥1 MW	≥1 MW	N/A	N/A
Signal List 2	DCC11.6.1.2	N/A	N/A	N/A	≥1 MW	≥1 MW
Signal List 3: Availability	DCC11.6.1.3	All	≥1 MW	≥1 MW	≥1 MW	≥1 MW

[3] Applies to RfG Generation Units only.

	Section	Topology 1	Topology 2	Topology 3/ Topology 2A	Topology 4	Topology 5
		Registered Capacity				
Signal List 4: Active Power Control	DCC11.6.1.4	All	≥1 MW	≥1 MW	≥1 MW	≥1 MW
Signal List 5: Frequency Control	DCC11.6.1.5	All	≥1 MW	≥1 MW	≥1 MW	≥1 MW
Signal List 6: Meteorological Data	DCC11.6.1.6	All	≥10 MW	≥10 MW	≥10 MW	≥10 MW
Signal List 7: DSO SCADA Signals	DCC11.6.1.7	N/A	≥2 MW <5 MW[4]	≥2 MW <5 MW[2]	≥2 MW <5 MW[2]	≥2 MW <5 MW[2]
Ability to Accept Control Signal- Active Power Control	DCC11.6.2.1	All	≥1 MW	≥1 MW	≥1 MW	≥1 MW
Ability to Accept Control Signal- Frequency Control Curve Mode Change	DCC11.6.2.2	All	≥1 MW	≥1 MW	≥1 MW	≥1 MW
Ability to Accept Control Signal- Voltage Control	DCC11.4.1 DCC11.4.2	All	≥5 MW	N/A	N/A	N/A
Installation of recloser at the PPM site for network Protection	DCC11.6.2.8	N/A	All Medium Voltage Connections			
Ability to receive Network Operator Initiated Shutdown command from DSO via DSO RTU[5] **or** **ability to be remotely disconnected by DSO via device located at or near PPM[6]**	DCC11.6.2.4	N/A	Medium Voltage Connections ≥ 2MW and <5MW			
Ability to receive Network Operator initiated Shutdown command from DSO via DSO RTU	DCC11.6.2.4	N/A	38kV Connections ≥ 2MW and <5MW			
Ability to receive Network Operator Initiated Shutdown command from DSO or TSO via TSO RTU	DCC11.6.2.4	All	≥5 MW			
Responsible Operator	DCC11.6.2.6.1	N/A	All	All	All	All
Responsible Operator	DCC11.6.2.6.2	All	N/A	N/A	N/A	N/A
Resource Power Forecasts	DCC11.6.3	≥30 MW	≥30 MW	≥30 MW	≥30 MW	≥30 MW
Declarations	DCC11.6.4	≥30 MW	≥30 MW	≥30 MW	≥30 MW	≥30 MW

[4] In certain circumstances, depending on future changes to the network connection, topology, the amount of embedded generation on the particular network and system reasons, generators with an MEC <2MVA may be required to provide telecommunication infrastructure for SCADA.

[5] As advised by DSO

[6] For medium voltage connections ≥ 2MW and <5MW, provided that adequate media coverage exists, remote operation of the recloser deployed to satisfy DCC11.6.2.8 may also be used to implement the requirements of DCC11.6.2.4 and DCC11.6.1.7.

TABLE 9X – APPLICABILITY MATRIX : **Applies to all PPMs which <u>are</u> included in Class Derogation against Mod #36**

	Section	TOPOLOGY 1	TOPOLOGY 2	TOPOLOGY 3 / TOPOLOGY 2A	TOPOLOGY 4	TOPOLOGY 5
Fault Ride-Through	DCC11.2	All	≥ 5 MW	≥ 5 MW	≥ 5 MW	≥ 5 MW
FREQUENCY						
Tolerance over Frequency Range	DCC11.3.1	All	All	All	All	All
Participation in High Frequency Control	DCC11.3.2.3	All	≥5 MW	≥5 MW	≥5 MW	≥5 MW
Participation in Low Frequency Control	DCC11.3.2.3	All	≥5 MW	≥5 MW	≥5 MW	≥5 MW
Adherence to Maximum Ramp Rates	DCC11.3.4	All	≥5 MW	≥5 MW	≥5 MW	≥5 MW
Active Power Control Participation	DCC11.3.2.2	All	≥5 MW	≥5 MW	≥5 MW	≥5 MW
Limited Frequency Sensitive Mode – Over Frequency[4]	DCC11.3.6	All	All	All	All	All
Limited Frequency Sensitive Mode – Under Frequency[4]	DCC11.3.7	≥5 MW	≥5 MW	≥5 MW	≥5 MW	≥5 MW
Frequency Sensitive Mode[4]	DCC11.3.8	≥5 MW	≥5 MW	≥5 MW	≥5 MW	≥5 MW
VOLTAGE						
Voltage Control	DCC11.4 DCC11.6.2.3	All	≥5 MW	N/A	N/A	N/A
Voltage Range	DCC11.4.2.1	All	N/A	N/A	N/A	N/A
REACTIVE POWER						
Power Factor Range	DCC11.5.1.1	N/A	< 5MW	All	All	All
Power Factor Range	DCC11.5.1.2	N/A	N/A	N/A	N/A	All
Reactive Power Range	DCC11.5.2	All	≥5 MW	N/A	N/A	N/A
Reactive Power Control Modes[7]	DCC11.5.3	≥5 MW	≥5 MW	≥5 MW	≥5 MW	≥5 MW
SIGNALS/COMMUNICATIONS/CONTROL						
Signal List 1	DCC11.6.1.1	All	≥5 MW	≥5 MW	N/A	N/A
Signal List 2	DCC11.6.1.2	N/A	N/A	N/A	≥5 MW	≥5 MW
Signal List 3: Availability	DCC11.6.1.3	All	≥5 MW	≥5 MW	≥5 MW	≥5 MW
Signal List 4: Active Power Control	DCC11.6.1.4	All	≥5 MW	≥5 MW	≥5 MW	≥5 MW
Signal List 5: Frequency Control	DCC11.6.1.5	All	≥5 MW	≥5 MW	≥5 MW	≥5 MW
Signal List 6: Meteorological Data	DCC11.6.1.6	All	≥10 MW	≥10 MW	≥10 MW	≥10 MW
Signal List 7: DSO SCADA Signals	DCC11.6.1.7	N/A	≥2 MW <5 MW[8]	≥2 MW <5 MW[2]	≥2 MW <5 MW[2]	≥2 MW<5 MW[2]
Ability to Accept Control Signal- Active Power Control	DCC11.6.2.1	All	≥5 MW	≥5 MW	≥5 MW	≥5 MW
Ability to Accept Control Signal- Frequency Control Curve Mode Change	DCC11.6.2.2	All	≥5 MW	≥5 MW	≥5 MW	≥5 MW

[7] Applies to RfG Generation Units only.

[8] In certain circumstances, depending on future changes to the network connection, topology, the amount of embedded generation on the particular network and system reasons, generators with an MEC <2MVA may be required to provide telecommunication infrastructure for SCADA.

	Section	TOPOLOGY 1	TOPOLOGY 2	TOPOLOGY 3 / TOPOLOGY 2A	TOPOLOGY 4	TOPOLOGY 5
Ability to Accept Control Signal- Voltage Control	DCC11.4.1 DCC11.4.2	All	≥5 MW	N/A	N/A	N/A
Installation of recloser at the PPM site for network Protection	DCC11.6.2.8	N/A	All Medium Voltage Connections			
Ability to receive Network Operator Initiated Shutdown command from DSO via DSO RTU[9] **or** **ability to be remotely disconnected by DSO via device located at or near PPM[10]**	DCC11.5.2.4	N/A	Medium Voltage Connections ≥ 2MW and <5MW			
Ability to receive Network Operator initiated Shutdown command from DSO via DSO RTU	DCC11.5.2.4	N/A	38kV Connections ≥ 2MW and <5MW			
Ability to receive Network Operator Initiated Shutdown command from DSO or TSO via TSO RTU	DCC11.6.2.4	All	≥5 MW			
Responsible Operator	DCC11.6.2.6.1	N/A	All			
Responsible Operator	DCC11.6.2.6.2	All	N/A			
Resource Power Forecasts	DCC11.6.3	≥30 MW	≥30 MW			
Declarations	DCC11.6.4	≥30 MW	≥30 MW			

Note: **PPM**s who are subject to DID323 please refer to class derogation against modification #36.

[9] As advised by DSO

[10] For medium voltage connections ≥ 2MW and <5MW, provided that adequate media coverage exists, remote operation of the recloser deployed to satisfy DCC11.5.2.8 may also be used to implement the requirements of DCC11.5.2.4 and DCC11.5.1.7.

DCC11.2 FAULT RIDE THROUGH REQUIRMENTS

DCC11.2.1.1 **DSO** topology 1 **Controllable PPMs,** irrespective of **Registered Capacity** and **DSO** topology 2, 3, 4 and 5 **Controllable PPMs** with **Registered Capacity** as detailed in Table 9, shall remain connected to the **Distribution System** for **Voltage Dips** on any or all phases, and shall remain **Stable**, where the **Distribution System** phase voltage measured at the **Connection Point** remains above the heavy black line in Figure 9.

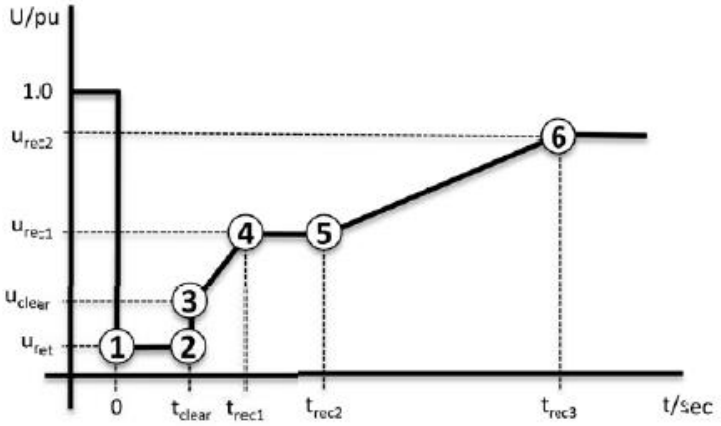


Figure 9: Fault Ride-Through Capability for Controllable PPMs Connected to the Distribution System

DCC11.2.1.2 Non-RfG Generation Units

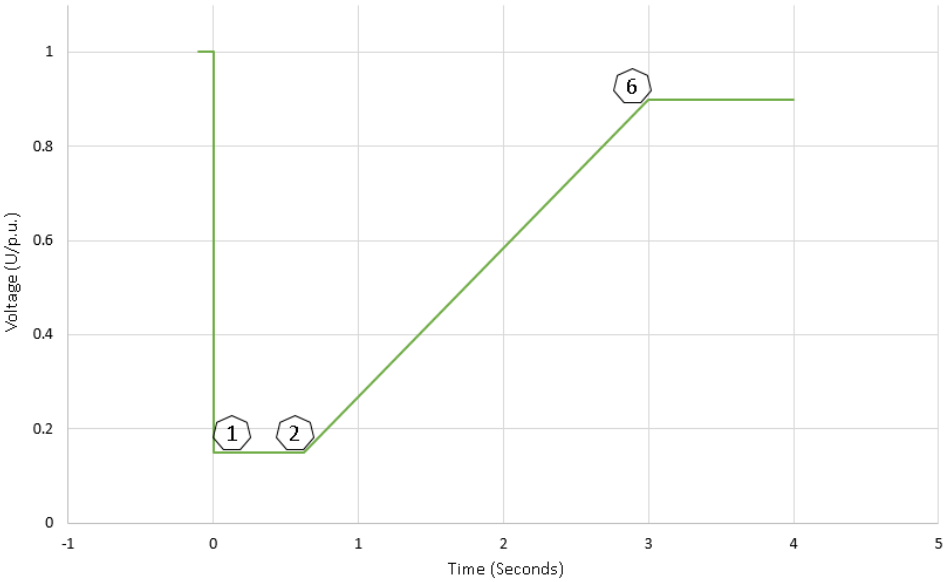


Figure 10

Table 10

No. on Graph	Parameter	Value	Applicability
1	U_{ret}	0.15 p.u.	Non-RfG Generation Units
2	U_{ret}	0.15 p.u.	
	t_{clear}	650ms	
3	U_{clear}	U_{ret}	
	t_{clear}	t_{clear}	
4	U_{rec1}	U_{clear}	
	t_{rec1}	t_{clear}	
5	U_{rec1}	U_{clear}	
	t_{rec2}	t_{rec1}	
6	U_{rec2}	0.9 p.u	
	t_{rec3}	3.0 s	

DCC11.2.2 RfG Generation Units

DCC11.2.2.1 That capability shall be in accordance with the voltage-against-time profile measured at the **Connection Point** for fault conditions as shown in Figure 9 and the relevant table below. Phase to phase voltage remains above the line, unless the protection scheme for internal electrical faults requires the disconnection of the power-generating module from the network.

DCC11.2.2.2 Undervoltage protection (either fault-ride-through capability or minimum voltage specified at the **Connection Point** voltage) shall be set by the **PPM** owner according to the widest possible technical capability of the **WTG** or **SG**, unless the distribution system operator requires narrower settings. The protection schemes and settings for internal electrical faults must not jeopardise fault-ride-through capability.

DCC11.2.2.3 Connected at ≥110kV

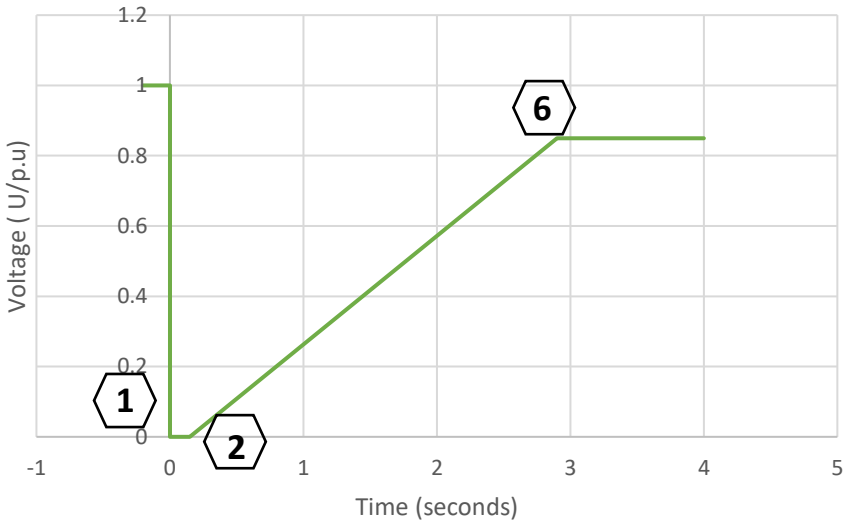


Figure 11

Table 11

No. on Graph	Parameter	Value	Applicability
1	U_{ret}	0 p.u.	Type D PPMs (Connected at ≥110kV)
2	U_{ret}	0 p.u.	
	t_{clear}	150ms	
3	U_{clear}	U_{ret}	
	t_{clear}	t_{clear}	
4	U_{rec1}	U_{clear}	
	t_{rec1}	t_{clear}	
5	U_{rec1}	U_{clear}	
	t_{rec2}	t_{rec1}	
6	U_{rec2}	0.85 p.u.	
	t_{rec3}	2.9 s	

DCC11.2.2.4 Connected at <110kV

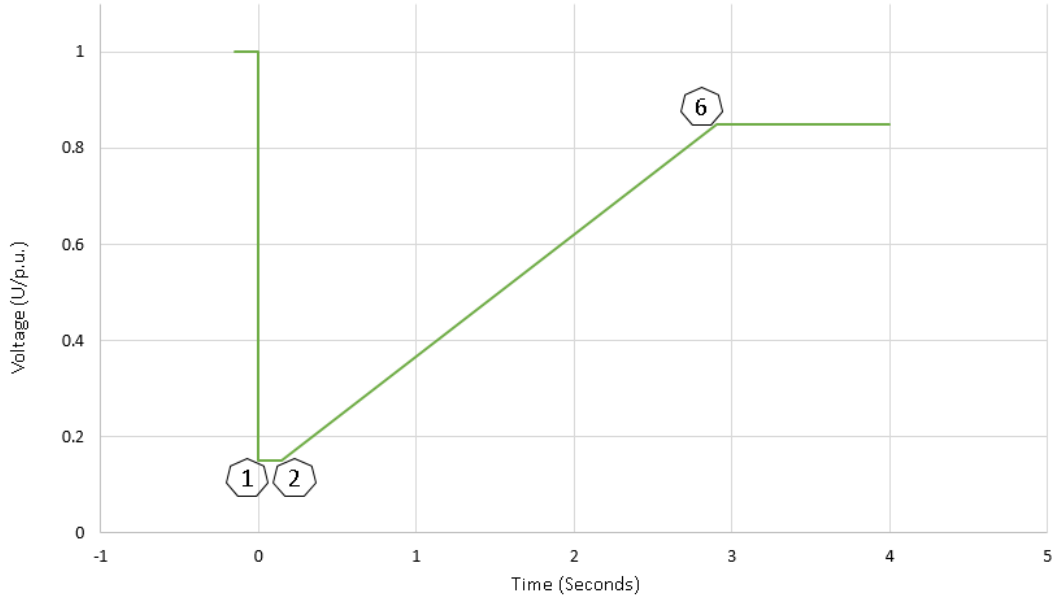


Figure 12

Table 12

No. on Graph	Parameter	Value	Applicability
1	U_{ret}	0.15 p.u.	Type B, C & D PPMs (Connected at <110kV)
2	U_{ret}	0.15 p.u.	
	t_{clear}	250ms	
3	U_{clear}	U_{ret}	
	t_{clear}	t_{clear}	
4	U_{rec1}	U_{clear}	
	t_{rec1}	t_{clear}	
5	U_{rec1}	U_{clear}	
	t_{rec2}	t_{rec1}	
6	U_{rec2}	0.85 p.u.	
	t_{rec3}	2.9 s	

DCC11.2.3 In addition to remaining connected to the **Distribution System**, the **PPMs** shall have the technical capability to provide the following functions:

a) During **Voltage Dips** the **Controllable PPMs** shall provide **Active Power** in proportion to retained voltage and maximise reactive current to the **Distribution System,** as set out in **DCC**11.2.3 (c). The provision of reactive current shall continue until the **Distribution System** voltage recovers to within the normal operational range of the **Distribution System**, voltage at which the **PPMs** is connected**,** as specified in Figures 12,13 or 14 as appropriate, or for at least 500ms, whichever is the sooner. The **Controllable PPMs** may use all or any available reactive sources, including installed statcoms or SVCs, when providing reactive support during **Voltage Dips**;

b) For **Voltage Dips** cleared within 140ms, the **Controllable PPMs** shall provide at least 90% of its maximum **Available Active Power** as quickly as the technology allows and in any event within 500ms of the voltage at the **Connection Point** recovering to the normal operating range, per Figure 13 below, of the voltage level at which the **PPMs** is connected**,**. For longer duration **Voltage Dips**, the **Controllable PPMs** shall provide at least 90% of its maximum **Available Active Power** within 1 second of the voltage at the **Connection Point** recovering to the normal operating range for the voltage at which it is connected.

c) During and after faults, priority shall always be given to the **Active Power** response within the capabilities of the PPM as defined in **DCC** 11.2.3 (a) and **DCC**11.2.3 (b). The reactive current response of the **Controllable PPMs** shall attempt to control the voltage back towards the voltage at which the **PPMs** is connected, recovering to its normal operating range as specified in Figures 12,13 or 14 as appropriate and should be at least proportional to the **Voltage Dip**. The reactive current response shall be supplied within the rating of the **Controllable PPMs,** with a **Rise Time** no greater than 100ms and a **Settling Time** no greater than 300ms. For the avoidance of doubt, the **Controllable PPMs** may provide this reactive response directly from individual **Generating Units**, or other additional installed dynamic reactive devices on the site, or a combination of both.

d) The **Controllable PPMs** shall be capable of providing its transient reactive response irrespective of the reactive control mode in which it was operating at the time of the **Voltage Dip**. The **Controllable PPMs** shall revert to its pre-fault reactive control mode and set-point within 500ms of the voltage at which the **PPMs** is connected, recovering to its normal operating range as specified in Figures 12,13 or 14 as appropriate.

e) **DSO** may seek to reduce the magnitude of the dynamic reactive response of the **Controllable PPMs** if it is found to cause over-voltages on the **Distribution System**. In such a case, the **DSO** will make a formal request to the **Controllable PPMs.** The **Controllable PPMs** and the **DSO** shall agree on the required changes, and the **Controllable PPMs** shall formally confirm that any requested changes have been implemented within 120 days of receiving the **DSO** formal request.

Table 13

Description	Nominal Voltage	Normal Operating Range [kV][11]	
		Lower bound	Upper bound
MV	10kV	9.6	11.3
MV	20kV	19.3	22.5
HV	38kV	35.6	43.8
110kV	110kV	99	123

DCC11.3 FREQUENCY REQUIREMENTS

DCC11.3.1 Frequency Ranges

PPMs shall have the capability to:

a) Operate continuously at normal rated output at frequencies in the range 49.0Hz to 51.0Hz
b) Remain connected to the **Distribution System** at frequencies within the range 47.5Hz to 52Hz for a duration of 90 minutes. Note that setting of the **Generator** interface **Protection** will determine actual **Operation** in this range.
c) Remain connected to the **Distribution System** at frequencies within the range 47.0Hz to 47.5Hz for a duration of 20 seconds required each time the **Frequency** is below 47.5Hz.
d) Remain connected to the **Distribution System** during **Rate of Change of Frequency** of values up to and including plus or minus 1.0 Hz per second measured as a rolling average over 500 ms. **Voltage dips** may cause localised **Rate of Change of Frequency** values in excess of 1Hz per second for short periods, and in these cases, the clause **DCC**11.2 supersedes this clause (**DCC**11.3.1(d)). The **DSO** may require lower or higher values to be used for **Protection** settings.

No additional **WTG** or **SG** shall be started while the **Frequency** is above 50.2Hz.

[11] DSO reserves the right to operating at voltages outside these ranges in emergency situations.

DCC11.3.2 Active Power Management

DCC11.3.2.1 A **PPM Control System** shall be installed by the **PPM** to allow for the provision of **Active Power Control** and **Frequency Response** from the **PPM**. The **PPM Control System** and **Frequency Response System** shall provide the functionality as specified in this section **DCC**11.3.2.

DCC11.3.2.2 Active Power Control

DCC11.3.2.2.1 The **PPM Control System** shall be capable of operating each **WTG** or **SG** at a reduced level if the **Controllable PPM's Active Power** output has been restricted by the **TSO** or **DSO**. In this **Active Power Dispatch Mode**, the **PPM Control System** shall be capable of receiving an on-line **Active Power Control Set-Point** sent by the **TSO** or **DSO** and shall commence implementation of the set-point within 10 seconds of receipt of the signal from the **TSO** or **DSO** as agreed between **DSO** and **TSO**.

DCC11.3.2.2.2 Type C & D **PPM**s shall be capable of receiving an on-line **Active Power Control Set-Point** within a tolerance of +/- 3% of **Registered Capacity** or +/- 0.5 MW (whichever is greater) and shall commence implementation of the set-point within 10 seconds[12].

DCC11.3.2.2.3 The rate of change of output to achieve the **Active Power Control Set-Point** should be the **Active Power Control Set-Point Ramp Rate** setting of the **PPM Control System**, as advised by the **TSO** or **DSO**, as per **DCC**11.3.3. It is acknowledged that if the **Active Power** output of the **Controllable PPM** is initially less than the **Design Minimum Operating Level**, and if the **Controllable PPM** is expected to increase its **Active Power** output, then it may not be able to achieve the specified ramp rate at first, due to **WTG's** or **SG's** going through a start-up sequence. In such a case, **WTG's or SG's** shall start up as quickly as the technology allows, and in any case, not longer than three minutes from the time the **Active Power Control Set-Point** was received.

DCC11.3.2.3 Frequency Response

DCC11.3.2.3.1 In **Resource Following Mode**, the **Frequency Response System** shall have the capabilities as displayed in the power-frequency response curve in Figure 13 where the power and **Frequency** ranges required for points A, B, C, D, E are defined below in Table 14 and Table 15.

The **Frequency Response System** shall adjust the **Active Power** output of the **Controllable PPM** according to a **Governor Droop**, settable by the **TSO** in a range from 2% to 10% and defaulting to 4%, when operating in the ranges outside the deadband range F_B-F_C in the power-frequency response curve. **Controllable PPM Frequency Response** and **Governor Droop** shall be calculated with respect to **Registered Capacity**. A **Controllable PPM** can only give a low **Frequency Response** if the **Active Power Control Set-Point** is less than the **Available Active Power.**

[12] Where wind turbines have to be turned on to achieve the set point then a maximum of 3 minutes response time is allowed.

DCC11.3.2.3.2 (a) The **Frequency Response System** shall adjust the **Active Power** output of the **Controllable PPM** according to a **Governor Droop**, settable by the **TSO** in a range from 2% to 12% and defaulting to 4%, when operating in the ranges outside the deadband range FB-FC in the Power-Frequency Response Curve.

DCC11.3.2.3.2 (b) When in **Active Power Control Mode,** the **Controllable PPM** shall always operate in **Frequency Sensitive Mode** with a **Governor Droop** as set out in **DCC**11.3.2.3.1 and with a deadband of +/-15mHz, or as otherwise agreed with the **TSO**.

DCC11.3.2.3.2 When in **Active Power Control Mode,** the **Controllable PPM** shall always operate in **Frequency Sensitive Mode** with a **Governor Droop** as set out in **DCC**11.3.4 and with a deadband of +/-15mHz, or as otherwise agreed with the **TSO**.

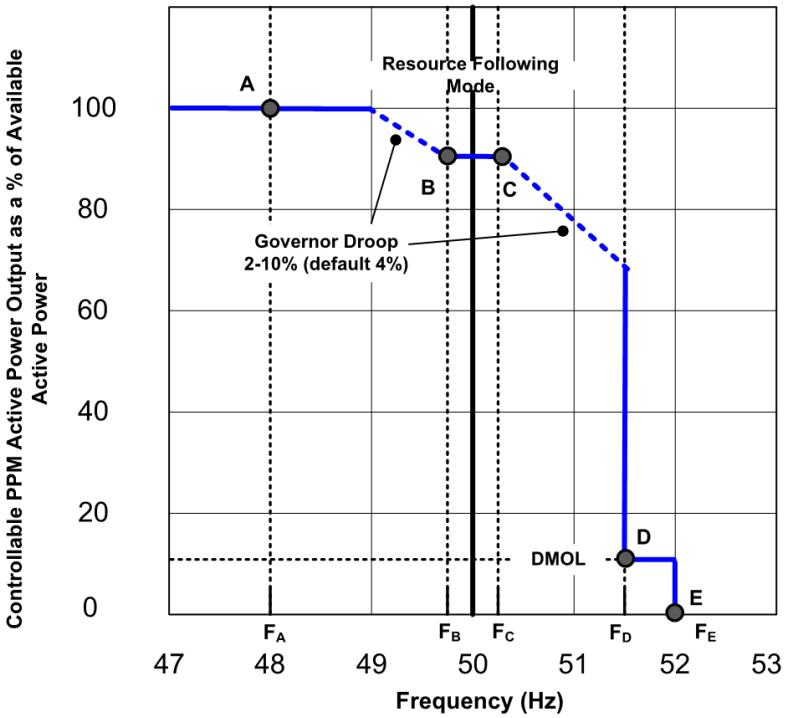


Figure 13 – Example of Power-Frequency Response Curve for Resource Following Mode

DCC11.3.2.3.3 When acting to control system **Frequency**, the **Controllable PPM** shall provide at least 60% of its expected additional **Active Power** response within 5 seconds, and 100% of its expected additional **Active Power** response within 15 seconds of the start of the system **Frequency** excursion outside the range F_B-F_C, or in the case of a **Controllable PPM** in **Active Power Dispatch Mode**, when the system **Frequency** goes outside the deadband set out in **DCC**11.3.2.3.2.

DCC11.3.2.3.4 When the system **Frequency** is in the range F_C-F_D, the **Controllable PPM** shall ensure that its **Active Power** output does not increase beyond the **Active Power** value of the **Controllable PPM** when the system **Frequency** first exceeded F_C, due to an increase in **Available Active Power** in that period.

DCC11.3.2.3.5 If the **Frequency** drops below F_A, then the **Frequency Response System** shall act to maximise the **Active Power** output of the **Controllable PPM**, irrespective of the **Governor Droop Setting**.

If the **Frequency** rises above F_D, then the **Frequency Response System** shall act to reduce the **Active Power** output of the **Controllable PPM** to its **DMOL** value. If the **Frequency** rises above F_E, then the **Frequency Response System** shall act to reduce the **Active Power** output of the **Controllable PPM** to zero. Any **WTG** or **SG** which has disconnected shall be brought back on load as fast as technically feasible, provided the system **Frequency** has fallen below 50.2Hz.

DCC11.3.2.3.6 Points 'A', 'B', 'C', 'D' and 'E' shall depend on a combination of the **Frequency**, **Active Power** and **Active Power Control Set-Point** settings. These settings may be different for each **PPM** depending on system conditions and **PPM** location. These settings are defined in Table 14.

Table 14 - FREQUENCY AND % AVAILABLE ACTIVE POWER SETTINGS FOR THE POINTS A, B, C, D AND E ILLUSTRATED IN Figure 13

Point	Frequency (Hz)	PPM Active Power Output (% of Available Active Power)
A	F_A	P_A
B	F_B	Minimum of : P_B Or **Active Power Control** Set-Point (converted to a % of Available **Active Power**)
C	F_C	Minimum of: P_C Or **Active Power Control** Set-Point (converted to a % of Available **Active Power**)
D	F_D	Minimum of: P_D Or **Active Power Control Set-Point** (converted to a % of Available **Active Power**) or DMOL
E	F_E	P_E = 0 %

Two settings for each of F_A, F_B, F_C, F_D, F_E, P_A, P_B, P_C, P_D and P_E shall be specified by the **TSO** at least 120 business days prior to the **Controllable PPM's** scheduled operational date (refer to Table 15 below). The **PPM** shall be responsible for implementing the appropriate settings during **Commissioning**.

DCC11.3.2.3.7 The table below, Table 15, shows the **Frequency** and **Active Power** ranges for F_A, F_B, F_C, F_D, F_E, P_A, P_B, P_C, P_D and P_E

Table 15 – FREQUENCY AND ACTIVE POWER RANGES APPROPRIATE TO Figure 13

	Transmission System Frequency *(Hz)*		***Available Active Power*** *(%)*
			Registered Capacity ≥ 5 MW
F_A	*47.0-49.5*	P_A	*50-100*
F_B	*49.5-50*	P_B	*15-100*
F_C	*50-50.5*	P_C	
F_D	*50.5-52.0*	P_D	*15-100 but not less than* ***DMOL***
F_E		P_E	*0*

For the **Frequency** values in Table 15 above, $F_A \leq F_B \leq F_C \leq F_D = F_E$.

DCC11.3.2.3.8 Alterations to the **Controllable PPM's Active Power** output, triggered by **Frequency** changes, shall be achieved by proportionately altering the **Active Power** output of all available **WTG or SG** as opposed to switching individual **WTG or SG** on or off, insofar as possible.

DCC11.3.2.3.9 No time delays, such as moving average **Frequency** filters, other than those necessarily inherent in the design of the **Frequency Response System** shall be introduced. The **Frequency Response System** shall continuously monitor the system **Frequency** in order to continuously determine the **Controllable PPM's** appropriate **Active Power** output by taking account of the **Controllable PPM's Available Active Power** or **Controlled Active Power**.

DCC11.3.2.3.10 If the system **Frequency** rises to a level above F_E, as defined by the power-frequency response curve in Figure 13, it is accepted that **WTGs or SGs** may disconnect. Any **WTG** or **SG** which has disconnected shall be brought back on load as fast as technically feasible (provided the system **Frequency** has fallen below 50.2Hz).

DCC11.3.3 Procedure for Setting and Changing the Power-Frequency Response Curves

Two power-frequency response curves (Curve 1 and Curve 2) shall be specified by the **TSO** at least 120 business days prior to the **PPM's** scheduled operational date. The **PPM** shall be responsible for implementing the appropriate settings during **Commissioning**. The **Frequency Response System** shall be required to change between the two curves within one minute from receipt of the appropriate signal from the **TSO**. The **TSO** shall give the **PPM** a minimum of 2 weeks if changes to any of the curve's parameters (i.e. F_A, F_B, F_C, F_D, F_E, P_A, P_B, P_C, P_D or P_E) are required. The **PPM** shall formally confirm that any requested changes have been implemented within two weeks of receiving the **TSO's** formal request.

DCC11.3.4 Ramp Rates

DCC11.3.4.1 The **PPM Control System** shall be capable of controlling the ramp rate of its **Active Power** output. There shall be three ramp rate capabilities, designated **Resource Following Ramp Rate**, **Active Power Control Set-Point Ramp Rate**, and **Frequency Response Ramp Rate**. The **PPM Control System** shall operate the ramp rates with the following order of priority (high to low): **Frequency Response Ramp Rate**; **Active Power Control Set-Point Ramp Rate**; **Resource Following Ramp Rate**. The **Resource Following Ramp Rate** shall be used during Start-Up, normal **Operation**, and shutdown. The **TSO** shall specify the **Resource Following Ramp Rate** and the **Active Power Control Set-Point Ramp Rate** in percentage of **Registered Capacity** per minute. The **Frequency Response Ramp Rate** shall be the maximum possible ramp rate of the **Controllable PPM** agreed with the **TSO** and with the characteristics as set out in **PPM**1.5.2.2.2**.** It is acknowledged that rapid change in the resource magnitude may cause temporary deviations from the ramp rate settings of the **Controllable PPM**, but these deviations should not be allowed to exceed 3% of **Registered Capacity**.

DCC11.3.4.2 It shall be possible to vary the **Resource Following Ramp Rate** and the **Active Power Control Set-Point Ramp Rate** each independently over a range of between 1% and 100% of **Registered Capacity** per minute.

DCC11.3.4.3 Procedure for Setting and Changing the Ramp Rate Control

The ramp rate settings shall be specified by the **TSO** at least 120 business days prior to the **PPM's** scheduled operational date. The **PPM** shall be responsible for implementing the appropriate settings during **Commissioning**. The ramp rate settings may need to be changed from time to time depending on system needs. The **TSO** shall formally give the **PPM** a minimum of two weeks' notice if a change is required. The **PPM** shall formally confirm that any requested changes have been implemented within two weeks of receiving the **TSO's** formal request.

DCC11.3.6 Limited Frequency Sensitive Mode – Over-frequency

The following shall apply to **RfG Generation Units** that are type A, B C or D **Controllable PPMs** operating in Limited Frequency Sensitive Mode – Over-frequency.

DCC11.3.6.(a) **Controllable PPMs** shall be capable of providing **Active Power** frequency response when the **Frequency** rises to or above 50.2 Hz.

DCC11.3.6.(b) The **Active Power** frequency response shall be capable of having a **Governor Droop** between 2% and 12%. The default **Governor Droop** setting shall be 4%.

Where the required level of response is not being achieved appropriate action should be taken by the **Controllable PPM** without delay and without receipt of instruction from the **TSO** to achieve the required levels of response, provided the **PPM**'s local security and safety conditions permit.

DCC11.3.6.(c) **Controllable PPMs** shall be capable of providing a power decrease down to **Minimum Load**. Stable operation shall be ensured

DCC11.3.6.(d) **Controllable PPMs** shall be capable of continuous stable operation when MW Output is reduced to **Minimum Load**. This response will prevail over any other **Active Power** control mode

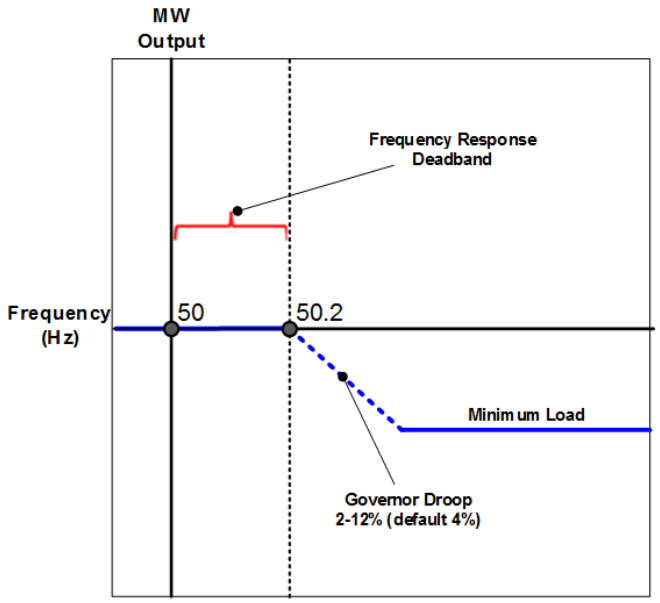


Figure 14: Limited Frequency Sensitive Mode – Over-frequency

DCC11.3.7 Limited Frequency Sensitive Mode – Under-frequency

The following shall apply for type C or D **Controllable PPMs** operating in Limited Frequency Sensitive Mode – Under-frequency:

DCC11.3.7.1 Type C & D PPMs shall be capable of providing **Active Power** frequency response when the **Frequency** falls to or below 49.5 Hz.

DCC11.3.7.2 The **Active Power** frequency response shall be capable of having a **Governor Droop** between 2% and 12%. The default **Governor Droop** setting shall be 4%.

Where the required level of response is not being achieved appropriate action should be taken by the **Controllable PPM** without delay and without receipt of instruction from the **TSO** to achieve the required levels of response, provided the **PPM**'s local security and safety conditions permit.

DCC11.3.7.3 Type C & D **Controllable PPM**s shall take into account the;

I. Ambient conditions when the response is triggered;
II. Operating conditions of each **Controllable PPM** and
III. Available Active Power

DCC11.3.7.4 Type C & D **Controllable PPM**s shall be capable of providing a power increase up to **Available Active Power**. Stable operation shall be ensured.

DCC11.3.7.5 Type C & D **Controllable PPM**s capable of acting as a load shall be capable of disconnecting their load. This requirement does not extend to auxiliary supplies.

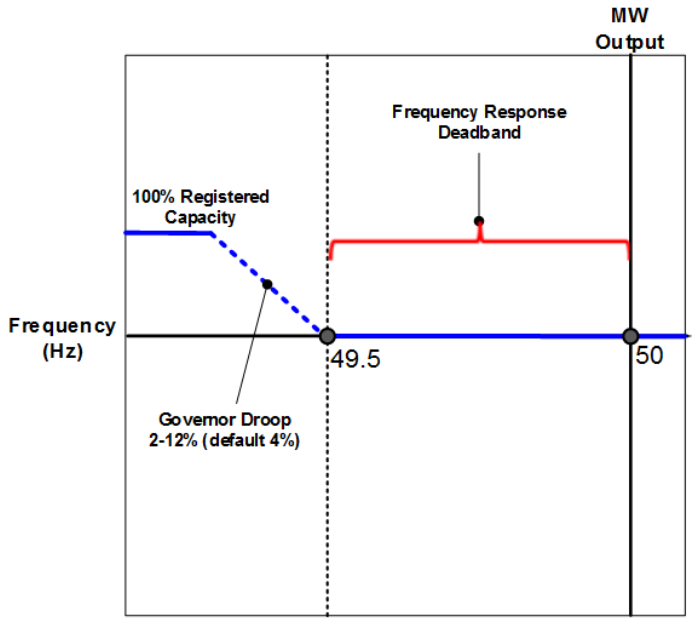


Figure 15

DCC11.3.8 Frequency Sensitive Mode

The following shall apply for that are type C or D **Controllable PPMs** for **Frequency Sensitive Mode** operation:

DCC11.3.8.1 A frequency deadband of no greater than +/- 15mHz may be applied. The design, implementation and operation of the frequency deadband shall be agreed with the **TSO** prior to the **Commissioning**.

DCC11.3.8.2 Type C & D **Controllable PPMs** shall be capable of setting **Governor Droop** between 2% and 12%. The default **Governor Droop** setting shall be 4%.

DCC11.3.8.3 Type C & D **Controllable PPM**s shall be capable of providing **Active Power** frequency response in accordance with the parameters specified in in Table 16.

Table 16

Parameters	**Value**
Frequency Response Insensitivity (Δf)	15 mHz
Frequency Response Insensitivity (Δf/f)	0.03 %

Upon request from the **TSO**, the frequency response deadband and governor droop must be able to be reselected repeatedly.

The maximum combined effect of frequency response insensitivity and frequency deadband cannot exceed a value of +/- 15 mHz.

DCC11.3.8.4 In response to low frequency events, type C & D PPMs shall be capable of providing a power increase up to **Available Active Power**. Stable operation in response to low frequency events shall be ensured.

Type C & D **Controllable PPM**s capable of acting as a load, shall be capable of disconnecting their load in the case of a low frequency event. This requirement does not extend to auxiliary supplies.

DCC11.4 VOLTAGE REQUIREMENTS

DCC11.4.1 For **DSO** topology 1 **Controllable PPM's** irrespective of **Registered Capacity** and **DSO** topology 2 **Controllable PPM's** with **Registered Capacity** ≥5**MW**, under steady state conditions, the **Voltage Regulation System** shall be capable of implementing the following **Reactive Power** control modes, as specified in **DCC**11.6.2.3, which shall be available to the **DSO** or **TSO** as agreed between **DSO** and **TSO.**

DCC11.4.1.1 **Controllable PPM's** shall have a continuously-variable and continuously-acting **Voltage Regulation System** with similar response characteristics to a conventional **AVR** and shall perform generally as described in BS4999 part 140, or equivalent European Standards.

DCC11.4.1.2 The **Voltage Regulation System Slope Setting** shall be capable of being set to any value between 1 % and 10 %. The setting shall be specified by the **DSO** at least 120 business days prior to the **Controllable PPM's** scheduled operational date. The **Controllable PPM** shall be responsible for implementing the appropriate settings during **Commissioning**. The slope setting may be varied from time to time depending on system needs. The **DSO** shall give the **Controllable PPM** a minimum of two weeks' notice if a change is required. The **Controllable PPM** shall formally confirm that any requested changes have been implemented within two weeks of receiving the **DSO's** formal request.

DCC11.4.1.3 The speed of response of the **Voltage Regulation System** shall be such that, following a **Step Change** in voltage at the **Connection Point**, the **Controllable PPM** shall achieve 90 % of its steady-state **Reactive Power** response within 1 second. The response may require a transition from maximum **MVAr** production to maximum **MVAr** absorption or vice-versa. If the **Step Change** results in a **Voltage Dip** then clause DCC11.2 takes precedence.

DCC11.4.2 Additional Requirements for Topology 1 Controllable PPM's

DCC11.4.2.1 **DSO** Topology 1 **Controllable PPM's** irrespective of **Maximum Capacity** shall remain continuously connected at maximum **Available Active Power** or **Controlled Active-Power** output for normal and disturbed system conditions and for **Step Changes** in voltage of up to 10%. The ranges that may arise during disturbances or following faults are given in Table 13.

DCC11.4.3 [PREVIOUS CONTENT RE-LOCATED]

DCC11.4.4 Topology 1 Controllable PPM's 110kV Step-up Transformer

DCC11.4.4.1 The 110kV step-up transformer shall be designed such that the **Reactive Power** capability is possible over the full range of 110kV voltage specified in Figure 13.

DCC11.4.4.2 Each 110kV step-up transformer shall have on-load tap changing facilities. The tap step shall not alter the voltage ratio at the **HV** terminals by more than 2.5% or as agreed with the **DSO**.

DCC11.4.4.3 110kV step-up transformers shall be connected either:

- In delta on the **Low Voltage** side and in star (with the star point or neutral brought out) on the **High Voltage** side; or
- In star on both higher and **Low Voltage** sides with a delta tertiary winding provided.

DCC11.4.4.4 Provision should be made for the **Earthing** of the 110kV neutral of any transformer connected to the 110kV system by bringing out the neutral and ensuring that the insulation is such that the transformer can be operated unearthed.

DCC11.5 REACTIVE POWER REQUIREMENTS

DCC11.5.1 Power Factor Range

For avoidance of doubt, at power levels of less than 12% of **Registered Capacity**, the **Reactive Power** at the **Connection Point** can vary up to a maximum of 12% of – the **Registered Capacity** value, expressed in MVAr [importing VArs]. This power factor range is illustrated in Figures 18 and 19.

DCC11.5.1.1 Topologies 2, 2A, 3 & 4

DSO topology 2A, 3 & 4 **Controllable PPM's** irrespective of **Registered Capacity** and **DSO** topology 2 **Controllable PPM's** with **Registered Capacity** <5**MW** , shall have a settable power factor in the range of 0.92, such that vars are absorbed by the **PPM** from the **Distribution System**, and unity, as measured at the **Connection Point**. This power factor range is illustrated in Figure 16. The setting shall be specified by the **DSO** at least 120 business days prior to the **PPM's** scheduled operational date. The **PPM** shall be responsible for implementing the appropriate settings during **Commissioning**. The power factor setting may be varied from time to time depending on system needs. The **DSO** shall give the **PPM** a minimum of two weeks' notice if a change is required or an agreed date for the change to be implemented by the **PPM**. The **PPM** shall formally confirm that any requested changes have been implemented within two weeks of receiving the **DSO's** formal request or on the date agreed with the **DSO**, as appropriate.

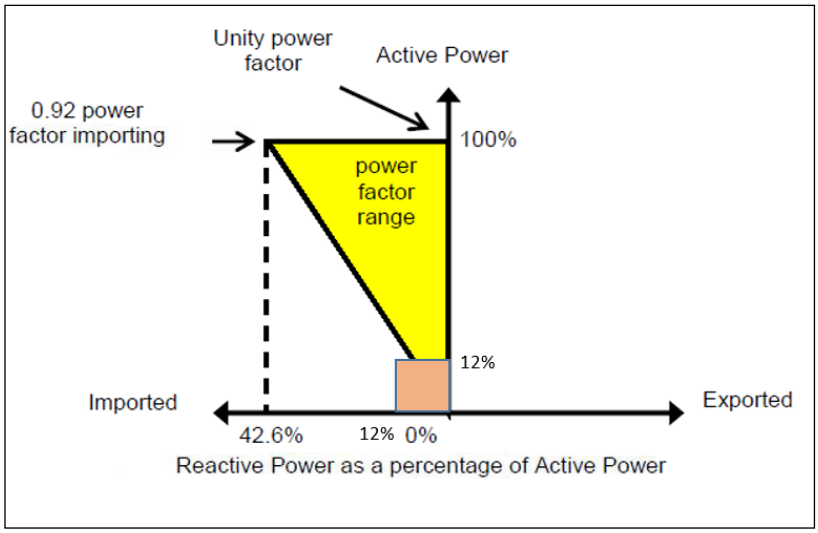


Figure 16

DCC11.5.1.2 Topology 5

PPMs, with connection topology 5, shall keep power factor between 0.92 and 0.95, as measured at the **Connection Point**, such that vars are absorbed by the **PPM** from the **Distribution System**. This power factor range is illustrated in Figure 17.

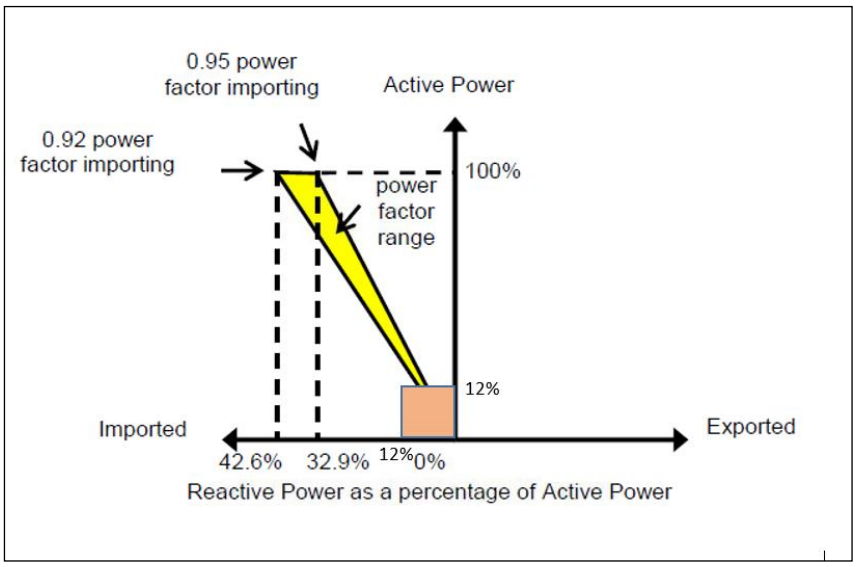


Figure 17

DCC11.5.2 Reactive Power Range

DSO topology 1 **Controllable PPMs** and **DSO** topology 2 **Controllable PPMs** with **Registered Capacity** ≥ 5**MW**, operating in power factor control mode, voltage control mode or constant **Reactive Power** mode shall be at least capable of operating at any point within the P-Q capability ranges illustrated in Figure 18, as measured at the **Connection Point** and shall be capable of providing this capability over the full range of voltages specified in Figure 13.

Referring to Figure 18:

- Point A represents the minimum **MVAr** absorption capability of the **Controllable PPM** at 100% **Registered Capacity** and is equivalent to 0.95 power factor with the **PPM** importing vars;
- Point B represents the minimum **MVAr** production capability of the **Controllable PPM** at 100% **Registered Capacity** and is equivalent to 0.95 power factor with the **PPM** exporting vars;
- Point C represents the minimum **MVAr** absorption capability of the **Controllable PPM** at 12% **Registered Capacity** and is equivalent to the same **MVAr** as point A;
- Point D represents the minimum **MVAr** production capability of the **Controllable PPM** at 12% **Registered Capacity** and is equivalent to the same **MVAr** as point B;
- Point E represents the minimum **MVAr** absorption capability of the **Controllable PPM** at the cut-in speed of the individual **WTGs** or **SGs**;
- Point F represents the minimum **MVAr** production capability of the **Controllable PPM** at the cut-in speed of the individual **WTGs** or **SGs**;

It is accepted that the values of points E and F may vary depending on the number of **WTGs** or **SGs** generating electricity in a low-resource scenario;

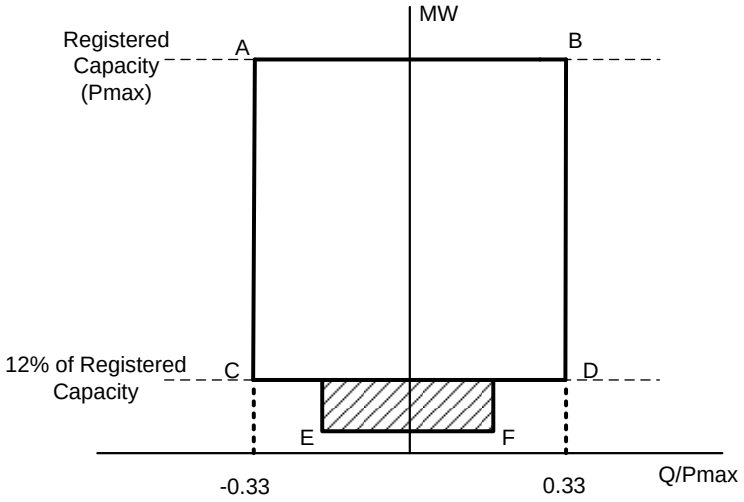


Figure 18

Figure 18 represents the minimum expected **Reactive Power** capabilities of the **Controllable PPM**. The **Controllable PPM** is obliged to tell the **DSO** if it can exceed these capabilities, and submit the actual P-Q capability diagram based upon the installed **Plant** and **Collector Network** characteristics to the **DSO** during **Commissioning**.

DCC11.5.3 Reactive Power Control Modes

DCC11.5.3.1 Voltage Control Mode

For avoidance of doubt, implementation of voltage control mode with voltage-reference set-points issued by ESBN via SCADA, is only mandated for topology 2 connections. For other topologies, operation at fixed power factors or power factor ranges appropriate to the topology, as specified above or in the Connection Agreement, shall apply.

However the requirement, per Article 21.3.d(vi) of RfG to have the capability to operate on a voltage droop applies to Types C and D PPMs , irrespective of topology.

If operating in Voltage Control Mode, then, following a **Step Change** in voltage, type C & D **PPMs** shall be capable of;

- Achieving 90% of the change in **Reactive Power** output within a time of 1 second.
- Settle at the value specified by the slope within 5 seconds with a steady-state reactive tolerance no greater than 5% of the maximum **Reactive Power**.

DCC11.5.3.2 Power Factor Control Mode

For the purpose of power factor control mode, type C & D **PPMs** shall be capable of controlling the power factor at the **Connection Point** within the required **Reactive Power** range that is appropriate to the topology of the connection, with a target power factor (as may be specified in the Connection Agreement), in steps no greater than 0.01. The target power factor value and its tolerance are specified in Table 17.

For avoidance of doubt, implementation of Power Factor Mode, with remotely issued set-points is only mandated for topology 2 connections. For other topologies, operation at fixed power factors or power factor ranges appropriate to the topology, as specified above or in the Connection Agreement, shall apply.

Table 17

Parameter	Value	Type Applicability
Target power factor	Site-specific	C and D **PPMs**
Tolerance	0.5%	C and D **PPMs**

DCC11.5.3.3 Reactive Power Mode

For the purpose of reactive power control mode, power park modules of topology 2, shall be capable of setting the reactive power setpoint anywhere in the reactive power range, specified in DCC11.5.2, with setting steps no greater than 5 MVAr or 5 % (whichever is smaller) of full reactive power, controlling the reactive power at the connection point to an accuracy within plus or minus 5 MVAr or plus or minus 5 % (whichever is smaller) of the full reactive power;

DCC11.6 SIGNALS, COMMUNICATIONS & CONTROL

DCC11.6.1 Signals from the PPM to TSO

Signals from the **PPM** to the **TSO** shall be broken up into a number of logical groups. There are different requirements for **PPMs** depending on the **PPM's** MEC size. Refer to Table 9 and Table 9x for a summary of the signal requirements for different **PPM** MEC.

The following groups shall apply:

- Signals List #1 - applies to **PPM** connection topologies 2 and 3.
- Signals List #2 - applies to **PPM** connection topologies 4 and 5.
- Signals List #8 - applies to **PPM** connection types B, C & D.

In addition, **PPMs** shall be required to provide certain signals from signals lists 3, 4, 5, 6 and 7. These lists relate to:

- Signals List #3 **PPM** availability data;
- Signals List #4 **PPM Active Power Control** data;
- Signals List #5 **Frequency Response System** data;
- Signals List #6 **PPM** meteorological data;
- Signals List #7 **DSO SCADA** signals.

DCC11.6.1.1 Signals List #1

The **PPM** shall make the following signals available at either the DSO RTU**,** or the **TSO Telecommunications Interface Cabinet** located at the **PPM** site or both, as specified in the signal list provided by TSO or DSO:

a) **Active Power** output (**MW**) at the **Connection Point**;
b) **Available Active Power** (**MW**) at the **Connection Point**;
c) **Reactive Power** output/**Demand** (+/-**MVAr**) at the **Connection Point**;
d) On/off status indications for all **Reactive Power** devices exceeding 5 **MVAr**[13];
e) **Circuit Breaker** position indication shall be required. These may include indications from **HV** as well as **MV Circuit Breakers** on individual **WTG** or **SG** circuits. Signals from individual **WTG** or **SG Circuit Breakers** shall not be required. The actual **Circuit Breaker** signals required shall be specified by the **TSO** and subsequently advised by the **DSO**, at least 60 business days prior to the **PPM's** scheduled operational date.
f) ON/OFF status of **TSO** remote control enabled switch, which disables the ability of the **TSO** to send commands to the **PPM**.

[13] Typically, the position indication from capacitor/SVC circuit breakers

g) Voltage (kV) at the **Connection Point**

h) For **DSO** topology 1 connected **PPMs** the following additional signals are required:

- 110kV step-up transformer OLTC tap positions
- Voltage in kV at the 110kV step-up transformer **Low Voltage** terminals
- **Voltage Regulation Set-Point** (in kV)
- A minimum of four sets of normally open potential free auxiliary contacts in each 110kV step-up transformer **Low Voltage** bay for fault indication

DCC11.6.1.2 Signals List #2

The **PPM** shall make the following signals available at either the DSO RTU**,** or the **TSO Telecommunications Interface Cabinet** located at the **PPM** site, or both, as specified in the signal list provided by TSO or DSO:

a) **Active Power** output (**MW**) at the **Connection Point**;
b) **Available Active Power** (**MW**) at the **Connection Point**;
c) **Reactive Power** output/**Demand** (+/-**MVAr**) at the **Connection Point**;
d) Voltage (kV) at the **Connection Point**
e) **Circuit Breaker** position indication shall be required. These may include indications from **HV** as well as **MV Circuit Breakers** on individual **WTG** or **SG** circuits. Signals from individual **WTG** or **SG Circuit Breakers** shall not be required. The actual **Circuit Breaker** signals required shall be specified by the **TSO** and subsequently advised by the **DSO** at least 120 business days prior to the **PPM's** scheduled operational date.
f) ON/OFF status of TSO remote control enabled switch, which disables the ability of the TSO to send commands to the PPM.

DCC11.6.1.3 Signals List #3

DCC11.6.1.3.1 The **PPMs**, with an MEC in excess of 10 **MW**, shall make available the following signals at either the DSO RTU**,** or the **TSO Telecommunications Interface Cabinet** located at the **PPM** site or both, as specified in the signal list provided by TSO or DSO:

a) **PPM** availability data (0-100% signal);
For Wind Farm Power Stations only:
b) Indication for percentage of the **WFPM's WTG** that are shutdown due to high-wind-speed conditions (0-100% signal);
c) Indication for percentage of the **WFPM's WTG** that are shutdown due to low-wind-speed conditions (0-100% signal).

DCC11.6.1.3.2 For **PPMs** where the **WTG** or **SG** are widely dispersed over a large geographical area and rather different weather patterns are expected for different sections of the **PPM** site, the above data set (specified in **DCC**11.6.1.3.1) shall be provided for a number of groups of **WTG** or **SG** (e.g. 1 signal for each group of XX **WTG** or **SG** within the **PPM** site). It is expected that **WTG** or **SG** within an individual group shall demonstrate a high degree of correlation in **Active Power** output at any given time. The actual signals required shall be specified by the **TSO** and subsequently advised by the **DSO**, at least 120 business days prior to the **PPM's** scheduled operational date.

DCC11.6.1.4 Signals List #4

The **PPM** shall make the following signals available at either the DSO RTU**,** or the **TSO Telecommunications Interface Cabinet** located at the **PPM** site or both, as specified in the signal list provided by TSO or DSO:

a) **PPM Active Power Control Set-Point** value (**MW**);
b) **PPM Active Power Control** status indication (ON/OFF).

DCC11.6.1.5 Signals List #5

The **PPM** shall make the following signals available at either the DSO RTU**,** or the **TSO Telecommunications Interface Cabinet** located at the **PPM** site or both, as specified in the signal list provided by TSO or DSO:

a) **Frequency Response System** mode signal (i.e. power-frequency response curve 1 or 2);
b) **Frequency Response System** status indication (ON/OFF).

DCC11.6.1.6 Signals List #6

DCC11.6.1.6.1 **PPMs**, with an MEC in excess of 10 **MW**, shall make the following signals available at either the DSO RTU**,** or the **TSO Telecommunications Interface Cabinet** located at the **PPM** site or both, as specified in the signal list provided by TSO or DSO:

:

Wind Farm Power Station Only

a) Wind speed (at hub height or as to be agreed with the TSO) – measurand signal;

b) Wind direction (at hub height or as to be agreed with the TSO) – measurand signal;

c) Air temperature – measurand signal;
d) Air temperature – measurand signal;

Solar Farm Power Station Only

a) Global Horizontal Irradiance (GHI) –measurand signal;
b) Diffused Horizontal Irradiance (DHI) – measurand signal;
c) Direct Normal Irradiance (DNI) (required for solar tracking panels only) – measurand signal;
d) Air temperature – measurand signal;
e) Back panel temperature – measurand signal;
f) Wind speed – measurand signal;
g) Wind direction – measurand signal;
h) Precipitation – measurand signal;
i) Air pressure – measurand signal.

DCC11.6.1.6.2 The Wind Farm Power Station meteorological data signals shall be provided by a dedicated **Meteorological Mast** located at the Wind-Powered Controllable **PPM** site or, where possible and preferable to do so, data from a means of the same or better accuracy. The Solar Farm Power Station meteorological data signals shall be provided by measurement devices located at the Solar-Powered Controllable PPM site. All meteorological data signals shall at a minimum meet accuracy levels defined by the TSO. For **PPMs** where the **WTG** or **SG**s are widely dispersed over a large geographical area and rather different weather patterns are expected for different sections of the **PPM**, the meteorological data shall be provided from a number of individual **Meteorological Masts** or measurement devices**,** or where possible and preferable to do so, data from a source of the same or better reliability for groups of **WTG** or **SG**s (e.g. 1 set of meteorological data for each group of XX **WTG** or **SG**s within the **PPM** site). It is expected that **WTG** or **SG**s within an individual group shall demonstrate a high degree of correlation in **Active Power** output at any given time. The actual signals required shall be specified by the **TSO** no later than 120 business days prior to the **PPM's** scheduled operational date.

DCC11.6.1.7 Signals List #7

The following data signals and commands shall be provided by **PPMs**:

a) **MW**
b) **MVAr**
c) kV

DCC11.6.1.8 Signals List #8

With regard to real-time monitoring of Frequency Sensitive Mode, as described in **DCC**11.3.8, type C & D **PPMs** shall be equipped to transfer in real time and in a secured manner, at least the following signals:

a) Status signal of Frequency Sensitive Mode (on/off);
b) Scheduled **Active Power** output,
c) Actual value of the **Active Power** output,
d) Actual parameter settings for **Active Power** frequency response; and
e) **Governor Droop** and Frequency Response Deadband.

The **DSO** & **TSO** shall specify additional signals to be provided by the **PPM** by monitoring and recording devices in order to verify the performance of the **Active Power** frequency response provision of participating **PPM**s.

DCC11.6.1.8 Time Delays and data quality

DCC11.6.1.8.1 A digital signal change from the **PPM** shall be relayed to the **TSO Telecommunications Interface Cabinet** within 1 second of the associated change of state event. An analogue signal change shall be relayed within 5 seconds and with an error of 0.5% or less, with the exception of the Meteorological Data as required by **DCC**11.6.1.6.1, which shall be updated within 5 seconds and with and shall be accurate at least 97.5% of the time over rolling 12-month period.

DCC11.6.2 Control Signals from DSO/TSO to PPM

The control signals described in **DCC**11.6.2 shall be sent from **DSO** or **TSO** to the **PPM**. The **PPM** shall be capable of receiving these signals and acting accordingly.

DCC11.6.2.1 Active Power Control

An **Active Power Control Set-Point** signal shall be sent by **TSO** to the **PPM Control System**. This set-point shall define the maximum **Active Power** output permitted from the **PPM**. The **PPM Control System** must be capable of receiving this signal and acting accordingly to achieve the desired change in **Active Power** output. This signal shall most likely be in the form of a single analogue value and a strobe pulse to enable. The **PPM** is required to make it possible for the **TSO** to remotely enable/disable the **Active Power Control** function in the **PPM Control System**. The associated status indication is described in **DCC**11.6.1.4.

DCC11.6.2.2 Frequency Response

This signal shall be sent by **TSO** to the **PPM** in the event that a change from power-frequency response curve 1 to power-frequency response curve 2, or vice versa, is required. The **PPM** is required to make it possible for the **TSO** to remotely enable/disable the **Frequency Response System**. The associated status indication described in **DCC**11.6.1.5.

DCC11.6.2.3 Voltage Control

For **DSO** topology 1 **Controllable PPM's** irrespective of **Registered Capacity** and **DSO** topology **Controllable PPM's** with **Registered Capacity** ≥5**MW**, under steady state conditions, the **Voltage Regulation System** shall be capable of implementing the following **Reactive Power** control modes which shall be available to the **DSO** or **TSO** as agreed by **DSO** and **TSO**:

a) The **Controllable PPM** shall be capable of receiving a power factor control (PF) set-point to maintain the power factor set-point at the **Connection Point**;
b) The **Controllable PPM** shall be capable of receiving a **Reactive Power Control** (Q) set-

point to maintain the **Reactive Power** set-point at the **Connection Point**;

c) The **Controllable PPM** shall be capable of receiving a **Voltage Regulation** (kV) set-point for the voltage at the **Connection Point**. The **Voltage Regulation System** shall act to regulate the voltage at this point by continuous modulation of the **Controllable PPM's Reactive Power** output, without violating the voltage Step Emissions limits as set out in the **IEC** standard 61000-3-7:1996 Assessment of Emission limits for fluctuating loads in **MV** and **HV** power systems. The **Controllable PPM's Reactive Power** output shall be zero when the voltage at the **Connection Point** is equal to the **Voltage Regulation Set-point**.

d) A change to the power factor control (PF) set-point**, Reactive Power** control (Q) set-point, **Voltage Regulation** (kV) set-point or **Reactive Power** control mode shall be implemented by the **Controllable PPM** within 20 seconds of receipt of the appropriate signal, within its **Reactive Power** capability range as specified in **DCC**11.4.5

e) One **Reactive Power** control mode shall be operational at all times with the facility to toggle between each of the **Reactive Power** control modes as instructed by the **DSO** or **TSO**, as agreed by the **DSO** and **TSO**. Toggling between **Reactive Power** controllers shall be smooth in transfer i.e. the **Controllable PPM** shall calculate and implement an appropriate set-point when transferring to the new control mode. The set-point calculated for the new control mode shall be consistent with the **MVAr** output at that time.

DCC11.6.2.4 Network Operator Initiated Shutdown

This signal shall facilitate the disconnection of the **PPM** under Black Start conditions and / or if the **PPM** has to be disconnected for operational reasons.

For 38kV connections, it shall be possible for **DSO** to send a trip and / or inhibit signal[14] to the **Circuit Breaker** at the **PPM Connection Point**. The signal shall open the **Circuit Breaker** and switch off the auto-reclosing.

For **MV** connections:

a) It shall be possible for **DSO** to send a trip and / or inhibit signal[15] to the **Circuit Breaker** at the **PPM Connection Point**. The signal shall open the **Circuit Breaker** and switch off the auto-reclosing, or

b) A switching device capable of being remotely operated by **DSO** shall be installed at or near the **PPM Connection Point**.

DCC11.6.2.5 Time Delays and Data Quality

A digital output command from the **TSO Telecommunications Interface Cabinet** shall be relayed to the **PPM Equipment** within 1 second of the associated change of state event. A set-point output signal shall be relayed within 5 seconds and with an error of 0.5% or less.

DCC11.6.2.6 Responsible Operator

DCC11.6.2.6.1 A designated responsible operator shall be contactable by **DSO** or **TSO** at all times to discuss operational matters without undue delay and in any case within at most 6. Following a request from **DSO**, the responsible operator shall be present at the **PPM's Connection Point** without undue delay and in any case within two hours and shall be capable of taking any appropriate actions. The responsible operator shall be contactable 24 hours a day, 365 days a year. Specialist response shall be available on the next working day following a request from the **DSO** or **TSO**.

DCC11.6.2.6.2 For **DSO** topology 1 connected **PPMs** a designated responsible operator shall be contactable by the **DSO** and **TSO** at all times to discuss operational matters without undue delay and in any case within 15 minutes. Following a request from the **DSO**, the responsible operator shall be present at the **PPM's Connection Point** without undue delay and in any case within one hour and shall be

[14] Refer to Table 9 and Table 9x.

[15] Refer to Table 9 and Table 9x.

capable of taking any required appropriate actions. The responsible operator shall be contactable 24 hours a day, 365 days a year.

DCC11.6.2.7 Data and Communications Specifications

DCC11.6.2.7.1 The location of the **TSO Telecommunications Interface Cabinet** shall be agreed between the **DSO** and the **PPM** at least 120 business days prior to the **PPM's** scheduled operational date. A standard interface for signals will be made available to the **PPM** by the **TSO**.

DCC11.6.2.7.2 The necessary communications links, communications protocol and an individual **PPM** signal list shall be specified by the **TSO**/**DSO** as appropriate, at least 120 business days prior to the **PPM's** scheduled operational date. Current applicable standards shall apply and the accuracy class for signals shall comply with the prevailing European Standard at that time.

DCC11.6.2.7.3 For loss of communications links, persistence (i.e. continuing to operate with the most recent data set) shall be used in terms of set-points until the designated responsible operator has been contacted by the **DSO**/**TSO** as appropriate.

DCC11.6.2.7.4 If **Active Power Control**, **Frequency Response** or **Voltage Regulation** facilities at the **PPM** become unavailable, the **PPM** shall contact **TSO** or **DSO** without undue delay.

DCC11.6.2.7.5 Where signals or indications required to be provided by the **PPM** under **DCC**11.6 become unavailable or do not comply with applicable standards due to failure of the **PPM's** technical **Equipment** or any other reason under the control of the **PPM**, the **PPM** shall, acting in accordance with **Good Industry Practice**, restore or correct the signals and / or indications as soon as possible.

DCC11.6.2.8 Installation of **MV** recloser at PPM site

In order to provide adequate **Protection** to **MV** networks connecting to the **PPM Power Station** an **MV** recloser shall be installed in the **DSO's MV** substation at the **PPM Power Station** site.

DCC11.6.3 Resource Power Forecasts

MW forecasts shall be provided by **PPMs** with an MEC in excess of 30 **MW**. These forecasts shall be provided at 10:00 a.m. on a daily basis for the following 48 hours for each 30 minute time-period, by means of an electronic interface in accordance with the reasonable requirements of **TSO's** data system.

DCC11.6.4 PPM Power Station MW Availability Declarations

PPMs with an MEC in excess of 30 **MW** shall submit **PPM MW** availability declarations whenever changes in **PPM** availability occur or are predicted to occur. These declarations shall be submitted by means of an electronic interface in accordance with the reasonable requirements of **TSO's** data system.

DCC11.7 DYNAMIC MODELS FOR PPMs

DCC11.7.1 PPM Generator Dynamic Models

The **TSO** requires suitable and accurate dynamic models for all **Generators** connected to, or applying for a connection to, the **Transmission System** or the **Distribution System** in order to assess reliably the impact of the **Generator's** proposed installation on the dynamic performance and security and **Stability** of the power system.

Modelling requirements for thermal and hydro **Generators** are processed on the identification by the applicant of the relevant PSS/E[16] library model and the provision of the applicable data parameters as set out in **DCC**11.3.4. Where there are no suitable library models available, specially written models are supplied. These are known as "user-written models".

DCC11.7.2 Requirement to Provide a Dynamic Model

[16] PSS/E Power System Simulator for Engineering; the power system analysis software package used by the **TSO**.

Each **PPM** with a **Registered Capacity** of 5**MW** or greater shall provide to the **DSO**, for onward transmission to the **TSO**, a dynamic model, or shall provide an unambiguous reference to a dynamic model previously provided to the **DSO** or the **TSO**, appropriate for the **PPM**. If all the **WTGs** or **SGs** in the **PPM** are not identical, the model shall incorporate separate modules to represent each type of **WTG** or **SG**. Appropriate data and parameter values must be provided for each model.

The model shall be provided in PSS/E format, or in such other format as may be agreed between the **PPM** and the **TSO**.

The models for **WTGs** or **SG** and the **PPM** (computer software based on a mathematical representation of the behaviour of the machine) must be able to calculate how quantities such as **Active Power** output, **Reactive Power** output, turbine speed etc. vary as factors such as the voltage at the **Connection Point** change. They must take account of the inherent characteristics of the machines and the actions of the **WTG** or **SG**control systems and any relevant **PPM** control systems.

DCC11.7.3 Computer Environment

The dynamic models must run on the PSS/E software for the Irish network. They must not require a simulation time step of less than 5 ms. Details of the current PSS/E version, computer platform, compiler version etc., will be provided by the **TSO** upon request. The **TSO** may from time to time request that the models be updated to be compatible with changes in the **TSO's** computing environment. Each **PPM** shall ensure that such updated models are provided without undue delay.

DCC11.7.4 Features to be Represented in the Dynamic Model

The dynamic model must represent the features and phenomena likely to be relevant to angular and voltage **Stability**. These features include but may not be limited to:

a) The electrical characteristics of the **Generator**;
b) The separate mechanical characteristics of the turbine and the **Generator** and the drive train between them;
c) Variation of power co-efficient with pitch angle and tip speed ratio;
d) Blade pitch control;
e) Converter controls;
f) Reactive compensation;
g) **Protection** relays.

DCC11.7.5 Model Aggregation

For computational reasons, it is essential that the models of individual **WTGs** or **SGs** can be aggregated into a smaller number of models, each representing a number of **WTGs** or **SGs** at the same site. A representation of the **Collector Network** may be included in the aggregate model of the **PPM**.

DCC11.7.6 Model Documentation

The model should be fully documented. The documentation should describe in detail the model structure, inputs, outputs and how to set up and use the model and should be based on the documentation of standard PSS/E library models.

The **TSO** may, when necessary to ensure the proper running of its complete system representation or to facilitate its understanding of the results of a dynamic simulation, request additional information concerning the model, including the source code of one or more routines in the model. The **PPM** shall comply with any such request without delay. Where the **PPM** or any other party (acting reasonably) designates such information as confidential on the basis that it incorporates trade secrets, the **DSO** or **TSO** shall not disclose the information so designated to any third party.

DCC11.7.7 Time to Comply

Where a **User** requires reasonable time to develop the necessary model or models so as to comply fully with all the provisions in this section **DCC**11.7.2, the **User** may apply to the **DSO** to be deemed compliant with the provisions of **DCC**11.7.2 on the basis that the non-compliance will not unduly inhibit the assessment by the **TSO** of the **Stability** and reliability of the power system and that the **User** has a satisfactory programme to remedy the non-compliance. The **DSO** shall refer any such application to the **TSO** for consideration. If the **TSO** is satisfied as to the **User's** programme for developing and testing the necessary dynamic model or models, the **DSO** and **TSO** may, for so long as the **TSO** is so satisfied, treat the **User** as being in compliance with the provisions of **DCC**10.6.2. If the **TSO** decides, acting reasonably, that it is not satisfied as to the **User's** programme for developing and testing the necessary dynamic model and that the **User** cannot be deemed to be in compliance with **DCC**11.7.2, the **User** may apply for a derogation under the terms of **DGC**11.3.

DCC11.7.8 Validation of Model

All models provided to the **DSO** and **TSO** for use in dynamic simulations must be validated. The **TSO** must be satisfied that the behaviour shown by the model under simulated conditions is representative of the behaviour of the real **Equipment** under equivalent conditions.

For validation purposes the **PPM** shall ensure that appropriate tests are performed and measurements taken to assess the validity of the dynamic model. Where the validity of the model has not been confirmed prior to the **Commissioning** of the **PPM**, appropriate tests shall be carried out and measurements taken at the **PPM** to assess the validity of the dynamic model. The tests and measurements required shall be agreed with the **DSO** and the **TSO**.

The **PPM** shall provide to the **DSO** for onward transmission to the **TSO** all available information showing how the predicted behaviour of the dynamic model to be verified compares with the actual observed behaviour of a prototype or production **WTG** or **SG** under laboratory conditions and / or actual observed behaviour of the real **WTG** or **SG** as installed and connected to a transmission or distribution network.

If the on-site measurements or other information provided indicate that the dynamic model is not valid in one or more respects, the **PPM** shall provide a revised model whose behaviour corresponds to the observed on-site behaviour as soon as reasonably practicable.
The conditions validated should as far as possible be similar to those of interest, e.g. low short circuit level at **Connection Point**, close up, severe faults, nearby moderate faults, remote faults, voltage excursions, **Frequency** excursions, large wind speed variations.

DCC11.7.9 Requirements for PPM of less than 5 MW

As an alternative to providing a dynamic model as specified in **DCC**11.7.2 to 11.6.8, a **PPM** of less than 5 **MW** may provide to the **DSO** for onward transmission communication to the **TSO** the following information:

For **Wind Farm Power Stations** only

- **Wind Turbine Generator** type
  (fixed speed stall regulated, fixed speed pitch regulated, fixed speed pitch regulated with variable rotor resistance, variable speed with doubly-fed induction **Generator**, variable speed with synchronous **Generator** and fully-rated converter or other specified type.)
- Manufacturer of **Wind Turbine Generator**
- Model/type description
- Manufacturer of **Generator**
- Turbine **Generator** data as set out in **DCC**11.3.1
  - For **Solar Farm Power Stations** only
  - [to be completed]

DCC11.7.10 Power Park Module Data

In order to construct a valid dynamic model of each **PPM** the following **Controllable PPM** data is required by the **TSO** and **DSO**:

a) Generator (WTG or **SG) Transformer**

This is the transformer that connects the **WTG** with the internal **PPM** network.

- Rating of **WTG** or **SG** transformer (**MVA** or **kVA**)
- **WTG** or **SG** transformer voltage ratio (kV)
- **WTG** or **SG** transformer impedance (% on rated **MVA** or **kVA**)

b) Internal PPM Network and Corresponding Data

Details of the **PPM's** internal network (**Collector Network**) structure should be provided by means of a single-line diagram or other description of connections. The description should indicate how the individual **WTG** or **SGs** are connected together as well as how they are connected to the **PPM** substation. The different cable or overhead line types and the individual length of each section of circuit should be specified.

Electrical parameters of the cables or overhead lines in the **Collector Network** should be provided as set out in the table below:

	Type 1	Type 2	Type 3	
Total Length (m)				Extend table as appropriate
Conductor Cross Section Area per Core (mm)				
Conductor Type (Al, Cu, etc.)				
Type of Insulation				
Charging Capacitance (µF/km)				
Charging Current (Amp/km)				
Positive Sequence Resistance (R1 Ohm/km)				
Positive Sequence Reactance (X1 Ohm/km)				

c) Connection Point Step-up Transformer

If there is a step-up transformer connecting the **PPM** site with the **Distribution System,** the following transformer data is required:

- Rating of step-up transformer (**MVA** or **kVA**)
- Transformer voltage ratio (kV)
- Transformer impedance (% on rated **MVA** or **kVA**)

d) Reactive Compensation Installed at Site

Number of inductive devices

For each device, the inductive kVAr or **MVAr** capability. If the device has more than one stage, please indicate the number of stages and the kVAr or **MVAr** capability switched in each stage i.e. 0.5 **MVAr** in 5 steps etc.

Number of capacitive devices

For each device, the capacitive kVAr or **MVAr** capability. If the device has more than one stage, please indicate the number of stages and the kVAr or **MVAr** capability switched in each stage i.e. 0.5 **MVAr** in 5 steps etc.

Method of voltage / **Reactive Power** control applied to each controllable reactive compensation device. This information should be provided in sufficient detail (e.g. transfer function block diagram, control system gain/droop, deadband and hysteresis characteristics, tap steps, etc.) to allow an appropriate dynamic model to be developed.

DCC12 ADDITIONAL REQUIREMENTS FOR SYNCHRONOUS POWER GENERATING MODULES [SPGMs]

DCC12.0.1 Objective

The primary objective of **DCC**12 is to establish the technical rules to which **SPGMs** must comply in order to ensure that the **DSO** and the **TSO** can operate the **Distribution System** and **Transmission System** reliably.

DCC12.0.2 Scope

DCC12 applies wholly or in part to **RfG Generation Units** that are **SPGMs**, with the exception of **DCC1**2.5.3 & **DCC1**2.5.4 which applies to all **SPGMs.**

DCC12.0.3 Applicability

Requirements for **RfG Generation Units** that are **SPGMs** will be considered based on **Registered Capacity** as categorised in Table 6.

DCC12.1 FAULT RIDE THROUGH REQUIREMENTS

DCC12.1.1.1 That capability shall be in accordance with the voltage-against-time profile measured at the **Connection Point** for fault conditions as shown in Figure 9 and the relevant table below. Phase to phase voltage remains above the line, unless the protection scheme for internal electrical faults requires the disconnection of the power-generating module from the network.

DCC12.1.1.2 Undervoltage protection (either fault-ride-through capability or minimum voltage specified at the **Connection Point** voltage) shall be set by the **SPGM** owner according to the widest possible technical capability of the **Generating Unit**, unless the distribution system operator requires narrower settings. The protection schemes and settings for internal electrical faults must not jeopardise fault-ride-through capability.

DCC12.1.2 Connected at <110kV

Table 18

No. on Graph	Parameter	Value	Applicability
1	U_{ret}	0.05 p.u.	Type B, C & SPGMs (Connected at <110kV)
2	U_{ret}	0.05 p.u.	
	t_{clear}	150 ms	
3	U_{clear}	0.7 p.u.	
	t_{clear}	150 ms	
4	U_{rec1}	U_{clear}	
	t_{rec1}	t_{clear}	
5	U_{rec1}	U_{clear}	
	t_{rec2}	450 ms	
6	U_{rec2}	0.9 p.u.	
	t_{rec3}	t_{rec2}	

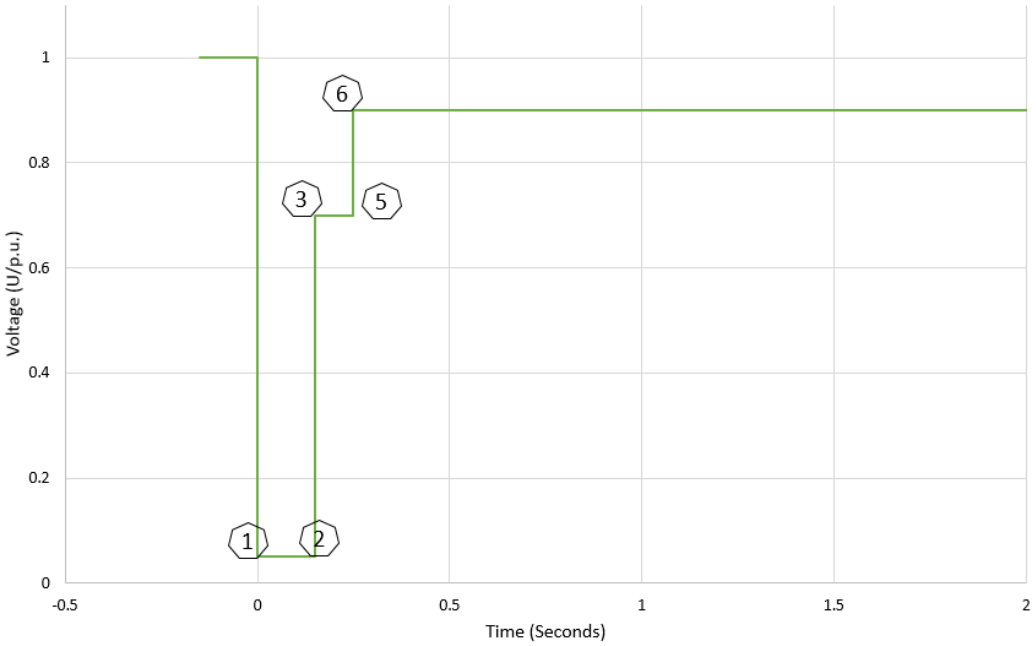


Figure 19

DCC12.1.3 Connected at ≥110kV

Table 19

No. on Graph	Parameter	Value	Applicability
1	U_{ret}	0 p.u.	Type D SPGMs (Connected at ≥110kV)
2	U_{ret}	0 p.u.	
	t_{clear}	150 ms	
3	U_{clear}	0.25 p.u.	
	t_{clear}	150 ms	
4	U_{rec1}	0.5 p.u.	
	t_{rec1}	450 ms	
5	U_{rec1}	0.5 p.u.	
	t_{rec2}	450 ms	
6	U_{rec2}	0.9 p.u.	
	t_{rec3}	450 ms	

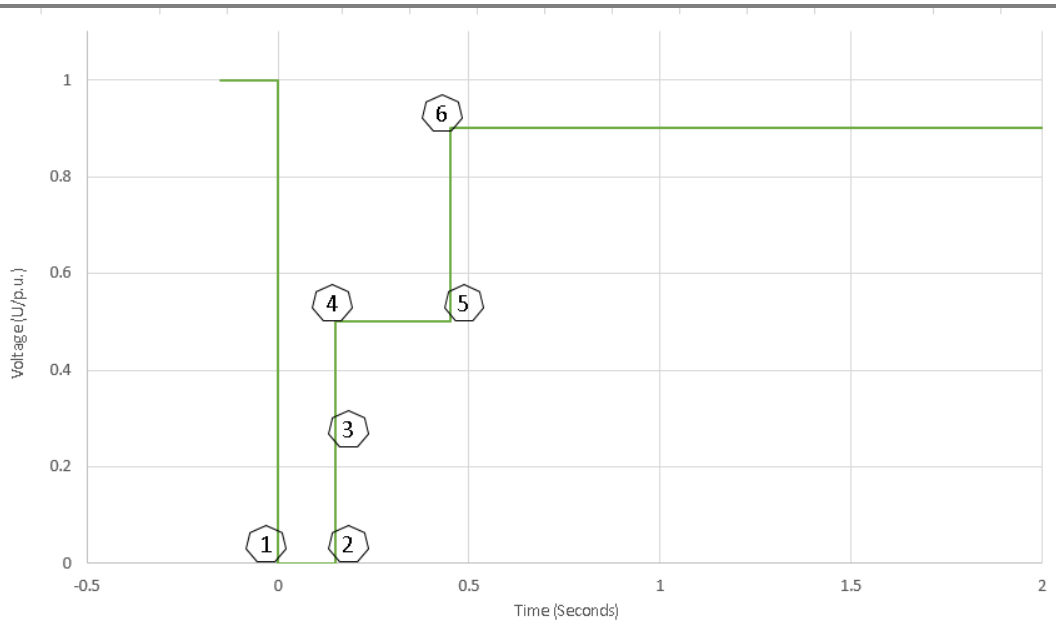


Figure 20

DCC12.2 FREQUENCY REQUIREMENTS

DCC12.2.1 Limited Frequency Sensitive Mode – Over-frequency

The following shall apply for type A, B, C or D **SPGMs** operating in Limited Frequency Sensitive Mode – Over-frequency:

DCC12.2.1.1 **SPGMs** shall be capable of providing **Active Power** frequency response when the **Frequency** rises to or above 50.2 Hz.

DCC12.2.1.2 The **Active Power** frequency response shall be capable of having a **Governor Droop** between 2% and 12%. The default **Governor Droop** setting shall be 4%.

Where the required level of response is not being achieved appropriate action should be taken by the **SPGM** without delay and without receipt of instruction from the **TSO** to achieve the required levels of response, provided the **SPGM**'s local security and safety conditions permit.

DCC12.2.1.3 **SPGMs** shall be capable of providing a power decrease down to **Minimum Load**. Stable operation shall be ensured.

DCC12.2.1.4 **SPGMs** shall be capable of continuous stable operation when MW Output is reduced to **Minimum Load**. This response will prevail over any other **Active Power** control mode.

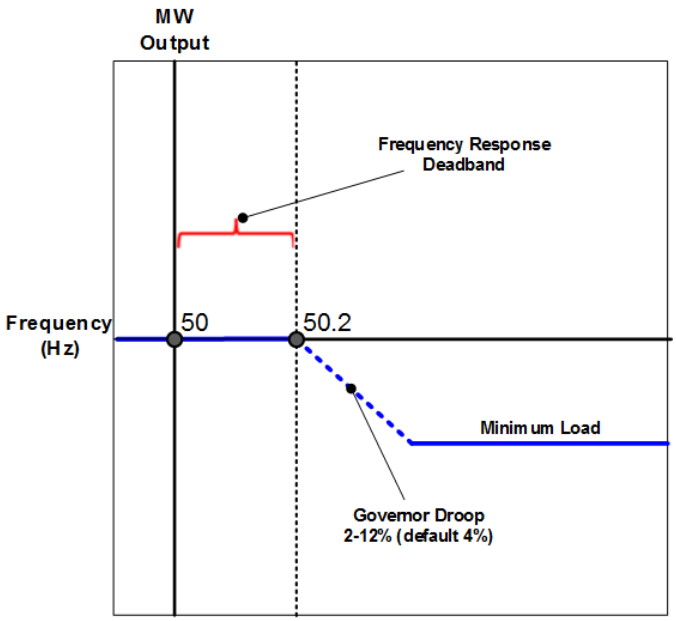


Figure 21: Limited Frequency Sensitive Mode – Over-frequency

DCC12.2.2 Limited Frequency Sensitive Mode – Under-frequency

The following shall apply for type C or D **SPGMs** operating in Limited Frequency Sensitive Mode – Under-frequency:

DCC12.2.2.1 Type C & D **SPGMs** shall be capable of providing **Active Power** frequency response when the **Frequency** falls to or below 49.5 Hz.

DCC12.2.2.2 The **Active Power** frequency response shall be capable of having a **Governor Droop** between 2% and 12%. The default **Governor Droop** setting shall be 4%.

Where the required level of response is not being achieved appropriate action should be taken by the **SPGM** without delay and without receipt of instruction from the **TSO** to achieve the required levels of response, provided the **SPGM**'s local security and safety conditions permit.

DCC12.2.2.3 Controllable **SPGM**s shall take into account the;

I. Ambient conditions when the response is triggered;
II. Operating conditions of each **Controllable SPGM**; and
III. Available Active Power

DCC12.2.2.4 Type C & D **SPGM**s shall be capable of providing a power increase up to **Registered Capacity**. Stable operation shall be ensured.

DCC12.2.2.5 Type C & D **SPGM**s capable of acting as a load, shall be capable of disconnecting their load. This requirement does not extend to auxiliary supplies

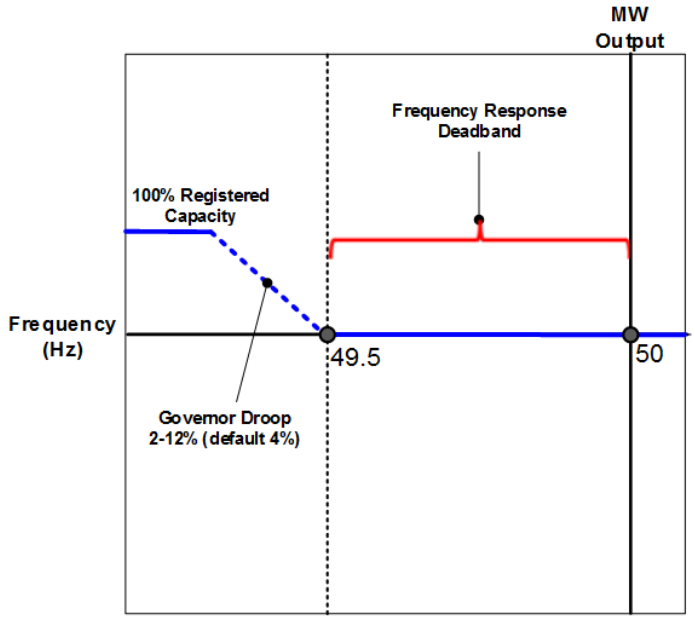


Figure 22: Limited Frequency Sensitive Mode – Under-frequency

DCC12.2.3 Frequency Sensitive Mode

The following shall apply to type C & D **SPGMs** for **Frequency Sensitive Mode** operation:

DCC12.2.3.1 A frequency deadband of no greater than +/- 15mHz may be applied. The design, implementation and operation of the frequency deadband shall be agreed with the **TSO** prior to the **Commissioning**.

DCC12.2.3.2 Type C & D **SPGMs** shall be capable of setting **Governor Droop** between 2% and 12%. The default **Governor Droop** setting shall be 4%.

DCC12.2.3.3 Controllable **SPGMs** shall be capable of providing **Active Power** frequency response in accordance with the parameters specified in Table 20.

Table 20

Parameters	**Value**
Frequency Response Insensitivity (Δf)	15 mHz
Frequency Response Insensitivity (Δf/f)	0.03 %

Upon request from the TSO, the frequency response deadband and **Governor Droop** must be able to be reselected repeatedly.

The maximum combined effect of Frequency Response Insensitivity and Frequency Deadband cannot exceed a value of +/- 15 mHz.

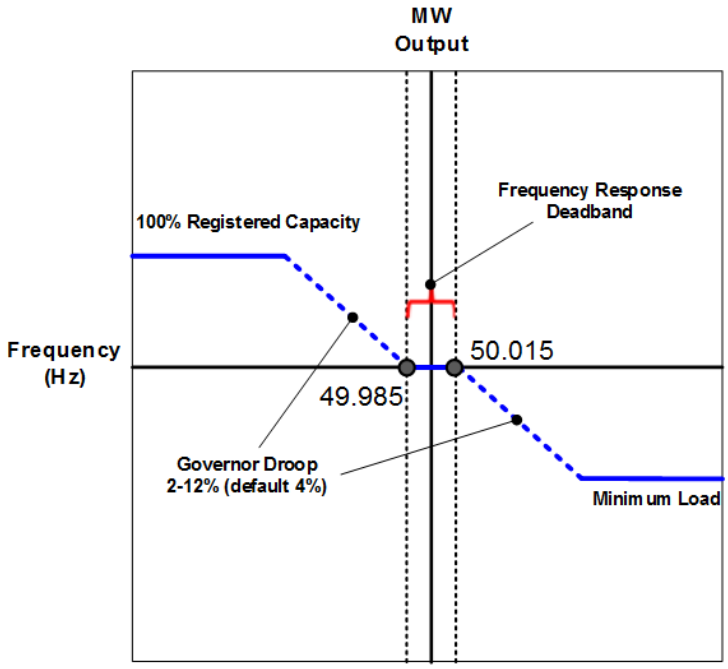


Figure 23: Frequency Sensitive Mode

DCC12.2.3.4 The **Frequency Response System** shall be required to change between Limited Frequency Sensitive Mode – Under-frequency, Limited Frequency Sensitive Mode – Over-frequency, and Frequency Sensitive Mode within one minute from receipt of the appropriate signal from the **TSO**. **SPGMs** may be instructed to be in both Limited Frequency Sensitive Mode – Under-frequency and Limited Frequency Sensitive Mode – Over-frequency at the same time. **SPGMs** shall only operate in Frequency Sensitive Mode when they are not operating in Limited Frequency Sensitive Mode – Under-frequency or Limited Frequency Sensitive Mode – Over-frequency.

DCC12.3 VOLTAGE REQUIREMENTS

DCC12.3.1 Voltage Control System

The excitation control system of an automatic voltage regulator (AVR) shall include a Power System Stabilizer (PSS) function to attenuate power oscillations, for Type D **SPGMs**.

DCC12.4 ACTIVE POWER CONTROL

DCC12.4.1 Type C & D **SPGM**'s control system shall be capable of adjusting an **Active Power Control Set-Point** in line with instructions given to the **Generator** by the **DSO** or **TSO**. In this **Active Power Dispatch Mode**, the **SPGM Control System** shall be capable of receiving an on-line **Active Power Control Set-Point** (within a tolerance of 1 MW or 1% of dispatch quantity) sent by the **TSO** or **DSO** and shall commence implementation of the set-point within 10 seconds (plus the ramp rate for the unit) of receipt of the signal from the **TSO** or **DSO** as agreed between **TSO** and **DSO**.

DCC12.5 REACTIVE POWER REQUIRMENTS

DCC12.5.1 For centrally dispatched controllable type C & D **SPGMs** a **Dispatch Instruction** relating to **Reactive Power** will be implemented without delay and, will be achieved not later than 2 minutes after the **Dispatch Instruction** time, or such longer period as the **TSO** may instruct. **Centrally Dispatched SPGMs** will not have their reactive power dispatched by the **TSO** unless individually agreed.

DCC12.5.3 For type C & D **SPGMs** the power factor requirements shall be maintained for the voltages in Figure 13.

DCC12.5.4 **DSO** phase balance requirements are covered in EN50160.

DCC12.6 SIGNALS, COMMUNICATIONS & CONTROL

DCC11.6.1 Signals from the SPGM to TSO

Signals from the **SPGM** to the **TSO** shall be broken up into a number of logical groups. There are different requirements for **PPMs** depending on the **PPM's** type.

The following groups shall apply:

- Signals List #1 - applies to **PPM** connection types B, C & D.

DCC11.6.1.1 Signals List #1

With regard to real-time monitoring of Frequency Sensitive Mode, as described in **DCC**12.2.3, type C & D **SPGMs** shall be equipped to transfer in real time and in a secured manner, at least the following signals:

a) Status signal of Frequency Sensitive Mode (on/off);
b) Scheduled **Active Power** output,
c) Actual value of the **Active Power** output,
d) Actual parameter settings for **Active Power** frequency response; and
e) **Governor Droop** and Frequency Response Deadband.

The **DSO** & **TSO** shall specify additional signals to be provided by the **SPGM** by monitoring and recording devices in order to verify the performance of the **Active Power** frequency response provision of participating **SPGM**s.

DCC12.7 DYNAMIC MODELS FOR TYPE C & D SPGMS

DCC12.7.1 SPGM Generator Dynamic Models

The **TSO** requires suitable and accurate dynamic models for all type C & D **SPGMs** connected to, or applying for a connection to, the **Transmission System** or the **Distribution System** in order to assess reliably the impact of the **Generator's** proposed installation on the dynamic performance and security and **Stability** of the power system.

Modelling requirements for type C & D **SPGMs** are processed on the identification by the applicant of the relevant PSS/E[17] library model and the provision of the applicable data parameters as set out in **DCC**11.3.4. Where there are no suitable library models available, specially written models are supplied. These are known as "user-written models".

DCC12.7.2 Requirement to Provide a Dynamic Model

Each type C & D **SPGM** shall provide to the **DSO**, for onward transmission to the **TSO**, a dynamic model, or shall provide an unambiguous reference to a dynamic model previously provided to the **DSO** or the **TSO**, appropriate for the **SPGM**.

The model shall be provided in PSS/E format, or in such other format as may be agreed between the **SPGM** and the **TSO**.

The models for the **SPGM** (computer software based on a mathematical representation of the behaviour of the machine) must be able to calculate how quantities such as **Active Power** output,

[17] PSS/E Power System Simulator for Engineering; the power system analysis software package used by the **TSO**.

Voltage, speed etc. vary as factors such as the voltage at the **Connection Point** change. They must take account of the inherent characteristics of the machines and the actions of the **SPGM** control systems.

DCC12.7.3 Computer Environment

The dynamic models must run on the PSS/E software for the Irish network. They must not require a simulation time step of less than 5 ms. Details of the current PSS/E version, computer platform, compiler version etc., will be provided by the **TSO** upon request. The **TSO** may from time to time request that the models be updated to be compatible with changes in the **TSO's** computing environment. Each **SPGM** shall ensure that such updated models are provided without undue delay.

DCC12.7.4 Features to be Represented in the Dynamic Model

The model provided shall contain the following sub-models, depending on the existence of the individual components

a) Alternator and prime mover.
b) Speed and power control.
c) Voltage control, including if applicable, power system stabiliser (PSS) function and excitation control system.
d) **SPGM** protection models

DCC12.7.5 Model Documentation

The model should be fully documented. The documentation should describe in detail the model structure, inputs, outputs and how to set up and use the model and should be based on the documentation of standard PSS/E library models.

The **TSO** may, when necessary to ensure the proper running of its complete system representation or to facilitate its understanding of the results of a dynamic simulation, request additional information concerning the model, including the source code of one or more routines in the model. The **SPGM** shall comply with any such request without delay. Where the **SPGM** or any other party (acting reasonably) designates such information as confidential on the basis that it incorporates trade secrets, the **DSO** or **TSO** shall not disclose the information so designated to any third party.

DCC12.7.6 Time to Comply

Where a **User** requires reasonable time to develop the necessary model or models so as to comply fully with all the provisions in this section **DCC**12.6.2, the **User** may apply to the **DSO** to be deemed compliant with the provisions of **DCC**12.6.2 on the basis that the non-compliance will not unduly inhibit the assessment by the **TSO** of the **Stability** and reliability of the power system and that the **User** has a satisfactory programme to remedy the non-compliance. The **DSO** shall refer any such application to the **TSO** for consideration. If the **TSO** is satisfied as to the **User's** programme for developing and testing the necessary dynamic model or models, the **DSO** and **TSO** may, for so long as the **TSO** is so satisfied, treat the **User** as being in compliance with the provisions of **DCC**10.6.2. If the **TSO** decides, acting reasonably, that it is not satisfied as to the **User's** programme for developing and testing the necessary dynamic model and that the **User** cannot be deemed to be in compliance with **DCC**12.6.2, the **User** may apply for a derogation under the terms of **DGC**11.3.

DCC12.7.7 Validation of Model

All models provided to the **DSO** and **TSO** for use in dynamic simulations must be validated. The **TSO** must be satisfied that the behaviour shown by the model under simulated conditions is representative of the behaviour of the real **Equipment** under equivalent conditions.

For validation purposes the **SPGM** shall ensure that appropriate tests are performed and measurements taken to assess the validity of the dynamic model. Where the validity of the model has not been confirmed prior to the **Commissioning** of the **SPGM**, appropriate tests shall be carried out and measurements taken at the **SPGM** to assess the validity of the dynamic model. The tests and measurements required shall be agreed with the **DSO** and the **TSO**.

The **SPGM** shall provide to the **DSO** for onward transmission to the **TSO** all available information showing how the predicted behaviour of the dynamic model to be verified compares with the actual observed behaviour of a prototype or production **SPGM** under laboratory conditions and / or actual observed behaviour of the real **SPGM** as installed and connected to a transmission or distribution network.

If the on-site measurements or other information provided indicate that the dynamic model is not valid in one or more respects, the **SPGM** shall provide a revised model whose behaviour corresponds to the observed on-site behaviour as soon as reasonably practicable.

DCC13 DEMAND RESPONSE REQUIREMENTS

DCC13.1 Dispatchable Demand Customers

DCC13.1.1 This **DCC**13.1 applies to **Dispatchable Demand Customers** in relation to **Demand Side Units** that are providing demand response services to the **TSO**.

DCC13.1.2 Signals, Communications and Control

DCC13.1.2.1 The following signals and indications are required to be provided by **Users** to the **TSO**. They will include but shall not be limited to the following:

a), b) and c) are applicable to **Dispatchable Demand Customers** who represent **Demand Side Units** which consists of an **Individual Demand Site**:

a) kW and +/-kVAr at alternator terminals of each **Generator** where applicable;
b) Measured or derived kW output for each **Generator** at the **HV** terminals of the transformer where applicable; and
c) **Demand Reduction** aggregated at the **HV** terminals of the transformer.

d), e), f) and g) are applicable to **Dispatchable Demand Customers** who represent **Demand Side Units** which consists of an **Aggregated Demand Site**:

d) The aggregated kW and +/-kVAr aggregated at alternator terminals of each **Generator** where applicable;
e) When requested by the **TSO**, the kW and +/-kVAr of each **Individual Demand Site** at alternator terminals of each **Generator** where applicable;
f) The aggregated measured or derived KW output for each **Generator** aggregated at the **HV** terminals of the transformer where applicable; and
g) The aggregated **Demand Reduction** aggregated at the **HV** terminals of the transformer.

DCC13.1.2.2 **Dispatchable Demand Customers** shall provide the **TSO** the specification of the method of aggregation of **SCADA** from multiple sites. The minimum specifications shall be agreed with the **TSO** in advance.

DCC13.1.3 Responsible Operator

DCC13.1.3.1 For **Dispatchable Demand Customers**, the **Control Facility** shall be staffed by a responsible operator(s) who shall respond to communications from the **TSO** without undue delay (except where otherwise provided for by agreement between the **Dispatchable Demand Customer** and the **TSO**, such agreement not to be unreasonably withheld) and are of suitable experience and training and are authorised to perform functions on behalf of the **Dispatchable Demand Customer** as follows:

a) To accept and execute **Dispatch** Instructions;
b) To receive and acknowledge receipt of requests, for amongst other matters, **Operation** outside the declared values of **Demand Reduction**.

DCC13.1.3.2 A designated responsible operator shall be contactable by **DSO** or **TSO** at all times to discuss operational matters without undue delay and in any case within at most 1 hour. Following a request from **DSO**, the responsible operator shall be present at the **Demand Side Unit** control point without undue delay and in any case within two hours and shall be capable of taking any appropriate actions. The responsible operator shall be contactable 24 hours a day, 365 days a year. Specialist response shall be available on the next working day following a request from the **DSO** or **TSO**

DCC13.1.3.3 The Responsible Manager shall be authorised to perform the following functions on behalf of the **Dispatchable Demand Customer**:

a) To make estimates in accordance with **Good Industry Practice** as to the **Demand Reduction**;
b) To make declarations of the **Demand Reduction** for each **Demand Side Unit**;

c) To communicate with respect to issues regarding outages of each **DSU**.

The **Dispatchable Demand Customer** may, from time to time, notify a replacement contact location and personnel, which meets the foregoing requirements.

DCC13.1.4 Supervisory Control and Data Acquisition (SCADA)

DCC13.1.4.1 **SCADA** remote terminal Equipment shall be required in the control room of the transmission station at the **User** site for the transmission of signals and indications to and from the NCC. The signals and indications which must be provided by **User**s for transmission by **SCADA** Equipment to the NCC are the signals and indications referred to under connection conditions together with such other information as the TSO may from time to time by notice to **User**s reasonably require.

DCC13.1.4.2 For **Dispatchable Demand Customers**, **SCADA** remote terminal **Equipment** shall also be required at the **Control Facility** for the transmission of signals and indications to and from the **NCC**. The signals and indications which must be provided by **Dispatchable Demand Customers** for transmission by **SCADA Equipment** to the **NCC** are the signals and indications referred to under connection conditions together with such other information as the **TSO** may from time to time, by notice to **Dispatchable Demand Customers**, reasonably require.

DCC13.1.4.3 Interface cabinets shall be installed in the control room of the transmission station at the or in **Dispatchable Demand Customer's Control Facility**. Provision and **Maintenance** of wiring and signalling from the **Dispatchable Demand Customer's Plant** and apparatus to the **Dispatchable Demand Customer's** interface cabinet shall be the responsibility of the **Dispatchable Demand Customer's**. The **TSO** shall provide the cables to interconnect these interface cabinets.

DCC13.1.5 Monitoring, Testing and Investigation

DCC13.1.5.1 The response of the **Dispatchable Demand Customer's Demand Side Units** to **Dispatch** Instructions and compliance with their **Availability Notice** shall be monitored, tested and checked in accordance with OC8 and OC10 of the **Grid Code**.

DCC13.1.6 Scheduling and Dispatch of Demand Side Units

DCC13.1.6.1 **Scheduling** and declaration of availability of the **Demand Side Units** shall be in accordance with SDC1 of the **Grid Code**.

DCC13.1.6.2 The **Scheduling**, **Dispatch** and additional parameters required for Dispatching a **Demand Side Units** shall be in accordance with SDC1A of the **Grid Code**

DCC13.1.6.3 Dispatching of the **Demand Side Units** shall be in accordance with SDC2 of the **Grid Code**.

DCC13.1.7 Outage Planning

DCC13.1.7.1 The **Dispatchable Demand Customers** must adhere to the outage planning requirement as specified in OC2 of the **Grid Code**.

DCC13.1.8 Additional Connection Conditions

DCC13.1.8.1 Each **Demand Side Unit** shall, as a minimum, have the following capabilities:

a) Able to provide **Demand Reduction** between 0 **MW** and the **Demand Reduction Capability**
b) Max ramp up capability not less than 1.5% of **Demand Reduction Capability** per minute when the **Demand Side Unit** is in normal **Dispatch** condition
c) Max ramp down capability not less than 1.5% of **Demand Reduction Capability** per minute when the **Demand Side Unit** is in normal **Dispatch** condition
d) Minimum down-time capability not greater than 30 minutes for **Demand Side**

Units

e) Maximum down-time capability not less than 2 hours for **Demand Side Units**

Each **Demand Side Unit** with on-site generation, shall, as a minimum, have the following capabilities:

f) Operate continuously at normal rated output at frequencies in the range 49.5Hz to 50.5Hz;

g) Remain synchronised to the **Distribution System** at frequencies within the range 47.5Hz to 52.0Hz for a duration of 60 minutes;

h) Remain synchronised to the **Distribution System** at frequencies within the range 47.0Hz to 47.5Hz for a duration of 20 seconds required each time the **Frequency** is below 47.5Hz;

i) Remain synchronised to the **Distribution System** during a **Rate of Change of Frequency** of values up to and including plus or minus 1.0 Hz per second measured as a rolling average over 500 ms. **Voltage dips** may cause localised **Rate of Change of Frequency** values in excess of 1 Hz per second for short periods, and in these cases, the **Demand Side Unit** shall remain synchronised during **Voltage dips** at the **HV** terminals of 95% of nominal voltage (5% retained) for a duration of 0.6 seconds; The **DSO** may require lower or higher values to be used for **Protection** settings;

DCC13.1.8.2 Each **Demand Side Unit** will require electronic interface to receive **Dispatch Instructions** from the **TSO**.

DCC13.2 Demand Response Service Providers

DCC13.2.1 This **DCC**13.2 applies to **Demand Response Service Providers** in relation to the **Demand Units** that are providing any of the demand response services defined in DCC13.2.2 to the **DSO**. For the avoidance of doubt, it does not apply to **Customers**' installations and **Equipment** in general.

DCC13.2.2 Demand Response Service Definitions

DCC13.2.2.1 **Active Power** control – a service where a **Demand Response Service Provider** makes available the modulation by the **DSO** of **Demand** within one or more **Customers' Demand Facilities**.

DCC13.2.2.2 **Reactive Power** control – a service where a **Demand Response Service Provider** makes available the modulation by the **DSO** of one or more **Customers' Reactive Power** production or consumption within one or more **Customers' Demand Facilities**.

DCC13.2.3 Technical Requirements

DCC13.2.3.1 Voltage Ranges

DCC13.2.3.1.1 Any **Demand Unit** must be able to remain connected and operating normally when the supply voltage is within the range specified in Table 21.

Table 21

Description	Nominal Voltage	Normal Operating Range [kV][18]	
		Lower bound	Upper bound
LV	230V	207	253
LV	400V	360	440
MV	10kV	9.6	11.3
MV	20kV	19.3	22.5
HV	38kV	35.6	43.8
110kV	110kV	99	123

DCC13.2.3.2 Frequency Ranges

DCC13.2.3.2.1 Any **Demand Unit** shall, as a minimum, remain synchronised to the **Distribution System** and operate within the **Frequency** ranges and time periods specified in Table 22.

Table 22

Frequency Range	Time Period
47 – 47.5 Hz	20 seconds
47.5 – 48.5 Hz	90 minutes
48.5 – 49 Hz	90 minutes
49 – 51 Hz	Unlimited
51 – 51.5 Hz	90 minutes
51.5 – 52 Hz	60 minutes

DCC13.2.3.2.2 Any **Demand Unit** must be able to remain connected and operating normally for rates of change of frequency up to 1 Hz/s measured over a 500ms window.

DCC13.2.3.3 Modulation

DCC13.2.3.3.1 A **Demand Unit** or **Demand Units** must be capable of controlling its **Active Power** or **Reactive Power** production or consumption over the range specified in any contract with the **DSO.**

DCC13.2.3.3.2 **Demand Units** must be equipped to receive modulation instructions either directly, or indirectly via a **Demand Response Service Provider**, from the **DSO.**

At the time of approval of this version, there is no common standard for communication protocols agreed between **DSO** and **Demand Response Service Providers** for this context. The **DSO** shall provide details to any contracted **Demand Response Service Provider** of the method or protocol to be employed between the **DSO** and the **Demand Response Service Provider**. Where an RTU is to be deployed, protocols currently considered include, but are not limited to, simple current loop and IEC 60870-5-101 [IEC101], however the **DSO** shall agree with the **Demand Response Service Provider** the protocol to be used.

DCC13.2.3.3.3 The **DSO** shall agree with the **Demand Response Service Provider** the required response time. Having received the signal or requirement from the **DSO** the **Demand Unit** will modulate its behaviour to the full extent of the contract within the required response time.

DCC13.2.3.3.4 The modulated behaviour will be maintained for the duration of the signal or requirement to do so from the **DSO** unless otherwise agreed with the **DSO**.

DCC13.2.3.3.5 If the modulation, or any part of it, ceases to be fully available for operation at any time, either temporarily or permanently, unless otherwise agreed with the **DSO** the **Demand Response Service Provider** will notify the **DSO** without delay.

DCC13.2.3.3.6 The **DSO** shall agree with the **Demand Response Service Provider** the required operational monitoring and/or metering.

[18] DSO reserves the right to operate at voltages outside these ranges in emergency situations.

DCC13.2.4 Demand Response Operational Notification Process

DCC13.2.4.1 As part of the contractual arrangements for the provision of demand response services to the **DSO**, the **Demand Response Service Provider** must provide the following information within the timeframe agreed with the **DSO**, in advance of the commencement of the contracted demand response services:

a) Full contact details of the **Demand Response Service Provider**;
b) Full contact details of the **Demand Facility** owner (if different from (a));
c) The exact address and location of the **Demand Facility**;
d) The capacity of the modulated behaviour of the **Demand Unit** expressed in kW or kVAr (including production or consumption) as appropriate;
e) The **Demand Unit** certificate and the **Equipment Certificate** as relevant for the demand response service, or if not available, equivalent information;
f) Confirmation that the **Demand Unit** complies with the technical and modulation requirements of DCC13.2.3;
g) The above information must be submitted for each and every **Demand Unit**.

DCC13.2.4.2 Unless agreed otherwise with the **DSO** the above information, together with the **Statement of Compliance** required by DCC13.2.5.4 below shall be submitted by the **Demand Response Service Provider** on the form provided by the **DSO** for that purpose.

DCC13.2.4.3 Unless agreed otherwise with the **DSO** the **Demand Response Service Provider** must notify the **DSO** of any planned change or modification to the capabilities of the **Demand Unit** within the timeframe agreed with the **DSO** and specified in the contract.

DCC13.2.4.4 Unless otherwise agreed with the **DSO** the **Demand Response Service Provider** must notify the **DSO** of any unplanned incident or failure of a **Demand Unit** without undue delay.

DCC13.2.4.5 In the case of an aggregated service, any unplanned incident or failure of the contracted service should be notified to the **DSO** without undue delay.

DCC13.2.4.6 For any **Demand Facility** connected at **MV** or **HV**, the demand response services cannot be called upon until the **DSO** has issued a **Final Operational Notification** to the **Customer** responsible for the **Demand Facility**. The **DSO** will issue the **Final Operational Notification** to the customer on receipt of the complete information required in DCC13.2.4.1 and DCC13.2.4.2. The **DSO** will recognise practical difficulties in completing all appropriate tests for confirmation of compliance and will not, if due to reasons attributable to the **DSO**, unreasonably withhold the **Final Operation Notification**.

DCC13.2.5 Compliance

DCC13.2.5.1 The **Demand Response Service Provider** is wholly responsible for the compliance of the **Customer's Demand Units** with the requirements of this DCC13.2 and for the conduct of any tests necessary to demonstrate compliance.

DCC13.2.5.2 The **Demand Response Service Provider** must demonstrate the modulation of behaviour of the **Demand Units** on receipt of the signal or requirement from the **DSO**. Where appropriate such tests can be undertaken off site, for example by the manufacturer.

DCC13.2.5.3 To the extent that the **Demand Response Service Provider** requires the **DSO** to assist or participate in compliance testing the **DSO** will co-operate to achieve an agreed timetable.

DCC13.2.5.4 The **Demand Response Service Provider** will supply to the **DSO** a **Statement of Compliance** detailing how compliance with the relevant parts of DCC13.2 has been demonstrated. The statement can include an **Equipment Certificate** to support the demonstration of compliance.

DCC13.2.5.5	The **DSO** may require the **Demand Response Service Provider** to repeat compliance tests in accordance with a plan or following any modification or failure of the **Demand Unit** to perform as required.

Distribution Operating Codes

DOC DISTRIBUTION OPERATING CODE 1

DOC1 DISTRIBUTION OPERATING CODE 1 – DEMAND FORECASTING

DOC1.1 INTRODUCTION

DOC1.1.1 In order for the **DSO** to operate the **Distribution System** efficiently and to ensure maximum system security and **System Stability**, there is a need for those **Users** specified in DOC1.3 to provide loading and generation output information to the **DSO**.

DOC1.1.2 The **Grid Code** specifies the **TSO** requirements for **Demand** forecasting for **Users** subject to **Central Dispatch**. Distribution Operating Code 1 (DOC1) specifies the information to be provided to the **DSO** by other **Users** of the **Distribution System** so that these requirements can be met.

DOC1.1.3 The information to be provided under DOC1 is required to enable the **DSO** to maintain the integrity of the **Distribution System**.

DOC1.1.4 Where **Demand** data is required from the **User**, this means the **MW Demand** of electricity at the **Connection Point**. The **DSO** may in certain cases specify that the **Demand** data shall include the **MVAr Demand**.

DOC1.1.5 The means of providing the information to the **DSO** and its confirmation includes any non-transitory written form, or any other suitable means of electronic transfer which enables the recipient to retain information.

DOC1.2 OBJECTIVE

The objectives of DOC1 are to:

a) Set out the **Demand** forecast and the **Generating Plant** output information to be provided by **Users** to enable the **DSO** to operate the **Distribution System**; and
b) Specify the information to be provided by **Users** to the **DSO** to enable it to comply with its obligations under the **Grid Code**.

DOC1.3 SCOPE

DOC1 applies to the following **Users** of the **Distribution System**:

a) **Major Customers** connected to the **Distribution System** and **Medium Voltage Customers** where the **DSO** considers it appropriate.
b) **Generators** with **Generating Plant** over 2**MW**.

DOC1.4 INFORMATION FLOW AND CO-ORDINATION

DOC1.4.1 The **DSO** shall co-ordinate **Demand** forecast information for each **Bulk Supply Point** to meet the requirements of the **Grid Code** (OC1). The **DSO** shall aggregate forecast information provided by **Users**, where appropriate, and provide forecast information to the **TSO** where **Demand**, or change in **Demand**, is greater than 4**MW** at any **Connection Point**.

DOC1.4.2 Generation information for **Generating Plant** in the **Distribution System**, which is not subject to **Central Dispatch**, shall be provided where specified to the **DSO**. **Customers** with **CHP** and **Customers with Auto-production** may also be required to supply information.

DOC1.4.3 **Centrally Dispatched Users** shall comply with the requirements of OC1 of the **Grid Code**. Information shall be provided directly to the **DSO** and **TSO**.

DOC1.5 DEMAND FORECAST DATA

DOC1.5.1 **Generating Units** greater than 2**MW** and not subject to **Central Dispatch** shall provide to the **DSO** information regarding output and planned shutdowns for specified future periods. This shall be provided on an annual basis when requested by the **DSO**. The information required is given in Schedule 2 of the **Distribution Data Registration Code (DDRC)**.

DOC1.5.2 **Major Customers** shall provide to the **DSO** information regarding **Demand** and planned shutdowns for specified future periods. This shall be provided on an annual basis when requested by the **DSO**. The information required is given in Schedule 2 of the **Distribution Data Registration Code (DDRC)**.

DOC1.5.3 **Dispatchable Demand Customers** shall provide to the **DSO** information regarding **Demand** and planned shutdowns for specified future periods. This shall be provided on an annual basis when requested by the **DSO**. The information required is given in Schedule 2 of the **Distribution Data Registration Code (DDRC)**.

DOC2 DISTRIBUTION OPERATING CODE 2 – OPERATIONAL PLANNING

DOC2.1 INTRODUCTION

DOC2.1.1 Distribution Operating Code 2 (DOC2) is concerned with the co-ordination of **Planned Outages** of **Plant** and apparatus which affect the **Operation** of the **Distribution System** and/or the Transmission System,or require the commitment of **DSO** resources.

DOC2.1.2 DOC2 supplements the obligation of the **DSO** to provide certain information to the **TSO** under the **Grid Code** and establishes procedures to enable the collection of such data from **Users** specified in DOC2.3.

DOC2.1.3 The means of providing the information to the **DSO** and the TSO where relevant and its confirmation includes any non-transitory written form, or any other suitable means of electronic transfer which enables the recipient to retain information. The DSO or TSO, by agreement with the DSO, can specify the specific means, which may include completion of a set form published on the DSO and/or TSO website(s).

DOC2.1.4 In order for the **DSO** to fulfil the requirements of this DOC2 it should be noted that the information set out in **Grid Code** (OC2), to be provided by the **TSO** will form the basis of operational planning under this DOC2.

DOC2.2 OBJECTIVE

DOC2.2.1 The objectives of DOC2 are to:

a) Set out the operational planning procedure and typical timetable for the co-ordination of outage requirements for **Plant** and apparatus to be provided by **Users** to enable the **DSO** to operate the **Distribution System** and to enable the TSO to operate the Transmission System.
b) Specify the information to be provided by **Users** to the **DSO** to allow it to comply with the **Grid Code**.
c) Specify the information to be provided by Users to both the DSO and the TSO to ensure compliance with the System Operator Guideline - Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation.

DOC2.3 SCOPE

DOC2.3.1 DOC2 applies to the following **Users** of the **Distribution System**:

a) **Major Customers** connected to the **Distribution System** where the **DSO** considers it appropriate;

b) **Generating Plant** not subject to **Central Dispatch**;
c) **Customers** with **CHP** and **Customers with Auto-production**;
d) **Centrally Dispatched Users**
e) **Dispatchable Demand Customers**

DOC2.4 PROVISION OF INFORMATION

DOC2.4.1 Information on **Generating Plant** not subject to **Central Dispatch** (including **Customers** with **CHP** and **Customers with Auto-production**) shall be provided, where specified, directly to the **DSO**. Where there is intention to change the nominal generation profile by greater than 5 MW the information shall be provided directly to both the TSO and the DSO. This information to be provided is shown in Schedule 3(a) and Schedule 3(b) of the DDRC.

DOC2.4.2 **Centrally Dispatched Users** shall comply with the requirements of OC2 of the **Grid Code**. Information shall be provided directly to the **TSO**.

DOC2.4.3 Information on **Demand Side Units** shall be provided, where specified, directly to the **DSO.** Where there is intention to change the nominal demand by greater than 5 MW the information shall be provided directly to both the **TSO** and the **DSO.** This information to be provided is shown in Schedule 3(a) and Schedule 3(b) of the DDRC.

DOC2.5 TIMESCALES AND DATA

DOC2.5.1 For **Users** that are not subject to **Central Dispatch** detailed implementation of data gathering and timescales shall be determined by the **DSO** and each **User**. Due recognition shall be given by the **DSO** to voltage levels and capacities of **Plant** and apparatus when assessing information requirements.

DOC2.5.2 The information may be required for different timescales as may be determined by the **TSO** or the **DSO** planning needs.

DOC2.5.3 For **Users** that are subject to **Central Dispatch**, implementation of data gathering and timescales shall be determined by the **User**, **DSO** and **TSO**. Due recognition shall be given by the **DSO** to voltage levels and capacities of **Plant** and apparatus when assessing information requirements.

DOC2.6 INFORMATION FROM USERS

DOC2.6.1 Information from **Generating Plant** greater than 2**MW** and not subject to **Central Dispatch** shall include details of **Planned Outages** for **Maintenance** or other purposes as well as the expected time of return to service.

DOC2.6.2 The **Generator** shall not synchronise without first obtaining permission from the **DSO** unless prior agreement has been reached with the **DSO**.

DOC2.6.3 Information from **Demand Side Units** greater than 5MW shall include details of **Planned Outages** for **Maintenance** or other purposes as well as the expected time of return to service.

DOC2.7 INFORMATION TO USERS

DOC2.7.1 The **DSO** shall advise **Major Customers**, **Dispatchable Demand Customers** or **Generators** who may be significantly affected by particular outages of distribution **Plant** and apparatus, of the likely dates and duration of the outages. If there are objections from **Users** these shall be considered by the **DSO** and alternative arrangements proposed if possible.

DOC5 DISTRIBUTION OPERATING CODE 5 – DEMAND CONTROL

DOC5.1 INTRODUCTION

DOC5.1.1 Distribution Operating Code 5 (DOC5) is concerned with provisions to be made by the **DSO** or **Users** of the **Distribution System**, in certain circumstances, to permit reductions in **Demand** in the event of insufficient **Generating Plant** and transfers from external interconnections and **Inter-jurisdictional Tie-lines** being available to meet **Demand** or to avoid disconnection of **Customers** or in the event of breakdown and / or operating problems (such as in respect of system **Frequency**, system voltage levels or system thermal overloads) on any part of the **Transmission** or **Distribution System**.

DOC5.1.2 The **Demand** control procedures ensure that hardship to **Users** and **Customers** is minimised and that in so far as is practicable, all parties affected are treated equitably.

DOC5.1.3 DOC5 deals with the following means of reducing **Demand**:

a) Automatic low **Frequency** or voltage **Demand** disconnection;
b) **Customer Demand Reduction** including **Voltage Reduction**;
c) **Customer Demand** management initiated by **Suppliers** or other parties, other than following an instruction by the **TSO** or the **DSO**;
d) **Dispatchable Demand Customers**;
e) **Customer Demand Reduction** instructed by the **TSO** or the **DSO**;
f) Emergency manual **Demand** disconnection;

The term **Demand** control is used to describe any or all of these methods of achieving a **Demand Reduction**.

DOC5.1.4 Where **Demand** control is exercised by the **DSO** it shall be done in a manner that in so far as reasonably practicable does not discriminate against any **Customer** or **Supplier** and shall use reasonable endeavours to ensure that the burden is shared fairly among **Customers**. Exemptions may apply to vital and priority **Customers** as defined in the distribution load shedding plan approved by the **Commission for Regulation of Utilities** .

DOC5.2 OBJECTIVE

To establish procedures to enable the **DSO**, following an instruction of the **TSO** or otherwise to achieve a reduction in **Demand** that will either avoid or relieve operating problems on the **Transmission System** and / or the **Distribution System**, in whole or in part, in a manner that does not unduly discriminate against or unduly prefer any one or group of **Suppliers** or their **Customers** in accordance with the **DSO Licence**.

DOC5.3 SCOPE

DOC5.3.1 DOC5 applies to the **DSO** and all **Users** of the **Distribution System**.

DOC5.3.2 Implementation of **Demand** control by the **DSO** may affect all **Customers** of **Supplier** connected to the **Distribution System** and where applicable, contractual arrangements between **Suppliers** and their **Customers** shall reflect this.

DOC5.4 METHODS OF DEMAND CONTROL

DOC5.4.1 **Customer Demand** may be disconnected automatically at selected locations in accordance with the requirements of the **Grid Code**, in the event of a sudden fall in **Frequency**. Such an arrangement shall be carefully co-ordinated as part of an overall scheme and may take into account any operational requirements or essential load.

DOC5.4.2 Automatic disconnection by under-voltage relay may be used to discriminately disconnect load at either 110kV, 38kV or **MV** in order to maintain voltage within acceptable limits, so as to avoid widespread load shedding.

DOC5.4.3 Deliberate reduction of voltage may be used to achieve a temporary reduction in load **Demand**.

DOC5.4.4 Deliberate reduction in system **Frequency** may also be used to achieve a temporary reduction in load **Demand** in accordance with the **Grid Code**.

DOC5.4.5 Emergency manual load shedding may be carried out on the **Distribution** or **Transmission Systems** for reasons of shortfall in supply or other reasons.

DOC5.4.6 In the event of a sustained period of shortfall then planned rota load shedding may be used to share the available power among affected **Customers**.

DOC5.5 IMPLEMENTATION OF DEMAND CONTROL

DOC5.5.1 Where **Demand** control is exercised by the **DSO** in order to safeguard the **Distribution System**, the **DSO** shall liaise with and inform **Users** accordingly as far as is practicable.

DOC5.5.2 Where **Demand** control is exercised by the **DSO** on instruction or request from the **TSO** in order to safeguard the **Total System** then the **DSO** is required to respond to these requests promptly but shall liaise with and inform other **Users** so far as is practical.

DOC5.5.3 Procedures for load shedding including exemption policies, load shedding rotas and **Customer** communications are contained in the distribution load shedding plan approved by the **Commission for Regulation of Utilities** .

DOC7 DISTRIBUTION OPERATING CODE 7 – OPERATIONAL COMMUNICATIONS AND LIAISON

DOC7.1 INTRODUCTION

Distribution Operating Code 7 (DOC7) sets out the requirements for the exchange of information in relation to **Operations** and / or **Events** on the **Distribution System** or the installation of any **User** connected to the **Distribution System** which have had or may have had, or will have or may have an **Operational Effect** on the **Distribution System** or the installation of any other **User**.

DOC7.2 OBJECTIVE

To provide for the exchange of information so that the implications of the **Operation** and / or **Event** can be considered and the possible risks arising from it can be assessed and appropriate action taken by the relevant party in order to maintain the integrity of the **Total System** and the **User's** installation. DOC7 does not seek to deal with any actions arising from the exchange of information, but merely with that exchange.

DOC7.3 SCOPE

DOC7 applies to the following **Users** of the **Distribution System**

a) **Major Customers** connected to the **Distribution System** where the **DSO** considers it appropriate;
b) **Generating Plant** with a **Registered Capacity** greater than 2**MW**;
c) **Customers** with **CHP** and **Customers with Auto-production** where the **DSO** reasonably considers it appropriate;
d) **Dispatchable Demand Customers**.

DOC7.4 PROCEDURE

DOC7.4.1 The **DSO** and **Users** connected to the **Distribution System** shall nominate persons and / or contact locations and agree communication channels for the necessary exchange of information to make effective the exchange of information required by DOC7.

DOC7.4.2 **SCADA** remote terminal **Equipment** shall be required at a **User's** site for the transmission of information and data to the **TSO** and to the **DSO Control Facility**. The requirement to provide this information shall normally be included in the relevant **Connection Agreement**.

DOC7.4.3 Information between the **DSO** and **Users** shall be exchanged on the reasonable request of either party. The request may follow a specific **Operation**, or be in accordance with a prior agreement to exchange information on particular types of **Event**.

This does not preclude the voluntary exchange of information which may be perceived as being relevant to the **Operation** of the distribution or **User** installation, in accordance with **Good Industry Practice**.

DOC7.4.4 In the case of an **Operation** on the **Distribution System** or on receipt of notification of an **Operation** on the **Transmission System**, which will have or may have, in the opinion of the **DSO**, an **Operational Effect** on the installation of a **User** connected to the **Distribution System**, the **DSO** shall notify the **User**.

DOC7.4.5 In the case of an **Operation** on the installation of a **User** connected to the **Distribution System**, which will have or may have an **Operational Effect** on the **Distribution System**, the **User** shall notify the **DSO** in accordance with DOC7.

DOC 7.4.6 In the case of an **Operation** on the installation of a **Centrally Dispatched User** connected to the **Distribution System**, which will have or may have an **Operational Effect** on the **Distribution System**, the **User** shall notify both the **DSO** and **TSO** in accordance with DOC7.

DOC7.4.7 A notification under DOC7 shall be of sufficient detail to describe the **Operation**, although it need not state the cause, and to enable the recipient of the notification reasonably to consider and access the implications and risks arising and shall include the name of the individual reporting the **Operation**. The recipient may ask questions to clarify the notification.

DOC7.4.8 A notification under DOC7 shall be given as far in advance as possible to allow the recipient to consider and assess the implications and risks arising.

DOC7.5 SIGNIFICANT INCIDENTS

DOC7.5.1 Where an **Event** on the **Distribution System** has had or may have had a significant effect on the **User's** installation or where an **Event** in the **User's** installation has had or may have had a significant effect on the **Distribution System**, the **Event** shall be deemed to be a **Significant Incident** by the **DSO** in consultation with the **User**. **Significant Incidents** shall be reported in writing to the affected party in accordance with the provisions of DOC8.

DOC7.5.2 A **Significant Incident** shall include **Events** which result in, or may result in, the following:

a) Voltage limits outside statutory limits;
b) System **Frequency** outside statutory limits; or
c) **System Stability** failure.

DOC8 DISTRIBUTION OPERATING CODE 8 – EVENT REPORTING

DOC8.1 INTRODUCTION

DOC8.1.1 Distribution Operating Code 8 (DOC8) sets out the requirements for reporting in writing those **Events** deemed to be **Significant Incidents** under DOC7.

Information between the **DSO** and major **Users** shall be exchanged on the reasonable request of both parties.

DOC8.1.2 DOC8 also provides for the joint investigation of **Significant Incidents** by the **Users** involved.

DOC8.2 OBJECTIVES

DOC8.2.1 The objective of DOC8 is to facilitate the provision of more detailed information in writing and where agreed between the **DSO** and the **Users** involved, joint investigation of those **Significant Incidents** reported verbally under DOC7.

DOC8.3 SCOPE

DOC8.3.1 DOC8 applies to the following **Users** of the **Distribution System**:

a) **Major Customers** connected to the **Distribution System** where the **DSO** considers it appropriate;
b) **Generating Plant** with a capacity greater than 2**MW**;
c) **Customers** with **CHP** and **Customers with Auto-production** where the **DSO** reasonably considers it appropriate;
d) **Dispatchable Demand Customers**.

DOC8.4 PROCEDURES

DOC8.4.1 The **DSO** and each **User** specified in DOC8.3.1 shall nominate officers and establish communication channels to ensure the effectiveness of this DOC8. Such officers and communication channels may be the same as those established under DOC7.

DOC8.4.2 Communication shall, as far as possible, be direct between the **User** and the operator of the **Distribution System**. However, this does not preclude communication with the **Users** nominated representative.

DOC8.4.3 In the case of an **Event** which has been reported to the **DSO** under DOC7 and subsequently has been determined by the **DSO** to be a **Significant Incident**, a written report shall be given to the **DSO** by the **User** in accordance with DOC8.

DOC8.4.4 In the case of an **Event** which has been reported to the **User** under DOC7 and subsequently has been determined by the **DSO** to be a **Significant Incident**, a written report shall be given to the **User** by the **DSO** in accordance with DOC8. In the case where the **User** is subject to **Central Dispatch**, the written report shall be shared with the **TSO**, where the **DSO** deems it to be appropriate.

DOC8.4.5 A report shall be in writing or in electronic form and shall be sent to the **DSO** or **User**, as the case may be. It shall contain confirmation of the notification given under DOC7 together with more details relating to the **Significant Incident** including information which has become known relating to the **Significant Incident** since the notification. The report shall, as a minimum, contain those matters specified in DOC8.6.

DOC8.4.6 A report under DOC8 shall be given as soon as reasonably practical after the notification under DOC7.

DOC8.5 JOINT INVESTIGATIONS

DOC8.5.1 Where a **Significant Incident** has been declared and a report submitted under DOC8 either party or parties may request in writing that a joint investigation be carried out.

DOC8.5.2 The composition of such an investigation panel shall be appropriate to the incident to be investigated and agreed by all parties involved.

DOC8.5.3 A joint investigation shall only take place where all parties affected by it agree to it. The form and rules of, and procedures for, and all matters relating to the joint investigation shall be agreed at the time of a joint investigation and in the absence of agreement the joint investigation shall not take place.

DOC8.6 MATTERS TO BE INCLUDED IN A WRITTEN REPORT OF A SIGNIFICANT INCIDENT

DOC8.6.1 Matters applicable to the **DSO**, **Generators** and **Dispatchable Demand Customers**:

a) Date and time of **Significant Incident**;

b) Location;
c) **Equipment** involved;
d) Brief description of **Significant Incident**;
e) Details of any **Demand** control undertaken;
f) Conclusions and recommendations if applicable.

DOC8.6.2 Matters applicable to the **DSO**:

Effect on **Users** where appropriate:

a) Duration of incident; and
b) Estimated date and time of return to normal service.

DOC8.6.3 Matters applicable to **Generator**:

Effect on generation including, where appropriate:

a) Generation interrupted;
b) **Frequency Response** achieved;
c) **MVAr** performance achieved; and
d) Estimated date and return to normal service.

DOC8.6.4 Matters applicable to **Dispatchable Demand Customers**:

Effect on **Demand** including, where appropriate:

a) **Demand Reduction** interrupted;
b) Duration of incident;
c) Estimated date and time of return to service.

DOC9 DISTRIBUTION OPERATING CODE 9 – SYSTEM TESTS

DOC9.1 INTRODUCTION

DOC9.1.1 Distribution Operating Code 9 (DOC9) sets out the responsibilities and procedures for arranging and carrying out **System Tests** which have or may have an effect on the systems of the **DSO** or **Users**. **System Tests** are those tests which involve either simulated or the controlled application of irregular, unusual or extreme conditions on the **Total System** or any part of the **Total System**, but which do not include **Commissioning** or recommissioning tests or any other tests of a minor nature.

DOC9.2 OBJECTIVES

DOC9.2.1 The objectives of DOC9 are to:

a) Ensure that the procedures for arranging and carrying out **System Tests** are such that, so far as practicable, **System Tests** do not threaten the safety of personnel or the general public and cause minimum threat to the security of supplies, the integrity of **Plant** or **Equipment** and are not detrimental to the **DSO** and **Users**; and
b) Set out procedures to be followed for establishing and reporting **System Tests**.

DOC9.3 SCOPE

DOC9.3.1 DOC9 applies to the following **Users** of the **Distribution System**:

a) **Major Customers** connected to the **Distribution System** where the **DSO** considers it appropriate;
b) **Generating Plant** with a capacity greater than 2**MW**;
c) **Customers** with **CHP** and **Customers with Auto-production** where the **DSO** reasonably considers it appropriate;

d) **Dispatchable Demand Customers**.

DOC9.4 PROCEDURES

DOC9.4.1 If the **System Test** is proposed by the **DSO** or the **User** connected to the **Distribution System** or if the test will or may have an effect on the **Transmission System** then the provisions of DOC9 or the **Grid Code** shall apply.

DOC9.4.2 **System Tests** which have a minimal effect on the **Distribution System** or the systems of others will not be subject to this procedure; minimal effect shall be taken to mean variations in voltage, **Frequency** and waveform distortion of a value not greater than those figures which are defined in the **Distribution Planning Code**.

DOC9.4.3 When the **DSO** or a **User** intend to undertake a **System Test** which may have significant effect on the system of others normally twelve months' notice, or as otherwise agreed by the **DSO**, shall be given by the person proposing the **System Test** (test proposer) to the **DSO** and to those **Users** who may be affected by such a **System Test**.

DOC9.4.4 The proposal shall be in writing and shall contain details of the nature and purpose of the proposed **System Test** and shall indicate the extent and situation of the **Plant** or apparatus involved.

DOC9.4.5 If the information set out in the proposal notice is considered insufficient by the recipient, they shall contact the test proposer with a written request for further information which shall be supplied as soon as reasonably practicable. The **DSO** shall not be required to do anything under DOC9 until it is satisfied with the details supplied in the proposal or pursuant to a request for further information.

DOC9.4.6 If the **DSO** wishes to undertake a **System Test**, the **DSO** shall be deemed to have received a proposal of that **System Test**.

DOC9.4.7 The **DSO** shall have overall co-ordination of the **System Test**, using the information supplied to it under DOC9 and shall identify in its reasonable estimation, which **Users** other than the test proposer, may be affected by the proposed **System Test**.

DOC9.4.8 Following receipt of the **System Test** proposal the **DSO** shall evaluate the impact of the **System Test** and discuss the proposals with **Users** identified as being affected.

DOC9.4.9 Within one month of receiving the **System Test** proposal the **DSO** shall submit a report to the test proposer which shall contain:

a) Proposals for carrying out the **System Test** (including the manner in which it is to be monitored);
b) An allocation of costs between the affected parties, (the general principle being that the test proposer will bear the costs); and
c) Such other matters that the **DSO** consider appropriate; outline the procedure to be followed and the proposed test schedule and advise of any costs.

DOC9.4.10 The proposal report shall be submitted to all those who received a notice under DOC9.4.3.

DOC9.4.11 If the proposal report (or a revised proposal report as agreed between the **DSO** and the test proposer) is approved by all recipients, the **System Test** can proceed.

DOC9.4.12 At least one month prior to the date of the proposed **System Test**, the **DSO** shall submit to all recipients of the proposal notice a programme which in this DOC9 shall be called a final test programme stating the switching sequence and proposed timings, a list of those staff involved in carrying out the **System Test** (including those responsible for site safety) and such other matters as the **DSO** deem appropriate.

DOC9.4.13 The final test programme shall bind all recipients to act in accordance with the provisions contained within the programme in relation to the proposed **System Test**.

DOC9.4.14 At the conclusion of the **System Test**, the test proposer shall be responsible for preparing a written report (the "final report") of the **System Test** for submission to the **DSO**.

DOC9.4.15 The final report shall include a description of the **Plant** and / or apparatus, tested and of the **System Test** carried out, together with the results, conclusions and recommendation.

DOC9.4.16 Results of tests shall be reported to relevant parties, taking into account confidentiality issues.

DOC9.4.17 All **System Test** procedures shall comply with all applicable legislation.

DOC10 DISTRIBUTION OPERATING CODE – MONITORING, TESTING AND INVESTIGATION

DOC10.1 INTRODUCTION

DOC10.1.1 In order to properly discharge its responsibilities in respect of safe, secure and economic **Operation** of the **Distribution System** and in accordance with its **Licence** conditions the **DSO** shall organise and carry out monitoring, testing and investigation on the effect of **Users**' electrical apparatus or electrical installation on the **Distribution System**.

DOC10.2 OBJECTIVE

DOC10.2.1 The objective is to specify the **DSO** requirements to test and / or monitor the **Distribution System** to ensure that **Users** are not operating outside the technical parameters required by the **Distribution General Codes** and Operating Codes.

DOC10.3 SCOPE

DOC10.3.1 DOC10 applies to the following **Users** of the **Distribution System**:

a) All **Generators**;
b) All **Customers** who are connected to the **Distribution System**.

DOC10.4 PROCEDURES

DOC10.4.1 The **DSO** shall, from time to time, determine the need to test or monitor the quality of supply at various points on the **Distribution System**.

DOC10.4.2 In the case of a **Centrally Dispatched User** of the **Distribution System**, the **TSO** shall, from time to time, determine the need to test or monitor the functionality and operational response of the **User**. This testing and monitoring may be carried out at various points on the **Distribution System**, subject to the prior agreement between the **DSO** and **TSO**.

DOC10.4.3 The requirement for specific testing and / or monitoring may be initiated by the receipt of specific complaints as to the quality of supply on the **Distribution System**.

DOC10.4.4 Where testing or monitoring is required at the **Connection Point** with a **User** then the **DSO** shall advise the **User** involved and the **DSO** shall make available the results of such tests to the **User**. In the case of a **Centrally Dispatched User**, the **DSO** shall make available the results of such tests to the **TSO** on request.

DOC10.4.5 Where a **User** is found to be operating outside the technical limits specified in the **Distribution General Code** then the **User** shall rectify the situation or disconnect the apparatus causing the problem from its electrical system connected to the **Distribution System** immediately or within such time as agreed with the **DSO**. In the case of a **Centrally Dispatched User**, the **DSO** shall inform the **TSO** of the issue on request.

DOC10.4.6 Failure to rectify the situation shall result in the **User** being disconnected in accordance with the **Connection Agreement**.

DOC10.4.7 The **DSO** shall, from time to time, monitor the effects of the **User** on the **Distribution System**.

DOC10.4.8 The monitoring shall normally be related to the amount of **Active Power** and **Reactive Power** or **Flicker** or **Harmonics** transferred across the **Connection Point**.

DOC10.4.9 Where the **User** is exporting or importing **Active Power** or **Reactive Power** in excess of those defined in the **Connection Agreement** or causing disturbances, the **DSO** shall inform the **User** and the **User** shall restrict the power transfer to within the specified parameters.

DOC10.4.10 The **DSO** may check from time to time that **Users** are in compliance with agreed **Protection** requirements and **Protection** settings.

DOC11 DISTRIBUTION OPERATING CODE – SAFETY CO-ORDINATION

DOC11.1 INTRODUCTION

DOC11.1.1 **Distribution** Operating Code 11 (DOC11) specifies the **Safety Management** system criteria to be applied by the **DSO** to meet statutory requirements and **DSO Licence** conditions and obligations.

DOC11.1.2 Similar criteria and standards of **Safety Management** systems shall be provided by other **Users** of the **Distribution System** when carrying out work or tests at the operational interface with the **DSO**.

DOC11.2 OBJECTIVES

DOC11.2.1 To lay down the **Safety Management** criteria to be applied to ensure safety of persons working on the **Distribution System** and at or across operational and Ownership Boundaries.

DOC11.3 SCOPE

DOC11.3.1 DOC11 specifies the **Safety Management** criteria that applies to the **DSO** and the following **Users** of the **Distribution System**:

a) **Generators**;
b) **Major Customers**;
c) Any other party reasonably specified by the **DSO** including **Users** connected at Medium or **Low Voltage** for appropriate sections of DOC11 when necessary;
d) Agents of the **DSO** or **Users** working on the **Distribution System** or at or across operational boundaries;
e) **Centrally Dispatched Users**.

DOC11.4 PROCEDURES

DOC11.4.1 The **Safety Management** principles and procedures (**Safety Management** system) for ensuring the health and safety of all relevant personnel shall be specified by the **DSO** and **Users** for work on their respective systems or **Plant** or apparatus connected to them.

DOC11.4.2 The **DSO** shall specify the **Safety Management** system applicable at operational boundary points and proper documentation of the safety precautions to be taken shall be maintained.

DOC11.4.3 Authorised Persons

- The **DSO** shall at all times have nominated '**Authorised Person (s)**' to be responsible for the coordination of safety including the work of control, **Operation**, **Maintenance** or testing of **Plant** or apparatus forming part or connected to the **Distribution System** as per S.I. No.299 of 2007 Safety Health and Welfare at Work (General Application) Regulation 2007, SHAWW Act 2005 and relevant European Standards including EN50110 and ESB Networks Electrical Safety Rules.
- The **User** shall at all times have nominated '**Authorised Person(s)**' to be responsible for the coordination of safety including the work of control, **Operation**, **Maintenance** or testing of **Plant** or apparatus owned by the **User** and connected to the **Distribution System** as per S.I. No.299 of 2007 Safety Health and Welfare at Work (General Application) Regulation 2007, SHAWW Act 2005 and relevant European Standards including EN50110, and **Users Safety Management** procedures.
- The **User** shall confirm nominated '**Authorised Person(s)**' in writing to the **DSO**.

DOC11.4.4 There shall be joint agreement between the **DSO** and **Users** which specifies responsibility for system or control **Equipment** which shall ensure that only one party is responsible for any item of **Plant** or apparatus at any one time.

DOC11.4.5 The **DSO** and each **User** shall at all times have nominated a person or persons responsible for the co-ordination of safety on the respective systems.

DOC11.4.7 The **DSO** and each **User** shall maintain a suitable system of documentation which records all relevant operational **Events** that have taken place on the **Distribution System** or other system connected to it and the co-ordination of relevant safety precautions for work.

DOC11.4.8 System diagrams which show sufficient information for control personnel to carry out their duties shall be exchanged between the **DSO** and **User** as required.

DOC11.5 SAFETY AT THE DSO / USER INTERFACE

DOC11.5.1 The following procedure set down the basic safety requirements at the operator and the **DSO** interfaces. These procedures are necessary to ensure the safety of all who may have to work at either side of the interface or on the interface (boundary).

a) Written rules shall be specified by the **DSO** and safe working and communicating procedures shall be available and used by all persons who may have to work at or use the facilities provided at the Interface;
b) Electrical **Equipment** connected to either side of the interface and interface **Equipment** shall be under the control of a named person at either side;
c) Each item of **Equipment** shall be controlled by only one identifiable person at any one time;
d) Adequate means of isolation shall be provided at the interface to allow work to be carried out safely at either side of the interface;
e) Where necessary to prevent danger adequate facilities for **Earthing** shall be provided at either side of the interface to allow work to be carried out safely at the interface or at either side of the interface;
f) Adequate working space, adequate means of access and egress and, where necessary, adequate lighting shall be provided at all electrical **Equipment** on or near which work is being done in circumstances which may cause danger;
g) All electrical **Equipment** shall be suitably identified where necessary to prevent danger;
h) Electrical installations and **Equipment** shall comply with the relevant Statutory Requirements as set down in S.I. No.299 of 2007.

DOC 11.5.2 Maintenance

The **DSO** shall ensure that it's electrical installations and any **Equipment** within it:

i) are maintained in a safe condition; and
j) complies with S.I. No.299 of 2007 Safety Health and Welfare at Work (General Application) Regulation 2007, SHAWW Act 2005 and relevant European Standards as appropriate.

Users shall insure that their electrical installations and any **Equipment** within it:

k) is maintained in a safe condition; and
l) complies with S.I. No.299 of 2007 Safety Health and Welfare at Work (General Application) Regulation 2007, SHAWW Act 2005 and relevant European Standards as appropriate.

DOC11.6 SAFETY PROCEDURES

DOC11.6.1 **Operation** and **Maintenance** of the **Users**' **Equipment** shall only be carried out by **Authorised Person(s)**. Before first **Commissioning** the **Plant**, operating procedures shall be agreed with the **DSO**.

DOC11.6.2 Instructions for operating and / or **Earthing** the **Users**' electrical **Equipment** shall be clearly displayed in the **Users**' **Medium** and **High Voltage** switch room.

DOC11.6.3 The ***ESB Networks Electrical Safety Rules*** detail the **Safety Procedures** to be observed for all personnel working on or in close proximity to **Distribution System Plant** or **Equipment**.

DOC11.6.4 The User's Safety Procedures shall apply to the Users' 'Authorised Persons' at the User's Plant or Equipment at the interface.

DOC 12 DISTRIBUTION OPERATING CODE – GENERATOR OPERATIONAL NOTIFICATION PROCESS

DOC12.1 INTRODUCTION

DOC12.1.1 **Distribution** Operating Code 12 (DOC12), describes the high level processes that ultimately leads to the issuance of various forms of Operational Notifications, to the Generator by the **DSO**, as mandated by the Requirements for Generators [RfG] EU Network Code.

DOC12.2 SCOPE

DOC12.2.1 DOC12 apples to **PGMs** of Types A, B, C and D.

For avoidance of doubt, for the subset of Type A **Generator**s that are classified as Microgeneration, the NC6 form used to notify installations, is deemed to be an **Installation Document**.

A **Power Generation Module Document [PGMD]**, is required by RfG, for **PGMs** of Types B and C. The **PGMD** shall set out, clearly, and in the appropriate level of detail, all the individual milestones that need to be completed by the **Generator** along with their associated sequencing and timings.

Even though not mandated by RfG, the **PGMD** provisions shall also apply to Type D **PGM**s.

Generic **PGMD**s shall be made available on the ESBN website, to provide general guidance, but at the appropriate point in the project, a generator specific **PGMD** shall issue to the generator in question.

For Controllable **PPM**s, the relevant **PGMD**s shall also set out, relevant testing carried out by the **TSO** and may be complimented by other documents which may emerge from time to time.

At the time of writing, the following categories of **Generators** shall have generic **PGMD**'s posted;

- Controllable **PPM**s – Topology 2
- Controllable **PPM**s – All Topologies except 2
- Non-Controllable **PPM**s
- Non-Controllable **SPGM**s

Others may be added from time to time as requirements and processes evolve.

DOC12.3 OPERATIONAL NOTIFICATION PROCEDURES

DOC12.3.1 ThePGFO shall demonstrate to the **DSO** that it has complied with **Generation Unit** requirements by successfully completing the Operational Notification Procedure for connection of each **Generation Unit**.

DOC12.3.2 Operational Notification Procedure

The Operational Notification Procedure for connection of each **Generation Unit** can involve combinations of the following:

- Where applicable issuance by the **DSO** of a **PGMD** to the **PGFO**;
- Where applicable, issuance by the **TSO**, of an **Operational Notification Justification [ONJ]** to the **DSO**;
- **Energisation Operational Notification (EON)**;
- **Interim Operational Notification (ION)**; and
- **Final Operational Notification (FON)**.

DOC12.3.3 **Energisation Operational Notification [EON]**

If all the necessary conditions are fulfilled, the **DSO** shall issue an **EON** to the **PGFO**. Upon receipt of the **EON**, a **PGFO** may energise its internal network and auxiliaries for the associated **Generation Unit** by using the grid connection that is specified for the **Connection Point**.

DOC12.3.4 **Interim Operational Notification [ION]**

If all the necessary conditions are fulfilled, the **DSO** shall issue an **ION** to the **PGFO**. Upon receipt of the **ION**, a **PGFO** may operate the associated **Generation Unit** and generate power for a limited period of time, by using the grid connection that is specified for the **Connection Point**. The limited period of time shall be agreed with the **TSO** or **DSO** as appropriate and shall not be longer than 24 months. An extension to this period of time may be granted via a derogation undertaken according to DGC12, if the **PGFO** can demonstrate sufficient progress towards full compliance and outstanding issues are clearly identified.

DOC12.3.5 Note on practical implementation by the **DSO**, of **EON**s and **ION**s

Issuance by the **DSO**, of an Approved Version of the Energisation Instruction [EI] to the **Customer** or their appointed agents, constitutes the means through which the **Customer** is notified that, at the appropriate step therein, it is in order to connect their plant to the **Distribution System** for the first time. It thus constitutes an **Energisation Operational Notification [EON]**.

It also constitutes the means through which, when successful energisation has been achieved through the execution of the EI, the **Power Generating Module [PGM]**, may use the grid connection for a period of time no greater than one year from the date of issuance of an approved version of the EI, to initiate compliance tests to ensure compliance with the relevant specifications and requirements of the **Distribution Code**. This may involve the exporting of power up to limits prescribed by other processes but in any event no greater than the **MEC**. It thus also constitutes an **Interim Operational Notification [ION]**.

DOC12.3.6 **Final Operational Notification [FON]**

If all the necessary conditions are fulfilled, including where controllability by the **TSO** applies, the issuance of a **ONJ** by the **TSO** to the **DSO**, the **DSO** shall issue a **FON** to the **PGFO**. Upon receipt of the **FON**, a **PGFO** may operate the associated **Generation Unit** and generate power by using the grid connection that is specified for the **Connection Point**.

If the **DSO** identifies a reason not to issue a **FON**, the **PGFO** may seek a derogation via the process described in DGC12. Where a request for a derogation is rejected, the **DSO** shall have the right to refuse to allow the operation of the **Generation Unit** until the **PGFO** and the **DSO** resolve the incompatibility and the **DSO** considers that the **Generation Unit** is compliant with **Distribution Code**.

If the **DSO** and the **PGFO** do not resolve the incompatibility within a reasonable time frame, but, in any case not later than 6 months after the notification of the rejection of the request for a derogation, each party may refer the issue for decision to the **CRU**.

DOC12.4 PERMANENT DECOMMISSIONING

The PGFO of a Type A, B, C or D Generator shall inform the DSO in the case of the permanent decommissioning of a Generation Unit. The Notification shall be made as soon as practicable, but in any event, no later than 3 months following the de-commissioning.

Distribution Data Registration Code

DDRC DISTRIBUTION DATA REGISTRATION CODE

DDRC1 INTRODUCTION

DDRC1.1 The various sections of the **Distribution Code** require **Users** to submit data to the **DSO**.

DDRC1.2 The **Distribution Data Registration Code (DDRC)** provides a series of schedule summarising all requirements for information of a particular type. Each **User** is then referred to the appropriate schedule for a statement of the total data requirements for that **User**.

DDRC1.3 The DDRC specifies procedures and timings for the supply of data and subsequent updating. Where the timings are covered by detailed timetables laid down in other sections of the **Distribution Code,** they are not necessarily repeated in full in the DDRC.

DDRC1.4 In the case of a **Generator** seeking a connection to the **DSO Distribution System** then irrespective of the potential arrangements for **Scheduling** and **Dispatch** discussions on connection shall be with the **DSO**.

DDRC2 SCOPE

The **Users** to which the DDRC applies are:

a) **Generators**;
b) **Major Customers**;
c) **Medium Voltage Customer** where the **DSO** considers it appropriate;
d) **Centrally Dispatched Users**.

DDRC3 PROCEDURES AND RESPONSIBILITIES

DDRC3.1 Unless otherwise specified or agreed by the **DSO** each **User** shall submit data as defined in DDRC5 below and attached schedules.

DDRC3.2 Data changes are reviewed annually to ensure continued accuracy or relevance. The **DSO** shall initiate this review in writing and the **User** shall respond in writing.

DDRC3.3 Where possible data shall be submitted on standard forms forwarded to the **User** by the **DSO**.

DDRC3.4 If a **User** wishes to change any data item then this must first be discussed with the **DSO** in order for the implications to be considered and the change if agreed (such agreement not to be unreasonably withheld), be confirmed by the submission of a revised data form or by verbal means with confirmation in writing.

DDRC3.5 From time to time the **DSO** may change its data requirements, appropriate **Users** shall be advised of these changes as they occur and with a reasonable timescale by which to reply.

DDRC3.6 In the case of a **Centrally Dispatched User**, the same data shall be provided to both the **DSO** and **TSO**.

DDRC4 DATA TO BE REGISTERED

DDRC4.1 The schedule numbering matches the schedule numbering of the **Grid Code** and some schedules are not required within the **Distribution Code**.

DDRC4.2 Schedules 1(a), 1(b), and 1(c) – **Generator** Technical Information.

DDRC4.3 Schedules 1(d) and 1(e) – Wind Generation

DDRC4.4 Schedules 1(f) – Centrally Dispatched **Demand Customers**

DDRC4.5 Schedule 2 – **Demand** Forecasts – as described in DOC1, **Demand** and generation forecasts for the **Users** defined in the scope.

DDRC4.6 Schedule 3 (a) and (b) – Operational Planning – as described in DOC2, outage planning information.

DDRC4.7 Schedule 4 (a) and (b) – System Design Information – comprising system technical data.

DDRC4.8 Schedule 5 – Load Characteristics – comprising the forecast data for load points indicating for example, the maximum load, the **Equipment** that comprises the load and the **Harmonic** content of the load.

DDRC5 DATA SCHEDULES

The schedules applicable to each class of **User** are as follows:

Schedule Number	**Title**	**Applicable to:**
Schedule 1(a)	**Generating Unit** Data	**Generators** including **Customers** with **CHP** and **Customers with Auto-production**
Schedules 1(b)	**Generating Unit** Data	**Generators** (with Parallel **Operation**)
Schedule 1(c)	**Generating Unit** Data	**Generators** (greater than 2**MW**).
Schedule 2	**Demand** Forecasts	**Generators** (greater than 2**MW**), **Major Customers**, **Centrally Dispatched Users**
Schedule 3(a)	Operational Planning (Outages)	**Generators**
Schedule 3(b)	Operational Planning (**Plant** and Apparatus)	**Major Customers**, **Generators**, **Customers** with **CHP** and **Customers with Auto-production**
Schedule 4(a)	System Design	**Generators**, **Major Customers**, **MV Customers** if advised by **DSO**
Schedule 4(b)	System Design	**Generator** (with Parallel **Operation**)
Schedule 5	Load Characteristics	**Generator**, **Major Customers**

SCHEDULE 1(a)

GENERATING UNIT DATA

For All Generators including Customers with CHP and Customers with Auto-production

DATA DESCRIPTION		**UNITS**
Site Details		Text
Contact Name		Text
Generator Make		Text
Type of **Generating Unit**		Text
Type of Prime Mover		Text
Anticipated Operating Regime	47.5	Text
Terminal Volts		kV
Rated **kVA**		**kVA**
Rated kW		kW
Maximum **Active Power** sent out		kW
Reactive Power required		kVAr
Fault Level Contribution		**MVA**
Method of Voltage Control		Text
Generator Transformer Details		Text

SCHEDULE 1(b)

GENERATING UNIT DATA

For Generators with Parallel Operation

DATA DESCRIPTION		UNITS
Engineering Details to include:		Text / Schematic Diagram
Relevant Voltage Levels **Generator** Size and Winding Configuration Transformer Size, Ratio, and Winding Configuration **Circuit Breaker** Location Maximum Three Phase Short Circuit Level (amps) Location of Alternate Electricity Supplies CT/VT Ratios and Locations Synchronising and Interlocking Arrangements Relay Types and Location Power Factor Correction Location		
Inertia Constant		**MW** secs /**MVA** (whole machine)
Stator Resistance		
Direct Axis Reactance	Sub-transient Transient Synchronous	
Time Constants: Direct Axis	Sub-transient Transient	
Zero Sequence	Resistance Reactance	
Negative Sequence	Resistance Reactance	
Generator Transformer	Resistance Reactance **MVA** Rating Tap Arrangement Vector Group **Earthing**	
Impulse Levels (BIL) and power withstands at each voltage level		Schedule
Fault current available due to metallic three phase short circuit at the main incoming **Circuit Breaker**		Calculation Sheet
Interface arrangements		Text / Diagrams
Details **Protection** circuit and trip circuit supervision		Text / Diagrams
Details of relays to be used including measuring range, proposed settings and calculations used to determine relay settings		Text
Details of power factor correction		Text / Diagrams

SCHEDULE 1(c)

GENERATING UNIT DATA

For Generators greater than 2MW

DATA DESCRIPTION	UNITS
Type of prime mover	Text
Rated **MVA**	
Type of Excitation System	Text
Automatic Voltage Regulator (AVR)	Diagram
A block diagram for the model of the **AVR** system including data on the gains forward and feedback time constants and voltage control limits.	Text
Speed Governor and Prime Mover Data	
A block diagram for the model of the **Generator Plant** Governor detailing the Governor Flyball and System Control and Turbine Rating and Maximum Power.	Diagram Text
Capacity and Standby Requirements	**MW**
Registered Capacity and Minimum Generation of each **Generating Unit** and **Power Station**.	
Generating Unit and **Power Station**	**MW**
Auxiliary **Demand** (**Active** and **Reactive Power**) at **Registered Capacity** conditions.	**MVAr**
Generating Unit and **Power Station** Auxiliary	**MW**
Demand (**Active** and **Reactive Power**) under Minimum Generation conditions.	**MVAr**

SCHEDULE 1(d)

GENERATING UNIT DATA – DYNAMIC MODELS FOR Power Park Modules

For all **PPMs**
(As an alternative, **PPMs** with a **Registered Capacity** of less than 5 **MW** may provide the data set out in Schedule 1(e)).

DATA DESCRIPTION	**UNITS**
Dynamic Model	PSS/E format (or other format agreed with **TSO**)
Dynamic Model Parameters	As required by dynamic model

OR

Dynamic Model previously provided to **DSO** or **TSO**:

Title / version of dynamic model	
Date sent to **TSO**/**DSO**	
By whom sent	
To whom addressed	
Means of transmission	

SCHEDULE 1(e)

GENERATING UNIT DATA – DYNAMIC MODELS FOR POWER PARK MODULES

For all **PPMs** with a **Registered Capacity** of less than 5 **MW**, where the data specified in Schedule 1(d) is not provided.

DATA DESCRIPTION	**UNITS**
WTG Technology	Fixed speed stall regulated Fixed speed pitch regulated Fixed speed pitch regulated with variable rotor resistance Variable speed with doubly-fed induction **Generator** Variable speed with synchronous **Generator** and fully-rated converter Other
SG Technology	
WTG Manufacturer	
WTG or **SG** Manufacturer's Type Designation	
Generator Manufacturer	
Generator Parameters	As specified in Schedule 1(b)

SCHEDULE 1(f)

Centrally Dispatched Customers Excluding Dispatchable Demand Customers

For each centrally dispatched customer excluding Dispatchable Demand Customer, the following information shall be provided:

DATA DESCRIPTION		UNIT
Site Details		Text
Contact Name		Text
Generator Make	(if appropriate)	Text
Type of **Generating Unit**	(if appropriate)	Text
Type of Prime Mover	(if appropriate)	Text
Anticipated Operating Regime		Text
Terminal Volts		kV
Rated **MVA**		**MVA**
Rated **MW**		**MW**
Maximum **Demand Reduction**	(if appropriate)	**MVA**
Fault Level Contribution		**MVA**
Method of Voltage Control		Text
Generator Transformer Details		Text
Meter registration ID (MPRN)		Text

Dispatchable Demand Customers

For each **Dispatchable Demand Customer**, the following information shall be provided:

DATA DESCRIPTION	UNIT
Name of **Demand Side Unit**	Text
Location of **Demand Site(s)**	Text
The name of the distribution station(s) to which the **Demand Site(s)** is / are normally connected	Text
Total **Demand Reduction Capability** (**MW**)	**MW**
Demand Reduction Capability from on-site generation	**MW**
Demand Reduction Capability from avoided **Demand** consumption	**MW**
Annual **Demand Profile**.	**MW**
Meter registration ID (MPRN)	Text

Dispatchable Demand Customer which represents an Aggregated Demand Site

For each **Dispatchable Demand Customer** which represents an **Aggregated Demand Site**, the following additional information shall be provided:

DATA DESCRIPTION	**UNIT**
Demand Reduction Capability per **Individual Demand Site**	**MW**
Demand Reduction Capability from generation per **Individual Demand Site**	**MW**
Demand Reduction Capability from avoided **Demand** consumption per **Individual Demand Site**	**MW**
Annual **Demand Profile** per **Individual Demand Site**	**MW**
Meter registration ID (MPRN)	Text

SCHEDULE 2

DEMAND FORECASTS

a) Generating Units greater than 2MW, not subject to Central Dispatch:

DATA DESCRIPTION	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Electricity Output (Annual half-hour Maximum **Active Power** Output (MW)) Forecast Electricity Generation (MWh)						
Planned Shutdown Periods Date: Start of Shutdown						
Planned Shutdown Periods Date: End of Shutdown						

Note: Year 0 is current year.

b) Major Customers and Medium Voltage Customers, where the DSO considers it appropriate:

DATA DESCRIPTION	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Electricity Demand (Annual half-hour Maximum Power Output (MW) and Power Factor) Annual Energy Forecast requirement (MWh)						
Planned Shutdown Periods Date: Start of Shutdown						
Planned Shutdown Periods Date: End of Shutdown						

Note: Year 0 is current year.

c) Centrally Dispatched Demand Customers:

Data Description	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Electricity Demand (Annual half-hour Maximum Power in (MW)). Annual Energy Forecast requirement (MWh)						
Planned Shutdown Periods Date: Start of Shutdown						
Planned Shutdown Periods Date: End of Shutdown						

SCHEDULE 3(a)

OPERATIONAL PLANNING – SCHEDULED OUTAGES

For Generators and Centrally Dispatched Users

DATA DESCRIPTION	UNITS	TIME PERIOD	TYPE OF DATA
For individual **Generating Units** the **Unit** number and **Generating Plant** capacity. Preferred outage dates earliest start date latest finish date.	**MW**	0 to 52 weeks	Committed Outage Programme
For individual **Generating Units** the **Unit** number and **Generating Plant** capacity. Preferred outage dates earliest start date latest finish date.	**MW**	Years 2 to 3	Provisional Outage Programme
For individual **Generating Units** the **Unit** number and **Generating Plant** capacity. Preferred outage dates earliest start date latest finish date.	**MW**	Years 4 to 7	Indicative Outage Programme

SCHEDULE 3(b)

OPERATIONAL PLANNING

Plant and Equipment

For **Generators** and **Major Customers**, **Customers** with **CHP** and **Customers with Auto-production** and **Centrally Dispatched Users**.

DATA DESCRIPTION	UNITS	Time Period Covered
Users provide the **DSO** and **Centrally Dispatched Users** provide the **TSO** with details of proposed outages which may affect the performance of the **Distribution System** with details of proposed outages which may affect the performance of the **Distribution System**, details of trip testing, risks of the trip and other information where known which may affect the security and **Stability** of the **Distribution System**	Dates	0 to 52 weeks
Users provide the **DSO** and **Centrally Dispatched Users** provide the **TSO** with details of proposed outages which may affect the performance of the **Distribution System**, with details of proposed outages which may affect the performance of the **Distribution System**, details of trip testing, risks of the trip and other information where known which may affect the security and **Stability** of the **Distribution System**	Dates	Years 1 to 2

All **Users** shall notify both the **TSO** and **DSO** with details of proposed outages of greater than 5MW three weeks in advance of the start date at the latest.

SCHEDULE 4(a)

SYSTEM DESIGN INFORMATION

Generators and Major Customers, MV Customers and Centrally Dispatched Users if advised by DSO

DATA DESCRIPTION	**UNITS**
Reactive Compensation	
Reactance of any capacity or banks and any series reactors	X
Rating of individual shunt reactors (not associated with cables)	**MVAr**
Rating of individual capacitor banks	**MVAr**
Details of any automatic control logic such that operating characteristics can be determined.	Text / Diagrams
Point of connection to the system	
Lumped Network Susceptance Details of the equivalent lumped network susceptance of the **User** Installation referred back to the connection with the **Distribution System**. Including: shunt reactors which are an integrated part of a cable system and which are not normally in or out of service independent of the cable. Excluding: independently switched reactive compensation connected to the **User** installation and any susceptance of any **User** installation inherent in the active and reactive **Demand**.	**MVAr**
Fault Infeeds	
Maximum and minimum short circuit infeeds into the system	R+jX
X/R ratio under maximum and minimum short	
Circuit conditions (contribution from rotating **Plant**)	
*Equivalent network information at the request of the **DSO***	
Interconnection Impedance	

SCHEDULE 4(b)

SYSTEM DESIGN INFORMATION

For Generators and Centrally Dispatched Users Operating in Parallel with the System

DATA DESCRIPTION	**UNITS**
Interconnection Impedance:	
Positive Sequence Resistance	%
Zero Sequence Resistance	%
Positive Sequence Resistance	%
Zero Sequence Resistance	%
Susceptance	
If the **DSO** considers that the impedance is low, then more detailed information will be requested.	
Circuit Parameters	Text / Diagrams
Switchgear	Text / Diagrams
***Protection** Arrangement*s	Text / Diagrams
Protection Settings	
Transient Over-voltage Effects	

SCHEDULE 5

LOAD CHARACTERISTICS

For Generators, Major Customers and Centrally Dispatched Users

DATA DESCRIPTION	UNITS
*Types of **Demand***: Maximum **Active Power Demand** Maximum and Minimum **Reactive Power** requirement	 kW kVAr
Type of Load and Control Arrangements: Type of starter employed; Controlled Rectifiers; Large motor drives;	Text / Diagram
Maximum load on each phase at the time of maximum **Demand**	Amp / Phase
Maximum Phase **Unbalance**	Amp / Phase
Maximum **Harmonic** content	% of **Harmonic** number
Fluctuating Loads: Rate of change of **Active** and **Reactive Power** both increasing and decreasing	 W / Sec kVAr / Sec
Shortest repetitive time interval between Fluctuation in **Active** and **Reactive Power**	Sec
Largest **Step Change** in **Active** and **Reactive Power** both increasing and decreasing	kW kVAr
Disturbing Loads	*Text*

SCHEDULE 6

DSO standard practice currently requires that, unless otherwise agreed with the **DSO**, the following standards shall apply:

a)	**Generation Units**:	For Hydro and Wind: G1, G2, etc. For thermal: U1, U2, etc.
b)	**Generator** Transformers (i.e. transformers for **Generation Unit** production)	at 110kV; T101, T102, etc.
c)	**Power Station** Transformers (i.e. dedicated transformers supplying both the generation unit and the **Power Station** auxiliaries from the **HV** busbar)	at 110kV: ST101, ST102, etc.
d)	Unit Transformers (i.e. transformers supplying auxiliaries of a **Generation Unit**)	UT1, UT2, etc.
e)	Load Transformers	for 110/38kV: T141, T142, etc. for 110/20kV: T121, T122, etc. for 110/11kV and below: T101, T102, etc.
f)	Bus Sections, conventional busbars	Single Bus; A1, A2, etc. Double Bus; A1, A2, B1, B2, etc.
g)	Bus sections, ring busbars:	each section identified by designation of **Plant** and / or apparatus item connected to it.
h)	Bus Couplers	K1, K2, etc.
i)	Line and cables	each line or cable at a station identified name of station or stations at the remote end or ends of the line or cable in alphabetical order.
j)	**Circuit Breakers**	CB
k)	Main Earth Disconnects	DE
l)	Line Disconnects	DL
m)	Busbar Disconnects	DA, DB, etc.
n)	Coupler Disconnects	DA, DB, etc.

Glossary and Definitions

In the **Distribution Code** the following words and expressions shall, unless the subject matter or context otherwise requires or is inconsistent therewith, bear the following meanings:

AC	Alternating Current.
Act	The Electricity Regulation **Act** 1999.
Active Power	The product of voltage and the in-phase component of alternating current, normally measured in kilowatts (kW) or megawatts (**MW**).
Active Power Control	The automatic change in **Active Power** output from a **PPM** in a response to an **Active Power Control Set-Point** received from the **TSO**.
Active Power Control Mode	A mode of **Operation** of a **Controllable PPM** where the **Controllable PPM** has been instructed by the **TSO** or **DSO** as agreed between **DSO** and **TSO,** to maintain its **Active Power** output at the **Active Power Control Set-Point.**
Active Power Control Set-point	The maximum amount of **Active Power** in **MW**, set by the **TSO**, that the **PPM** is permitted to export.
Active Power Control Set-Point Ramp Rate	The rate of increase or decrease of **Active Power** output of a **Controllable PPM** in response to an **Active Power Control Set-Point** instruction.
Aggregated Demand Site	A group of **Individual Demand Sites** represented by a **Dispatchable Demand Customer**, which together are capable of a **Demand Reduction Capability** equal to or above 4 **MW** (and which is therefore subject to **Central Dispatch** from the **TSO**). Each **Individual Demand Site** comprising an **Aggregated Demand Site** shall be in one currency zone. Unless otherwise specified, information submitted in respect of an **Aggregated Demand Site** shall always be at an aggregated level.
Authorised Person	**Authorised Person** means a person who is: (a) Competent in his/her a. knowledge of electricity; b. experience of electrical work; c. understanding of the installation to be worked on and practical experience of that work; d. understanding the hazards which can arise during the work and the precautions to be observed; e. ability to recognise at all times whether it is safe to continue working**.** (b) Either an employer, a self-employed person, or an employee appointed or selected by the employer or self-employed person, and (c) Engaged in work or duties incidental to the generation, transformation, conversion, switching, controlling, regulating, rectification, storage, transmission, distribution, provision, measurement or use of electrical energy.

Automatic Mains Failure Mode	The operation of **Generation Unit(s)** at a **Customer's premises** where in the event of disconnection, the **Generation Unit(s)** is(are) enabled and supplies(y) the **Customer's** load while not synchronised to the **Transmission System** or **Distribution System**. Upon sustained restoration of the connection to the **Transmission System** or **Distribution System** for a settable period of time, the **Generation Unit(s)** synchronise to the **Transmission System** or **Distribution System** for a short period of time not exceeding 180 seconds to facilitate the smooth transfer of power prior to shutdown of the **Generation Unit(s).**
Available Active Power	The amount of **Active Power** that the **PPM** could produce based on current resource conditions. The **Available Active Power** shall only differ from the actual **Active Power** if the **PPM** has been curtailed, constrained or is operating in a restrictive **Frequency Response** mode.
Availability Notice	A notice to be submitted to the **TSO** pursuant to SDC1.4.1.1 of the **Grid Code**.
AVR	Automatic Voltage Regulation.
Back-up Protection	That **Protection** system which will open a **Circuit Breaker** or other fault-current interrupting device in the absence of the current **Protection Operation** of another **Protection** system.
Black Start Shutdown	The procedure necessary for recovery from a total or partial system shutdown.
Bulk Supply Point	A point of connection between the **Transmission System** and the **Distribution System** or between the **Transmission System** and a directly connected **Customer**.
CCGT Installation	A collection of **Generating Units** comprising one or more **Combustion Turbine Units** and one or more **Steam Units** where, in normal **Operation**, the waste heat from the **Combustion Turbine Unit** is passed to the water/steam **System** of the associated **Steam Units** and where the component **Generating Units** within the **CCGT Installation** are directly connected by steam or hot gas lines which enable those units to contribute to the efficiency of the combined cycle **Operation** of the **CCGT Installation**.
CCGT Unit	A **Generating Unit** within a **CCGT Installation**.
CENELEC	European Committee for Electro-technical Standardisation.
Central Dispatch	The **Dispatch** of **Users** by the **TSO**.
Centrally Dispatched Generating Units	**Generating Units subject to Central Dispatch by the TSO.**
Centrally Dispatched Users	**Users** subject to **Central Dispatch** by the **TSO**.
Circuit Breaker	A mechanical switching device, capable of making, carrying and breaking currents under normal circuit conditions and also of making, carrying for specified time and

	breaking currents under specified abnormal circuit conditions, such as those of short circuit.
CHP	The simultaneous production of utilisable heat and electricity from an integrated thermo-dynamic process.
 **Closed Distribution System**	A system which distributes electricity within a geographically confined industrial, commercial or shared services site and does not supply household customers, without prejudice to incidental use by a small number of households located within the area served by the system and with employment or similar associations with the owner of the system.
Collector Network:	A geographical area containing a number of **PPMs** with signed **DSO Connection Agreements**, where any individual **WTG or SG** on a **PPM** site with a signed **DSO Connection Agreement** is within 1.5 kilometre of any individual **WTG or SG** on another separate **PPM** site with a signed **DSO Connection Agreement**. A proposed **PPM** will be deemed to be considered part of a **Contiguous Power Park Module Site** where any individual **WTG or SG** on the proposed **PPM** site is within 1.5 kilometre of any individual **WTG or SG** on a second **PPM** site, where that second **PPM** has a signed **DSO Connection Agreement**.
Combustion Turbine Unit	A **Generating Unit** which compresses the inlet air and feeds fuel to the combustion chamber. The fuel and air burn to form hot gases which in turn forces these hot gases into the turbine, causing it to spin. The turbine can be fuelled by natural gas, by distillate or by other such fuels as technology may allow.
Commission for Regulation of Utilities	The **Commission for Regulation of Utilities** (CRU) previously known as the Commission for Energy Regulation (CER) as established by the **Act**.
Commissioning	The final process of testing part of a system prior to that part of the system being considered suitable for normal use.
Connection Agreement	An agreement between the **DSO** and each **User** setting out terms relating to a connection with the **Distribution System**.
Connection Point	The physical point at which a **User's Plant** or apparatus is joined to the **Distribution System**.
Contiguous Power	

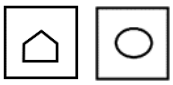
Park Module Site	A geographical area containing a number of **PPMs** with signed **DSO Connection Agreements**, where any individual **WTG** or **SG** n a **PPM** site with a signed **DSO Connection Agreement** is within 1.5 kilometre of any individual **WTG** or **SG** on another separate **PPM** site with a signed **DSO Connection Agreement**. A proposed **PPM** will be deemed to be considered part of a **Contiguous PPM Site** where any individual **WTG** or **SG** on the proposed **PPM** site is within 1.5 kilometre of any individual **WTG** or **SG** on a second **PPM** site, where that second **PPM** has a signed **DSO Connection Agreement**.
Control Facility	A location used for the purpose of monitoring, control and **Operation** of the **User's Plant** and apparatus.
 **Controlled Active-Power**	The amount of **Active Power** that a **Controllable** Generating Unit is permitted to export based on the **Active Power Control Set-Point** signal sent by the **TSO** or **DSO**.
Controllable PPM	A site containing at least one **WTG** or **SG** can automatically act upon a remote signal from the **TSO** to change its **Active Power** output.
Controllable PPM Availability	The amount of **MW** the **Controllable PPM** can produce given favourable resource conditions.
Controllable PPM MW Availability Declaration	A measure of the maximum **Active Power** which can be produced by a **Controllable PPM** given favourable resource conditions. Account shall be taken of partial and / or full outages of individual **WTG** or **SG** within the **Controllable PPM**.
Customer	A **User** whose premises is connected to the **Distribution System** for the purpose of obtaining a supply of electricity at that premises.
Customers with Auto-production	A **Customer** generating electricity for his or her own use.
DAO Licence	The licence granted to the **DAO** by the **Commission for Regulation of Utilities** pursuant to section 14(1)(k) of the **Act** authorising the **DAO** to discharge the functions of the **Distribution System Asset Owner**.
DC	Direct Current.

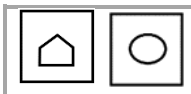
DCC Unit	A **Demand Unit** that is not a **Non-DCC Unit**. A **Pumped Storage Unit** which only operates in pumping operation mode, and does not meet Non-DCC Unit Criteria, is classified as a DCC Unit.
Demand	Unless otherwise stated, the **Demand** expressed in **MW** or **MVAr** of **Active Power** and **Reactive Power** respectively.
Demand Facility	An installation under the control of a **Customer** where electrical energy is consumed and is connected at one or more **Connection Points** to the **DSO**'s **Distribution System**. Auxiliary supplies of a **Power Generating Module** do not constitute a **Demand Facility**.
Demand Profile	The estimated consumption of **MW Demand** for an **Individual Demand Site** or aggregated consumption for each individual site which form part of a **Aggregated Demand Site** for each trading period in the following Optimisation Time Horizon Period and which must be submitted to the **TSO** in the **Availability Notice** under SDC1.4.1.2 of the **Grid Code**.
Demand Reduction	The reduction in **MW Demand** which can be achieved in one currency zone by a **Demand Side Unit** or Aggregated **Demand Side Unit** for each Trading Period in the following Optimisation Time Horizon Period and which must be submitted to the **TSO** in an **Availability Notice** under SDC1.4.1.2 of the **Grid Code**.
Demand Reduction Capability	The reduction capability in **MW Demand** that can be achieved by the **Demand Side Unit**.
Demand Response Service Provider	A party who contracts with the **DSO** to provide a demand response service. The party might be a **Customer** contracting bilaterally with the **DSO** for the provision of services, or may be a third party providing an aggregated service from many individual **Customers**. In the latter case, there will be a specific contract for the provision of the services to the **DSO** and will include compliance by that third

	party with the requirements of **DCC**13.2 in relation to each **Demand Unit** included in the aggregated service.
Demand Side Unit	An individual **Demand Reduction** site or **Aggregated Demand Site** with a **Demand Reduction Capability** of at least 4 **MW**. The **Demand Side Unit** shall be subject to **Central Dispatch**.
Demand Site	A premises owned by a **Customer** connected to the **Distribution System** with a **Demand Reduction Capability**. The **Demand Site** shall have a Maximum Import Capacity and shall not have a Maximum Export Capacity.
 **Demand Unit**	An appliance or device whose **Active Power Demand** or **Reactive Power** production or consumption is being actively controlled by the **Customer** in whose **Demand Facility** of **Closed Distribution System** it is installed. Where there is more than one **Demand Unit** in a **Demand Facility** or **Closed Distribution System**, these **Demand Units** shall together be considered as one **Demand Unit** if they cannot be operated independently of each other.
Design Minimum Operating Level (DMOL)	The minimum **Active Power** output of **Controllable PPM** where all **WTG's** are generating electricity and capable of ramping upwards at any of the specified ramp rates (given available resource conditions) and shall not be greater than 12% of **Registered Capacity**.
Disconnector	A device which provides in the open position a means of disconnecting apparatus from the **Distribution System** in accordance with specified requirements.
Dispatch	The issue of instructions for **Generating Units** to achieve specific **Active Power** and **Reactive Power** outputs within **Registered Data** parameter and by stated times.
Dispatchable Demand Customer	A person who operates a **Demand Side Unit**, with a **Demand Reduction Capability** not less than 4**MW**, and is subject to the **Distribution Code** pursuant to any agreement with the **DSO** or otherwise.
Distribution Code	This document produced by the **DSO** pursuant to the **DSO Licence**.
Distribution Code Review Panel (DCRP) or 'Panel'	The **Panel** with the functions set out in **DGC**7.

Distribution Connection Code (DCC)	That portion of the **Distribution Code** which is identified as the **Distribution Connection Code**.
Distribution Data Registration Code (DDRC)	That portion of the **Distribution Code** which is identified as the **Distribution Data Registration Code**.
Distribution General Conditions (DGC)	That portion of the **Distribution Code** which is identified as the Distribution Operating Code (DOC).
Distribution Planning Code (DPC)	That portion of the **Distribution Code** which is identified as the **Distribution Planning Code**.
Distribution System	The system which consists of electric lines, electric **Plant**, transformers and switchgear and which is used for conveying electricity to final **Customers**.
Distribution System Asset Owner (DAO)	**ESB Networks Ltd.** in its capacity as the licensed owner of the **Distribution System** under its **Distribution System** Owner Licence.
Distribution System Operator (DSO)	**ESB Networks Ltd.** in its capacity as the licensed operator responsible for the ownership, **Maintenance** and development of the **Distribution System** under its **DSO Licence**.
Distribution Use of System (DUoS)	The agreement between the **DSO** and **Suppliers** for transport of electricity Agreement from the **Transmission System** or **Generators** and **Centrally Dispatched Users** through the **Distribution System** to **Customers**.
Disturbing Loads	Loads which have the potential to introduce **Harmonics**, **Flicker** or **Unbalance** into the system.

Demand Response Unit Document or DRUD	A document, issued either by the **Demand Facility** owner or the **Closed Distribution System** operator to the **DSO** for **Demand Units** with demand response and connected at a voltage level above 1 000 V, which confirms the compliance of the **Demand Unit** with the technical requirements set out in EU 2016/1388 and provides the necessary data and statements, including a **Statement of Compliance**.

DSO Licence	The **Licence** granted to the **DSO** by the **Commission for Regulation of Utilities** pursuant to section 14(1)(g) of the **Act** authorising the **DSO** to discharge the functions of the **Distribution System Operator**.
Earthing	A way of providing a connection between conductors and earth by an **Earthing Device**.
Earthing Device	A means of providing a connection between a conductor and earth of adequate strength and capability for the intended purpose.
EirGrid	The **Transmission System Operator** established in accordance with Statutory Instrument (SI) No. 445 of 2000 (modified by Statutory Instrument 60 (2005)) to have responsibility for operating the **Transmission System**.
 **Energy Storage Unit**	A **Generation Unit(s)** using storage devices to generate and consume electricity as, or as part of, a **PPM**.
 **Energisation Operational Notification Or EON**	A notification issued by the **DSO** to a **Power Generating Facility** owner, **Demand Facility** owner, or HVDC system owner prior to energisation of its internal network
Equipment	**Plant** and / or apparatus.
 **Equipment Certificate**	A document issued by an authorised certifier (as defined in EU 2016/631 or 2016/1388) for equipment used by a **Power Generating Module**, **Demand Unit**, **Demand Facility** or HVDC system. The equipment certificate defines the scope of its validity at a national or other level at which a specific value is selected from the range allowed at a European level. For the purpose of replacing specific parts of the compliance process, the equipment certificate may include models that have been verified against actual test results.
ESB	Electricity Supply Board, a statutory corporation and licensed owner of the **Transmission System** and the **Distribution System**.

ESB Networks Limited	The **Distribution System Operator** (**DSO**) and wholly owned subsidiary of **ESB** established in accordance with Statutory Instrument No. 280 of 2008 (*European Communities (Internal Market in Electricity) (Electricity Supply Board) Regulations, 2008*) to have responsibility for operating the **Distribution System**.
ESB Networks Electrical Safety Rules	A document prepared by **ESB Networks Ltd.** and entitled '*ESB Networks Electrical Safety Rules'.*
ESI	Electricity Supply Industry.
ETCI	Electro Technical Council of Ireland.
Event	An unscheduled or unplanned occurrence on or relating to a system including, without limiting that general description, faults, incidents and breakdowns.
Fault level	Prospective current that would flow into a short circuit at a stated point on the system and which may be expressed in kA or, if referred to a particular voltage, in **MVA**.
Flicker	Impression of unsteadiness of visual sensation induced by a light stimulus whose luminance or spectral distribution fluctuates with time.
 **Final Operational Notification Or FON**	A notification issued by the **DSO** to a **Power Generating Facility** owner, **Demand Facility** owner, or HVDC system owner who complies with the relevant specifications and requirements set out in EU 2016/631 or 2016/1388, allowing them to operate respectively a **Power- Generating Module**, **Demand Facility**, or HVDC system by using the grid connection.
Frequency	The number of alternating current cycles per second, expressed in Hertz at which the system normally operates, i.e. 50 Hertz.
Frequency Response	The automatic adjustment of **Active Power** output from a **Generation Unit(s)** in response to **Frequency** changes.
Frequency Response System	A facility providing the means to automatically adjust the **Active Power** output from a **Generation Unit(s)** in response to changes in **Frequency**.
Frequency Response Ramp Rate	The minimum rate of increase or decrease of **Active Power** output of a **Controllable PPM** when acting to control **System Frequency.**

Generating Plant	A **Power Station** including any **Generating Unit** therein.
Generating Unit	Any apparatus which produces electricity.
Generator	A person who generates electricity under **Licence** or exemption under the **Act**.
Good Industry Practice	The standard of practice attained by exercising that degree of skill, diligence, prudence and foresight which would reasonably and ordinarily be expected from a skilled and experienced operator engaged in the same type of undertaking under the same or similar circumstances.
Governor Droop	The percentage drop in the **Frequency** that would cause the **Generation Unit** under free governor action to change its output from zero to its full **Capacity**. In the case of a **Controllable PPM**, it is the percentage drop in the **Frequency** that would cause the **Controllable PPM** to increase its output from zero to its full **Registered Capacity**.
Grid Code	The code produced by **EirGrid** pursuant to the **Act** and any amendments thereto.
Grid Connected	Any **Plant** or apparatus connected to the **Transmission System** is referred to as being **Grid Connected**.
Harmonics	Sinusoidal currents with a **Frequency** equal to an integer multiple of the fundamental **Frequency** of the connection voltage.
High Voltage (HV)	A voltage, used for the supply of electricity, whose lower limit of nominal RMS value is greater than 35kV.
IEC	International Electro-technical Commission.
Individual Demand Site	A single premises of a **Demand Customer** connected to the **Distribution System** with a **Demand Reduction Capability**. The **Individual Demand Site** shall have a Maximum Import Capacity and shall not have a Maximum Export Capacity.
Initial Demand Reduction	The **Demand Reduction** of a **Demand Side Unit** following a **Dispatch Instruction** from the **TSO** when the **Demand Reduction** is at 0 **MW** for a period greater than 24 Hours.
Initial Demand Reduction Time	The time as specified by the **Dispatchable Demand Customer** in the Technical Parameters and is the time it takes for the **Dispatchable Demand Customer** to be able to implement the **Initial Demand Reduction** from receipt of the **Dispatch Instruction** from the **TSO**.

Installation Document	A simple structured document containing information about a type A **Power-Generating Module** or a **Demand Unit**, with demand response connected below 1 000 V, and confirming its compliance with the relevant requirements set out in EU 2016/631 or 2016/1388.

Inter-jurisdictional Tie-lines	The lines, facilities and **Equipment** that connect the **Transmission System** of the Republic of Ireland to the **Transmission System** of Northern Ireland.

 **Interim Operational Notification Or ION**	A notification issued by the **DSO** to a **Power Generating Facility** owner, **Demand Facility** owner, or HVDC system owner which allows them to operate respectively a **Power-Generating Module**, **demand facility**, or HVDC system by using the grid connection for a limited period of time and to initiate compliance tests to ensure compliance with the relevant specifications and requirements set out in EU 2016/631.

Isolated	Disconnected from associated **Equipment** by a **Disconnector** or adequate physical separation.
kVA	Kilo Volt-Amp
Low Voltage (LV)	A voltage, used for the supply of electricity, whose upper limit of nominal RMS value is 1kV.
Lopping Mode (Peak Lopping)	The operation of **Generation Unit(s)** at a **Customer's premises** where the **Generation Unit(s)** supplies the **Customer's Demand** while not synchronised to the **Transmission System** or **Distribution System**. The **Generation Unit(s)** is(are) synchronised to the **Transmission System** or **Distribution System** for short periods of time not exceeding 180 seconds at start-up and shutdown of the **Generation Unit(s)** to facilitate a smooth transfer of power.
Maintenance	The inspection, testing, servicing and repair of electrical apparatus, plant and associated ancillary equipment as per S.I. No.299 of 2007 Safety Health and Welfare at Work (General Application) Regulation 2007.
Major Customer	A **Customer** who is connected to the **Distribution System** at **High Voltage** (voltage greater than 35kV).
Maximum Down Time	The maximum period of time during which **Demand Reduction** at a **Demand Side Unit** can be **Dispatched**.

Max Ramp Down Rate	The **Maximum Ramp Down Rate** of a **Demand Side Unit**. In the case of a **Demand Side Unit** which consists of an **Aggregated Demand Site** this shall be the aggregated **Maximum Ramp Down Rate** of the **Individual Demand Sites**.
Max Ramp Up Rate	The **Maximum Ramp Up Rate** of a **Demand Side Unit**. In the case of a **Demand Side Unit** which consists of an **Aggregated Demand Site** this shall be the aggregated **Maximum Ramp Up Rate** of the **Individual Demand Sites**.
Medium Voltage (MV)	A voltage, used for the supply of electricity, whose nominal RMS value lies between 1kV and 35kV.
Meteorological Mast	A device erected at the **PPM** site which has the capability measure representative wind speed, wind direction, air temperature and air pressure to a degree of accuracy corresponding to the appropriate prevailing European Standard at that time.
Metering Point	Has the meaning given to that term in the Registration Agreement.
Minimum Down Time	The minimum period of time during which **Demand Reduction** at a **Demand Side Unit** can be dispatched.
	
Minimum Load	Minimum **MW** Output a **Generator** can maintain on a continuous basis, whilst providing **System Services**.
MVA	Mega Volt-Amp
MVAr	Mega Volt-Amp reactive (1,000,000 vars).
MW	Mega Watt (1,000,000 watts).
National Control Centre (NCC)	The **TSO's National Control Centre**, as notified by the **TSO** to the **Generator** from time to time.
	
Non-DCC Unit	A User or **Demand Facility** or **Closed Distribution System** with a signed **Connection Agreement**: a) Connected to the network on or before the 7th September 2019; or

b) Whose owner has concluded a final and binding contract for the purchase of the main **Plant** on or before the 7th September 2019 and provides evidence of same, as acknowledged by the **DSO**, on or before the 7th March 2020. Such evidence shall at least contain the contract title, its date of signature and date of entry into force, and the specifications of the main **Plant** to be constructed, assembled, or purchased; or

c) Is an exception to the applicability of the **DCC Unit** requirements and / or is a **Non-DCC Unit** such as a **Pumped Storage Unit** that has both generating and pumping operation mode.

An existing **User** or **Demand Facility** or **Closed Distribution System** that undergoes modernisation, refurbishment or replacement of equipment which drives a modification to its **Connection Agreement**, and has concluded a final and binding contract for the purchase of the **Plant** being modified after the 7th September 2019 will be deemed a **DCC Unit**, unless the Plant being modified is one of the exceptions listed in c) above.

Non-RfG Generation Units

A **Generation Unit** with a signed **Connection Agreement:**

a) Connected to the network on or before the 30th November 2018; or

b) Whose owner has concluded a final and binding contract for the purchase of the main **Plant** on or before the 30th November 2018 and previous evidence of same, as acknowledged by the **DSO,** on or before the 31st May 2019. Such evidence shall at least contain the contract title, its date of signature and date of entry into force, and the specifications of the main **Plant** to be constructed, assembled, or purchased; or

c) Is one of the exceptions to the applicability of the **RfG Generation Unit** requirements and is a **Generation Unit** as follows:

(i) Installed to provide back-up power and operate in parallel with the network for less than five minutes per calendar month while the system is in normal state; or

(ii) No permanent **Connection Point** and is used by the **DSO** to temporarily provide power when normal system capacity is partly or completely unavailable; or

(iii) **Energy Storage Units** except for **Pumped Storage Plant**.

Operating Reserve	The additional **MW** output required from **Generating Units** (or **Demand Reduction**) which must be realisable in real time **Operation** to contain and correct any potential **Total System Frequency** deviation to an acceptable level. It will include **Primary Operating Reserve**, **Secondary Operating Reserve** and **Tertiary Operating Reserve**.
Operation	A scheduled or planned action carried out on a system.
Operational Effect	Any **Operation** which causes the **Transmission System** or the **Distribution System**, or the system of other **Users**, to operate (or be at a materially increased risk of operating) differently from the way in which they would or may have operated in the absence of such effect.
Ownership Boundary	The boundary between the **Distribution System** and **Equipment** owned by the **User**.
Point of Common Coupling (PCC)	The point on the Distribution **System** which is electrically nearest to the **Connection Point** and from which other **Customers**' loads are, or may be, connected.
Planned Outage	An outage of **Generating Plant** or of part of the **Transmission System** or of part of the **Distribution System** other than a forced outage.
Plant	Fixed and movable items used in the generation and / or supply and / or transmission of electricity other than apparatus.

Power Generating Facility	A facility that converts primary energy into electrical energy and which consists of one or more **Power Generating Module**s connected to a network at one or more connection points.
Power-Generating Facility Owner (PGFO)	A natural or legal entity owning a **Power Generating Facility.**
Power Generating Module (PGM)	Means either a **Synchronous Power-Generating Module** or a **Power Park Module**. For avoidance of doubt, the term **Generating Unit** (GU) and **Power Generating Module** (PGM) are considered to be equivalent within this document.

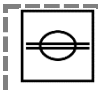
Power-Generating Module Document Or PGMD	A document provided by the **Power Generating Facility** owner to the **DSO** for a type B or C **Power-Generating Module** which confirms that the **Power-Generating Module**'s compliance with the technical criteria set out in EU 2016/631 has been demonstrated and provides the necessary data and statements, including a **Statement of Compliance.**
Power Park Module (PPM)	A unit or ensemble of units generating electricity, which is either non-synchronously connected to the network or connected through power electronics, and that also has a single **Connection Point** to the, distribution system. For avoidance of doubt, a **Wind Farm Power Station** (WFPS) or **Solar Farm Power Station** (SFPS), are considered to be a PPM. A PPM will comprise at least one WTG or SG.
Power Park Module Availability	The amount of **MW** the PPM can produce given favourable resource conditions**.** A measure of the maximum **Active Power** output which can be produced by a **MW** availability declaration **PPM** given favourable resource conditions. Account shall be taken of partial and / or full outages of individual **Generating Unit** within the **PPM**.
Power Park Module Control System	The control system at the **PPM** which provides for **Active Power Control**, **Frequency Response**, ramp rate control and other **WTG** or **SG** control features.
Power Park Module Operator	The operator of the **PPM**

Power Station	An installation consisting of **Generating Unit(s)**.
Primary Operating Reserve (POR)	The additional **MW** output (and / or reduction in **Demand**) required at the **Frequency** nadir (minimum), compared to the pre-incident output (or **Demand**) where the nadir occurs between 5 and 15 seconds after an **Event**. If the actual **Frequency** nadir is before 5 seconds or after 15 seconds after the **Event**, then for the purpose of **POR** monitoring the nadir is deemed to be the lowest **Frequency** which occurred between 5 and 15 seconds after the **Event**.
Protection	The provisions for detecting abnormal conditions in a system and initiating fault clearance or actuating signals or indications.

Pumped Storage Unit A **Generation Unit** within a **Pumped Storage Plant**.

Rate of Change of Frequency The rate of increase or decrease of **Frequency** as measured at the **User's Connection Point** over the time period as set out in **DCC**10.5.1(j).

Reactive Power The product of voltage, current and the sine of the phase angle between them which is normally measured in kilovars (kVAr) or megavars (**MVAr**).



Registered Capacity The maximum capacity, expressed to the nearest 0.1 **MW**, that a **Power Generating Module** is capable of delivering on a sustained operational basis at the **Connection Point** without accelerated loss of equipment life. This shall be the value at 10ºC, 70 % relative humidity and 1013 hPa for thermal plant.

For the avoidance of doubt, **Registered Capacity** shall be applied as the lesser of maximum capacity or MEC. Where there is no MEC or where the MEC equals zero, the **Registered Capacity** shall be the maximum capacity.

For the avoidance of doubt, this applies to all **Generating Units** on the **Distribution System**, including **Centrally Dispatched Generating Units** and **Controllable PPM** under the **dispatch** or control of the **TSO**.

For the avoidance of doubt, **Registered Capacity** as defined above is considered to be equivalent to *Maximum Capacity* in the Requirements for Generators EU Network Code.

Registered Data Data referred to in the schedules to the Data **Distribution Registration Code**.

Remote Terminal Unit (RTU) A device that collects, codes and transmits data. An **RTU** collects information from a master device and implements processes that are directed by that master. **RTU's** are equipped with input channels for sensing or metering, output channels for control, indication or alarms and a communications port.

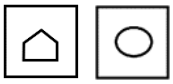
Resource Following Mode A mode of **Operation** of a **Controllable PPM** where the system **Frequency** is within normal range and the **Controllable PPM** is not under **Active Power Control** by the **TSO**, allowing the **Controllable PPM** to produce up to 100% of its **Available Active Power**, depending on the power-frequency curve in **Operation**.

	When operating on power-frequency curve 2, the **Controllable PPM** is required to maintain its **Active Power** output at a fixed percentage of its **Available Active Power** when **Transmission System Frequency** is within the range F_B-F_C.
Resource Following Ramp Rate	The maximum rate of increase of **Active Power** output of a **Controllable PPM** in response to an increase in the resource of the **Generating Unit**.

RfG Generation Unit	A **Generation Unit** that is not a **Non-RfG Generation Unit**.
Rise Time	In relation to reactive current response from **Controllable PPM**, it is the length of time from fault inception for reactive current to reach 90% of its steady-state value.
Safety Management	The procedure adopted by the **DSO** or a **User** to ensure the safe **Operation** of its system and the safety of personnel required to work on that system.
Safety Procedures	The procedures specified within a **Safety Management** system.
SCADA	Supervisory Control and Data Acquisition.
Scheduling	The procedure for determining intended usage of **Generating Plant**.

Secondary Frequency Regulation Systems (SFRS)	A control system installed between the **NCC** and a **Power Station** whereby **MW** set points can be adjusted remotely by the **TSO** to reflect the **Dispatch Instruction**.
Secondary Operating Reserve (SOR)	The additional **MW** output (and / or reduction in **Demand**) required compared to the pre-incident output (or **Demand**), which is fully available by 15 seconds from the time of the start of the **Frequency** fall and sustainable up to 90 seconds following an **Event**.
Settling Time	In relation to reactive current response from **Controllable PPM**, it is the length of time from Fault Inception for reactive current to settle within +/-10% of its steady-state value.
SFRS Control Range	The range of loads over which **SFRS** may be applied.
SFRS Maximum Load	The upper limit of the **SFRS Control Range**.
SFRS Minimum Load	The lower limit of the **SFRS Control Range**.
Single Electricity Market (SEM)	The wholesale all-island **Single Electricity Market** established and governed pursuant to the relevant legislation and the Trading and Settlement Code.
Significant Incident	**Events** which have had or may have an **Operational Effect** on the **Transmission** or **Distribution System** or a **User's** installation.
Solar Farm Power Station (SFPS)	A site containing at least one **SG**. For avoidance of doubt, a Solar Farm Power Station is considered to be a Power Park Module.
Solar Generator (SG)	A **Generating Unit** which generates electricity from photo-voltaic or other solar technology, which forms an indivisible unit for the purposes of implementation of control functions. It would typically comprise an Inverter Block, with which the **Solar Farm Power Station** controller would interact.
Steam Unit	A **Generating Unit** whose prime mover converts the heat-energy in steam to mechanical energy.
Step Change	A **Step Change** is defined as a single, rapid change of the RMS voltage. **Distribution System** voltage **Step Changes** can occur due to switching in and out of capacitors, lines, cables, transformers and other **Plant**.
Stable / Stability	A **Generation Unit** is adjudged to be **Stable** if the various machine states and variables, including but not limited to rotor angle, **Active Power** output, and

Reactive Power output, do not exhibit persistent or poorly damped oscillatory behaviour, when the **Generation Unit** is subjected to a fault disturbance or other transient **Event** on the **Distribution System**.



Statement of Compliance A document provided by the **Power Generating Facility** owner, **Demand Facility** owner, or HVDC system owner to the **DSO** stating the current status of compliance with the relevant specifications and requirements set out in EU 2016/631 or 2016/1388.

Superimposed Signals Those electrical signals carried on a **Distribution System** for the purposes of information transfer.

Supplier A person authorised by licence under section 14(1)(b), (c) or (d) or Section 14(2) of the **Act** to supply electricity to the **Connection Point** under a supply agreement.

Synchronous Power Generating Module (SPGM) An indivisible set of installations which can generate electrical energy such that the frequency of the generated voltage, the generator speed and the frequency of network voltage are in a constant ratio and thus in synchronism.

System Services Services which are required for **Transmission System** reasons and which include those which must be provided by **Users** in accordance with the **Connection Conditions** and those which must be provided by a **User** if the **User** has agreed to provide them under supplemental agreements.

System Stability The state of the system whereby predicted changes in load and generation can be accommodated without any detrimental effect on the system.

System Tests Those tests which involve simulating conditions or the controlled application of irregular, unusual or extreme conditions on the **Total System** or any part of it, but not including routine testing, **Commissioning** or recommissioning tests.

TAO Licence The licence granted to the **TAO** by the **Commission for Regulation of Utilities** pursuant to section 14(1)(f) of the **Act** authorising the **TAO** to discharge the functions of the **Transmission System Owner**.

Tertiary Operating Reserve Band 1 (TOR1)	The additional **MW** output (and / or reduction in **Demand**) required compared to the pre-incident output (or **Demand**), which is fully available and sustainable from 90 seconds to 5 minutes following an **Event**.
Tertiary Operating Reserve Band 2 (TOR2)	The additional **MW** output (and / or reduction in **Demand**) required compared to the pre-incident output (or **Demand**), which is fully available and sustainable from 5 minutes to 20 minutes following an **Event**.
Total System	The **Transmission System**, **Distribution System** and all **User** systems within the Republic of Ireland.
TN-C-S	A system of **Earthing** as described in the *National Rules for Electrical Installations* (RT101) published by the **ETCI**.
Transmission System	The system which consists wholly or mainly of **High Voltage** lines and electric **Plant** and which is used for conveying electricity from a generating station to a substation, from one generating station to another, or to any interconnector or to a final **Customer** but shall not include any such lines which the board may, from time to time, with the approval of the **Commission for Regulation of Utilities** , specify as being part of the **Distribution System**.
Transmission System Asset Owner (TAO)	**ESB** in its capacity as licensed owner of **Transmission System** under its **TAO Licence**.
Transmission System Operator (TSO)	**EirGrid** in its capacity as licensed operator of the **Transmission System** under its **TSO Licence**.
Transmission System Disturbance	Any type of fault including, but not limited to, single line to ground, line to line and three-phase short-circuits, in any single item of **Plant** anywhere in the **Transmission System** where the **Operation** of the **TSO Protection** will not disconnect the **Generator Plant** from the existing or planned **Transmission System** under normal or scheduled outages conditions. For the avoidance of doubt this fault disturbance can include bus zone **Protection**.
TSO Licence	The licence granted to the **TSO** by the **Commission for Regulation of Utilities** pursuant to section 14(1)(e) of the **Act** authorising the **TSO** to discharge the function of the **Transmission System Operator**.
TSO Telecommunication	

Interface Cabinet	The physical interface point between the **TSO's** telecommunications **Equipment** and the **PPM's** control **Equipment**.
Unbalance	(see **Voltage Unbalance**).
User	A term used in various sections of the **Distribution Code** to refer to the persons using the **Distribution System**, more particularly identified in each section of the **Distribution Code**.
Voltage Dip	This is a short-duration reduction in phase to phase voltage on any or all phases, resulting in voltages outside the ranges as specified in Figure 13, and more generally, bus voltages or terminal voltages of less than 90% of nominal voltage on any or all phases. Percentage **Voltage Dip** shall be calculated with respect to nominal voltage.
Voltage Fluctuations	A series of rapid voltage changes which may be regular or irregular.
Voltage Reduction	The method to temporarily control **Demand** by reduction of system voltage.
Voltage Regulation	The automatic adjustment of **Reactive Power** output from a **Generation Unit(s)** in response to voltage changes.
Voltage Regulation Set-Point	The voltage in kV that the **Voltage Regulation System** will act to regulate by continuous modulation of the **PPM's Reactive Power**.
Voltage Regulation System	A facility providing the means to automatically adjust the **Reactive Power** output from a **Generation Unit(s)** in response to changes in voltage.
Voltage Regulation System Slope Setting	The percentage change in **Distribution System** voltage that would cause the **Reactive Power** output of the **Controllable PPM** to vary from maximum **MVAr** production capability of Q/Pmax of 0.33 to maximum **MVAr** absorption capability of Q/Pmax of -0.33 or vice-versa, as per Figure 18.
Voltage Unbalance	In three-phase networks condition in which the RMS values of the phase voltages or the phase angles between consecutive phases are not equal.
Wind Farm Power Station (WFPS)	A site containing at least one **WTG**.
Wind Turbine Generator (WTG)	A **Generation Unit(s)** generating electricity from wind.

Annex 1

Supplementary Publications

Item 1	European Standard EN 50160
Item 2	Customer Charter – ESB Networks
Item 3	Guide to the Process for connection of Demand Customers to the Distribution System
Item 4	National Code of Practice for Customer Interface
Item 5	Conditions for Connection to the Distribution System for Customers less than 100kVA
Item 6	General Conditions for Connection of Industrial and Commercial Customers and Generators to the Distribution System
Item 7	Conditions Governing Connection to the Distribution System: Connections at MV and 38kV; and Generators at LV, MV and 38kV
Item 8	General Specification for MV Substation Buildings (Specification No. 13320)
Item 9	Domestic Supply-Procedures and Conditions for Supply to New House from Overhead Networks
Item 10	Domestic Supply-Specification of Requirements for Supply to Housing Schemes
Item 11	Distribution System Security & Planning Standards
Item 12	SI no.44 of 1993. Part VIII – Regulations 33 to 35
Item 13	The ESB Networks Electrical Safety Rules
Item 14	National Rules for Electrical Installations – ETCI.
Item 15	National Rules for Electrical Installations – Code of Practice for the selection and installation of low voltage generators.
Item 16	Irish Standard I.S. EN 50110 ‘Operation of Electrical Installations’
Item 17	S.I. No.299 of 2007 Safety Health and Welfare at Work (General Application) Regulation 2007

Annex 2

DISTRIBUTION CODE DEROGATION APPLICATION FORM		
DEROGATION APPLICATION SUBMITTED BY:	**DATE OF SUBMITTING APPLICATION:**	**DEROGATION APPLICATION NUMBER:** (to be assigned by Distribution Code Review Panel (DCRP) Secretary)
Contact Details for Derogation Applicant		
Name:	**Telephone Number:**	
E-mail address:		
DISTRIBUTION CODE CLAUSE FOR WHICH DEROGATION IS SOUGHT:		
PLANT / APPARATUS FOR WHICH DEROGATION IS SOUGHT:		
EXTENT OF NON-COMPLIANCE:		
REASON FOR NON-COMPLIANCE:		
LENGTH OF TIME FOR WHICH DEROGATION IS SOUGHT:		
PROPOSAL FOR REMEDYING NON-COMPLIANCE: **(MILESTONES FOR REMEDYING NON-COMPLIANCE, COSTS, RISK FACTORS THAT MAY DELAY COMPLIANCE ETC.)**		
DETAILS OF SUPPORTING DOCUMENTATION FOR APPLICATION (IF ANY) ATTACHED:		
Please return this form to the Review Panel Secretary by E-mail: DistCodePanel@mail.esb.ie		

DIST NCDF1 CONNECTION NETWORK CODE DEROGATION APPLICATION FORM for use by Distribution Connected Generator or Demand Connection		
DERROGATION APPLICATION SUBMITTED BY:	DATE OF SUBMISSION OF APPLICATION:	DEROGATION APPLICATION NUMBER:*(to be assigned by Distribution Code Review Panel Secretary)*
CONTACT DETAILS FOR DEROGATION APPLICANT		
NAME:		**TELEPHONE NUMBER:**
E-MAIL ADDRESS:		
EU NETWORK CODE AND CLAUSE FOR WHICH DEROGATION IS SOUGHT; **OR** **DISTRIBUTION CODE VERSION AND RFG GENERATION OR DCC UNIT CLAUSE FOR WHICH DEROGATION IS SOUGHT:**		
RFG GENERATION OR DCC UNIT(S) FOR WHICH A DEROGATION IS REQUESTED:		

RFG PGM GENERATION UNITS ONLY	TOTAL INSTALLED CAPACITY (MW)	
	MEC (MW)	
	NUMBER OF PGMS (POWER GENERATING MODULE)	
	SIZE (MW) OF EACH PGM	
	MAKE(S) AND MODEL(S) OF PGMS	
	ENERGISATION DATE	
	DATE OPERATIONAL CERTIFICATION ACHIEVED	
DCC UNITS ONLY	DEMAND CAPACITY (MW/MVA)	
	DESCRIPTION OF DCC UNIT	
	DETAILS OF UPS OR ON SITE GENERATION	

DESCRIPTION OF DEROGATION SOUGHT	
IMPACT ON THE ELECTRICITY SYSTEM OF NON-COMPLIANCE	
REASON FOR NON-COMPLIANCE / TECHNICAL LIMITATION	
LEVEL OF NON-COMPLIANCE AND EFFORTS MADE TO IMPROVE/ACHIEVE/MAXIMISE COMPLIANCE	
COSTS INVOLVED TO ACHIEVE COMPLIANCE	

IMPACT ON THE INTERESTS OF CONSUMERS/OTHER PARTIES	
POTENTIAL FOR DISCRIMINATING TREATMENT OF EXISTING PGMs (FOR RfG DEROGATIONS) OR EXISTING DEMAND UNITS (FOR DCC DEROGATIONS)	
EFFECT OF DEROGATION ON CROSSBORDER TRADE	
COST BENEFIT ANALYSIS PURSUANT TO: ARTICLE 39 OF RFG FOR RFG DEROGATIONS; OR ARTICLE 49 OF DCC FOR DCC DEROGATIONS	
THE REQUIRED DURATION OF DEROGATION	
PROPOSAL FOR REMEDYING NONCOMPLIANCE. PLEASE INCLUDE MILESTONES AND DATES FOR REMEDYING NONCOMPLIANCE, COSTS, AND RISK FACTORS THAT MAY DELAY COMPLIANCE. (THIS SECTION MUST BE FILLED OUT FOR ALL APPLICATIONS)	
DETAILS OF SUPPORTING DOCUMENTATION FOR APPLICATION (IF ANY) ATTACHED	
PLEASE SUBMIT DEROGATION APPLICATIONS TO THE PANEL SECRETARY BY E-MAIL TO: DISTCODEPANEL@MAIL.ESB.IE	

DIST NCDF2 CONNECTION NETWORK CODE DEROGATION APPLICATION FORM for use by ESB Networks as DSO		
DEROGATION APPLICATION SUBMITTED BY:	**DATE OF SUBMISSION OF APPLICATION:**	**DEROGATION APPLICATION NUMBER: (***to be assigned by Distribution Code Review Panel Secretary)*
CONTACT DETAILS FOR APPLICANT		
NAME:		**TELEPHONE NUMBER:**
E-MAIL ADDRESS:		
EU NETWORK CODE AND CLAUSE FOR WHICH DEROGATION IS SOUGHT; **OR** **DISTRIBUTION CODE VERSION AND RFG GENERATION/ OR DCC UNIT CLAUSE FOR WHICH DEROGATION IS SOUGHT:**		
RFG GENERATION OR DCC UNIT(S) FOR WHICH A DEROGATION IS REQUESTED:		
DESCRIPTION OF DEROGATION SOUGHT		
IMPACT ON THE ELECTRICITY SYSTEM OF NON-COMPLIANCE		
REASON FOR NON-COMPLIANCE / TECHNICAL LIMITATION		
LEVEL OF NON-COMPLIANCE AND EFFORTS MADE TO IMPROVE/ACHIEVE/MAXIMISE COMPLIANCE		
COSTS INVOLVED TO ACHIEVE COMPLIANCE		
IMPACT ON THE INTERESTS OF CONSUMERS/OTHER PARTIES		
POTENTIAL FOR DISCRIMINATING TREATMENT OF EXISTING PGMs (FOR RfG DEROGATIONS) OR EXISTING DEMAND UNITS (FOR DCC DEROGATIONS)		
EFFECT OF DEROGATION ON CROSSBORDER TRADE		
COST BENEFIT ANALYSIS PURSUANT TO: ARTICLE 39 OF RFG FOR RFG DEROGATIONS; OR ARTICLE 49 OF DCC FOR DCC DEROGATIONS;		
THE REQUIRED DURATION OF DEROGATION		
PROPOSAL FOR REMEDYING NONCOMPLIANCE. PLEASE INCLUDE MILESTONES AND DATES FOR REMEDYING NONCOMPLIANCE, COSTS, AND RISK FACTORS THAT MAY DELAY COMPLIANCE. (THIS SECTION MUST BE FILLED OUT FOR ALL APPLICATIONS)		
DETAILS OF SUPPORTING DOCUMENTATION FOR APPLICATION (IF ANY) ATTACHED		
PLEASE SUBMIT DEROGATION APPLICATIONS TO THE PANEL SECRETARY BY E-MAIL TO: DISTCODEPANEL@MAIL.ESB.IE		