EirGrid Grid Code

Version 10

Users are directed to the EirGrid Website to view any other modifications that have been approved by the CRU since the issue date.

Users are also directed to the Rate of Change of Frequency Decision Paper published by the CRU on the 4th April 2014.

Issue Date: DATE TBC

Demarcation of Requirements

Requirements in the **Grid Code** which are <u>not marked by a symbol and border</u> are applicable to all **Users** (which expression means all persons (other than the **TSO**) to whom any individual section of the **Grid Code** applies).

Requirements in the **Grid Code** which are <u>marked by a symbol and border</u> are appliciable to the corresponding **Users** as per Table 1: Demarcation of Requirements.

Table 1: Demarcation of Requirements

Symbol	Applicable to
○	**RfG Generation Units**
~~○~~	**Non-RfG Generation Units**
⌂	**DCC Units**
~~⌂~~	**Non-DCC Units**
‖	**HVDC Units**
~~‖~~	**Non-HVDC Units**

GC GENERAL CONDITIONS

GC.1 INTRODUCTION

GC.1.1 While each individual section of the **Grid Code** contains the rules and provisions relating specifically to that section of the **Grid Code**, there are provisions of more general application, which need to be included in the **Grid Code**. Such provisions are included in the **General Conditions**.

GC.1.2 Terms which are capitalised and in bold type shall be interpreted according to the definition in the **Glossary** of the **Grid Code**. Where the **Glossary** refers to any word or term which is more particularly defined in a part of the **Grid Code**, the definition in that part of the **Grid Code** will prevail over the definition in the **Glossary** in the event of any inconsistency.

GC.2 OBJECTIVE

GC.2.1 The objectives of the **General Conditions** are as follows:

(a) to ensure, insofar as it is possible, that the various sections of the **Grid Code** work together, and work in practice, for the benefit of the operation of the **Power System** and for the benefit of the **TSO** and **Users**;

(b) to provide a set of principles governing the status and development of the **Grid Code** and related issues, as approved by the **CRU**;

(c) to provide an outline of how the **TSO**, the **Other TSO** and the **Regulatory Authorities** will cooperate with regard to **Grid Code** revisions and derogations to both **Sections Under Common Governance** and other **Grid Code** sections which may be considered to be relevant to the operation of the **SEM**.

GC.3 SCOPE

The **General Conditions** apply to the **TSO**, the **CRU**, and to all **Users** (which expression in these **General Conditions** means all persons (other than the **TSO**) to whom any individual section of the **Grid Code** applies).

GC.4 PURPOSE

GC.4.1 This **Grid Code** is designed to cover all material technical aspects relating to the operation and use of the **Transmission System**, and (insofar as relevant to the operation and use of the **Transmission System**) all material technical aspects relating to the use of **Plant** and or **Apparatus** connected to the **Transmission System** or to the **Distribution System**.

GC.5 GRID CODE REVIEW PANEL

GC.5.1 The **TSO** shall establish and maintain the **Grid Code Review Panel** which shall be a standing body constituted to:

(a) generally review and discuss the **Grid Code** and its workings;

(b) review and discuss suggestions for amendments to the **Grid Code** which the **TSO**, the **CRU**, or any **User** may wish to submit to the **TSO** for consideration by the **Grid Code Review Panel** from time to time;

(c) discuss what changes are necessary to the **Grid Code** arising out of any unforeseen circumstances referred to it by the **TSO** under GC.12; and

(d) publish recommendations and ensure that **User** consultation upon such recommendations has occurred through **Grid Code Review Panel** members.

GC.5.2 The **Grid Code Review Panel** shall be governed by a constitution, which defines its scope, membership, duties, and rules of conduct and operation as approved by the **CRU**.

GC.6 JOINT GRID CODE REVIEW PANEL

GC.6.1 The **TSO** shall, in conjunction with the **Other TSO**, establish and maintain the **Joint Grid Code Review Panel**. This panel comprises all members of the **Grid Code Review Panel** and Northern Ireland **Grid Code Review Panel** and it has the following functions:

(a) generally review and discuss the **Sections Under Common Governance** and their workings;

(b) review and discuss suggestions for amendments to the **Sections Under Common Governance** of the **Grid Code**, which the **TSO**, either **Regulatory Authority**, or any **User** may wish to submit to the **TSO** for consideration by the **Joint Grid Code Review Panel** from time to time;

(c) discuss what changes are necessary to the **Sections Under Common Governance** of the **Grid Code** arising out of any unforeseen circumstances referred to it by the **TSO** under GC.12 and

GC.6.2 The **TSO** shall publish recommendations and ensure that **User** consultation upon such recommendations has occurred.

GC6.3 The **Joint Grid Code Review Panel** shall be governed by its own constitution, which defines its scope, membership, duties, and rules of conduct and operation as approved by both **Regulatory Authorities**.

GC.7 GRID CODE REVISIONS

GC.7.1 All revisions to the **Grid Code** must be reviewed by the **Grid Code Review Panel** or the **Joint Grid Code Review Panel** (where relevant) prior to application to the **CRU** by the **TSO**. Where the **TSO** identifies or receives a proposed revision that affects a **Section Under Common Governance**, it shall bring it to the attention of the **Other TSO**. All proposed revisions from **Users**, the **CRU**, or the **TSO** will be brought before the **Grid Code Review Panel** or the **Joint Grid Code Review Panel** (where relevant) by the **TSO** for consideration. In the event that the **TSO**, acting reasonably, considers that proposed revisions are frivolous or repeated, the **TSO** may propose to the **Grid Code Review Panel** or the **Joint Grid Code Review Panel** (where relevant) that these proposed revisions are not to be considered. However, in the event that any member of the **Grid Code Review Panel** or the **Joint Grid Code Review Panel** (where relevant) decides that the revision is worthwhile, it shall be reviewed. The **TSO** shall then inform the proposer of the decision, with an accompanying explanation if required. If the proposing **User** is not satisfied with the response from the **TSO**, they can bring it to the attention of the **CRU.**

The **TSO** will advise the **Grid Code Review Panel** or the **Joint Grid Code Review Panel** (where relevant), all **Users**, and the **CRU** of all proposed revisions to the **Grid Code** with notice of no less than 10 days in advance of the next scheduled meeting of the **Grid Code Review Panel** or the **Joint Grid Code Review Panel** (where relevant).

GC.7.2 Following review of a proposed revision by the **Grid Code Review Panel** or the **Joint Grid Code Review Panel** (where relevant), the **TSO** will apply to the **CRU** for revision of the **Grid Code** based on the **TSO** recommendation and shall make representation of all other views or considerations including those of the **Grid Code Review Panel** or the **Joint Grid Code Review Panel** (where relevant). The **TSO**, in applying to the **CRU**, shall also notify each **User** of the proposed revision and other views expressed by the **Grid Code Review Panel** or the **Joint Grid Code Review Panel** (where relevant) and **Users** so that each **User** may consider making representations directly to the **CRU** regarding the proposed revision.

GC.7.3 The **CRU** shall consider the proposed revision, other views, and any further representations and shall determine whether the proposed revision should be made and, if so, whether in the form proposed or in an amended form. Where amendments to the revision are contemplated by the **CRU**, the **CRU** shall consult the **Grid Code Review Panel** or the **Joint Grid Code Review Panel** (where relevant), the **TSO**, and **Users** as appropriate. Determination on a modification to a **Section Under Common Governance** shall be made by the **CRU** in accordance with its procedure that is in place to approve modifications to **Sections Under Common Governance**.

GC.7.4 Having been so directed by the **CRU** that the applied for revision or amended revision shall be made, the **TSO** shall notify each **User** of the revision at least 14 **Business Days** prior to the revision taking effect, and the revision shall take effect (and this **Grid Code** shall be deemed to be amended accordingly) from (and including) the date specified in such notification or other such date as directed by the **CRU**. The date may be modified to ensure that the revision is implemented simultaneously in both jurisdictions on the island of Ireland.

GC.8 GRID CODE INTERPRETATION

GC.8.1 In the event that any **User** requires additional interpretation of the intention and application of any provision of the **Grid Code**, it may apply to the **TSO** for such interpretation. Provided that the request is reasonable, the **TSO** shall provide the **User** with an interpretation of the relevant provision. If the request refers to a

Section Under Common Governance then the **TSO** shall liaise with the **Other TSO** prior to the provision of the interpretation to the **User**.

GC.8.2 In the event that the **User**, acting reasonably, considers that an interpretation provided by the **TSO** pursuant to GC.8.1 is incomplete, the **User** may request additional clarification from the **TSO**.

GC.8.3 In the event that the **User**, acting reasonably, considers that an interpretation provided by the **TSO** pursuant to GC.8.1 is unreasonable or incorrect, the **User** may require the **TSO** to refer the matter for consideration, at the next scheduled meeting of the **Grid Code Review Panel** or the **Joint Grid Code Review Panel** (where relevant) (or in the event that there is insufficient time before the next scheduled meeting, then at the meeting immediately following the next scheduled meeting).

GC.9 DEROGATIONS

GC.9.1 The following process is for all **Users** except **RfG Generation Units**.

GC.9.2 If a **User** finds that it is, or will be, unable to comply with any provision of the **Grid Code**, then it shall without delay report such non-compliance to the **TSO** and shall, subject to the provisions of GC.9.2.1 make such reasonable efforts as are required to remedy such non-compliance as soon as reasonably practicable. Where the **TSO** is aware or should reasonably be aware that a non-compliance may have an impact on the **Other Transmission System** or on the operation of the **SEM**, the **TSO** shall provide details of the non-compliance to the Other **TSO**.

GC.9.2.1 Where the non-compliance is:

(a) with reference to **Plant** and/or **Apparatus** connected to the **Transmission System** and is caused solely or mainly as a result of a revision to the **Grid Code**; or

(b) with reference to **Plant** and/or **Apparatus** which is connected, approved to connect, or for which approval to connect to the **Transmission 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 **TSO** a request for a derogation from such provision in accordance with the requirements of GC.9.2.2 and shall provide the **CRU** with a copy of such a request. In consideration of a derogation request by a **User**, the **TSO** may contact the relevant **User** to obtain clarification of the derogation request, or to obtain further information regarding the request, or to discuss changes to the request. Once the derogation request has been validated by the **TSO**, the reference number is assigned.

Where the derogation request may have an impact on the **Other Transmission System** or the operation of the **SEM**, the **TSO** shall liaise with the Other **TSO** prior to providing an assessment to the **CRU**.

The **TSO** will assess the derogation request and provide to the **CRU** an assessment and a recommendation.

On receipt of a derogation assessment from the **TSO**, the **CRU** will consider the derogation request, the **TSO's** assessment and the **TSO's** recommendation.

In its consideration of a derogation request by a **User**, the **CRU** may contact the relevant **User** and/or the **TSO** to obtain clarification of the request, or to obtain further information regarding the request, or to discuss changes to the request.

Where the **CRU** identifies that a derogation request may impact on the **Other Transmission System** or the operation of the **SEM**, the **CRU** shall keep the **Regulatory Authority** in Northern Ireland informed in its consideration of the request.

Provided that the **CRU** considers that the grounds for the derogation are reasonable, then the **CRU** shall grant such derogation unless the derogation would, or it is likely that it would, have a materially adverse impact on the security and stability of the **Transmission System** or the **Other Transmission System** or impose unreasonable costs on the operation of the **Transmission System** or on other **Users**.

GC.9.2.2 A request for derogation from any provision of the **Grid Code** shall contain:

(a) the version number of the **Grid Code**;

(b) identification of the **Plant** and/or **Apparatus** in respect of which a derogation is sought;

(c) identification of the provision with which the **User** is, or will be, unable to comply;

(d) the extent of the non-compliance;

(e) the reason for the non-compliance; and

(f) the date by which compliance will be achieved (if remedy of the non-compliance is possible) subject to GC.9.2.1.

GC.9.2.3 If the **TSO** finds that it is, or will be, unable to comply with any provision of the **Grid Code**, then it shall, subject to the remaining provisions of GC.9.1 make such reasonable efforts as are required to remedy such non-compliance as soon as reasonably practicable.

GC.9.2.4 In the case where the **TSO** requests a derogation, the **TSO** shall submit the information set out in GC.9.2.2 to the **CRU**.

GC.9.2.5 To the extent of any derogation granted in accordance with this GC.9.1, the **TSO** and/or the **User** (as the case may be) shall be relieved from its obligation to comply with the applicable provision of the **Grid Code** and shall not be liable for failure to so comply but shall comply with any alternate provisions as set forth in the derogation.

GC.9.2.6 The **TSO** shall:

(a) keep a register of all derogations which have been granted, identifying the company and **Plant** in respect of whom the derogation has been granted, the relevant provision of the **Grid Code** and the **Grid Code** version number, the period of the derogation and the extent of compliance to the provision;

(b) on request from any **User** or **User** of the **Other Grid Code**, provide a copy of such register of derogations to such **User**; and

(c) publish this register on the **TSO**'s website.

GC.9.2.7 Where a material change in circumstance has occurred a review of any existing derogations, and any derogations under consideration, may be initiated by the **CRU** at the request of the **CRU**, the **TSO**, or **Users**.

GC.9.3 RfG Generation Unit Derogation Procedure

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GC.9.3.1 <u>Power to Grant Derogations</u>

CRU may, at the request of a **Generator**, or the **TSO**, grant a **Generator** or the **TSO** derogations from one or more **RfG Generation Unit** clauses in the **Grid Code** for **RfG Generation Units** and **Non-RfG Generation Units** in accordance with GC.9.3.2, GC.9.3.3 and GC.9.3.4. Derogations may be granted and revoked in accordance with GC.9.3.2, GC.9.3.3 and GC.9.3.4 by other authorities than the **CRU**.

GC.9.3.2 <u>General Provisions</u>

GC.9.3.2.1 The criteria specified by **CRU** to assess derogations pursuant to GC.9.3.3 and GC.9.3.4 are specified in form CNCD1 and CNCD2 respectively.

GC.9.3.2.2 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 GC.9.3.2.1. Any changes to the criteria shall not apply to derogations for which a request has already been made.

GC.9.3.2.3 The **CRU** may decide that **Generation Units** for which a request for a derogation has been filed pursuant to GC.9.3.3 or GC.9.3.4 do not need to comply with **RfG Generation Unit** clauses in the **Grid Code** from which a derogation has been sought from the day of filing the request until the **CRU**'s decision is issued.

GC.9.3.3 Request for a Derogation by a Generator

GC.9.3.3.1 **Generators** may request a derogation to one or several **RfG Generation Unit** clauses in the **Grid Code** for **Generation Units** within their **Facility**.

GC.9.3.3.2 A request for a derogation shall be filed with the **TSO** using form CNCD1 and include:

(a) an identification of the **Generator**, and a contact person for any communications;

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

(c) a reference to the **RfG Generation Unit** clauses in the **Grid 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.

GC.9.3.3.3 Within two weeks of receipt of a request for a derogation, the **TSO** shall confirm to the **Generator** whether the request is complete. If the **TSO** considers that the request is incomplete, the **Generator** shall submit the additional required information within one month from the receipt of the request for additional information. If the **Generator** does not supply the requested information within that time limit, the request for derogation shall be deemed withdrawn.

GC.9.3.3.4 The **TSO** shall assess the request for derogation and the provided cost-benefit analysis, taking into account the criteria determined by the **CRU** pursuant to GC.9.3.2.

GC.9.3.3.5 Within six months of receipt of a request for derogation, the **TSO** shall forward the request to the **CRU** and submit the assessment(s) prepared in accordance with GC.9.3.3.4. That period may be extended by one month where the **TSO** seeks further information from the **Generator**.

GC.9.3.3.6 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 from any other interested parties. The additional period shall begin when the complete information has been received.

GC.9.3.3.7 The **Generator** shall submit any additional information requested by the **CRU** within two months of such a request. If the **Generator** 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** informs the **CRU** by means of a reasoned submission that the request for a derogation is complete.

GC.9.3.3.8 The **CRU** shall issue a reasoned decision concerning a request for derogation. Where the **CRU** grants a derogation, it shall specify its duration.

GC.9.3.3.9 The **CRU** shall notify its decision to the relevant **Generator** and the **TSO**.

GC.9.3.3.10 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 GC.9.3.6.2.

GC.9.3.4 <u>Request for a Derogation by the TSO</u>

GC.9.3.4.1 The **TSO** may request derogations for classes of **Generation Units** connected or to be connected to their **Network**.

GC.9.3.4.2 The **TSO** shall submit their requests for derogations, using form CNCD2, to the **CRU**. Each request for a derogation shall include:

(a) identification of the **TSO**, and a contact person for any communications;

(b) a description of the **Generation Units** for which a derogation is requested and the total installed capacity and number of **Generation Units**;

(c) the **RfG Generation Unit** clauses in the **Grid 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.

GC.9.3.4.3 The **CRU** shall adopt a decision concerning a request for derogation within six months from the day after it receives the request.

GC.9.3.4.4 The six-month time limit referred to in GC.9.3.4.3 may, before its expiry, be extended by an additional three months where the **CRU** requests further information from the **TSO** requesting the derogation or from any other interested parties. That additional period shall run from the day following the date of receipt of the complete information.

The **TSO** shall provide any additional information requested by the **CRU** within two months from the date of the request. If the **TSO** 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 **TSO** informs the **CRU** by means of a reasoned submission that the request for derogation is complete.

GC.9.3.4.5 The **CRU** shall issue a reasoned decision concerning a request for derogation. Where the **CRU** grants a derogation, it shall specify its duration.

GC.9.3.4.6 The **CRU** shall notify its decision to the **TSO** and ACER.

GC.9.3.4.7 The **CRU** may lay down further requirements concerning the preparation of requests for derogation by the **TSO**. 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** and stakeholders, including manufacturers.

GC.9.3.4.8 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 GC.9.3.6.2.

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GC.9.3.5 Register of Derogations

GC.9.3.5.1 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.

GC.9.3.5.2 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.

GC.9.3.6 Monitoring of Derogations

GC.9.3.6.1 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.

GC.9.3.6.2 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.

GC.9.3.6.3 The European Commission may request ACER to report on the application of GC.9.3.6.1 and GC.9.3.6.2 and to provide reasons for requesting or not requesting derogations to be revoked.

GC.9.4 DCC Unit Derogation Procedure

GC.9.4.1 Power to Grant Derogations

CRU may, at the request of a **Demand Facility Owner, Closed Distribution Systems Operator** and **Distribution System Operator**, or the **TSO**, grant a **Demand Facility, Closed Distribution System, DSO** or the **TSO,** derogations from one or more **DCC Unit** clauses in the **Grid Code** for **DCC Units** and **Non-DCC Generation Units** in accordance with GC.9.4.2, GC.9.4.3 and GC.9.4.4. Derogations may be granted and revoked in accordance with GC.9.4.2, GC.9.4.3 and GC.9.4.4 by other authorities than the **CRU**.

GC.9.4.2 General Provisions

GC.9.4.2.1 The criteria specified by **CRU** to assess derogations pursuant to GC.9.4.3 and GC.9.4.4 are specified in form CNCD1, CNCD2 and CNCD3 respectively.

GC.9.4.2.2 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 GC.9.4.2.1. Any changes to the criteria shall not apply to derogations for which a request has already been made.

GC.9.4.2.3 The **CRU** may decide that **Demand Facilities, Closed Distribution Systems, Distribution Systems** and **Demand Units** for which a request for a derogation has been filed pursuant to GC.9.4.3 or GC.9.4.4 do not need to comply with **DCC Unit** clauses in the **Grid Code** from which a derogation has been sought from the day of filing the request until the **CRU**'s decision is issued.

GC.9.4.3 Request for a Derogation by a Demand Facility Owner, Closed Distribution System Operator or Distribution System Operator

GC.9.4.3.1 **Demand Facility Owners, Closed Distribution Systems Operators** and **Distribution System Operator** may request a derogation to one or several **DCC Unit** clauses in the **Grid Code** for **Demand Facility, Closed Distribution System** or **Distribution System**.

GC.9.4.3.2 A request for a derogation shall be filed with the **TSO** using form CNCD1 or CNCD2 and include:

(a) an identification of the **Demand Facility Owner, Closed Distribution System Operators** or **DSO** and a contact person for any communications;

(b)a description of the **Demand Facility, Closed Distribution System**, **Distribution System** or **Demand Unit** for which a derogation is requested;

(c) a reference to the **DCC Unit** clauses in the **Grid 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.

GC.9.4.3.3 Within two weeks of receipt of a request for a derogation, the **TSO** shall confirm to the **Demand Facility Owner, Closed Distribution System Operator** or **DSO** whether the request is complete. If the **TSO** considers that the request is incomplete, the **Demand Facility Owner**, **Closed Distribution System Operator** or **DSO** shall submit the additional required information within one month from the receipt of the request for additional information. If the **Demand Facility Owner, Closed Distribution System Operator** or **DSO,** does not supply the requested information within that time limit, the request for derogation shall be deemed withdrawn.

GC.9.4.3.4 The **TSO** shall assess the request for derogation and the provided cost-benefit analysis, taking into account the criteria determined by the **CRU** pursuant to GC.9.4.2

GC.9.4.3.5 Within six months of receipt of a request for derogation, the **TSO** shall forward the request to the **CRU** and submit the assessment(s) prepared in accordance with GC.9.4.3.4. That period may be extended by one month where the **TSO** seeks further information from the **Demand Facility Owner**, **Closed Distribution System Operator** or **DSO**.

GC.9.4.3.6 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 **Demand Facility Owner**, **Closed Distribution System Operator** or **DSO,** or from any other interested parties. The additional period shall begin when the complete information has been received.

GC.9.4.3.7 The **Demand Facility Owner, Closed Distribution System Operator** or **DSO** shall submit any additional information requested by the **CRU** within two months of such a request. If the **Demand Facility Owner**, **Closed Distribution System Operator** or **DSO** 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 **Demand Facility Owner**, **Closed Distribution System Operator** or **DSO** informs the **CRU** by means of a reasoned submission that the request for a derogation is complete.

GC.9.4.3.8 The **CRU** shall issue a reasoned decision concerning a request for derogation. Where the **CRU** grants a derogation, it shall specify its duration.

GC.9.4.3.9 The **CRU** shall notify its decision to the relevant **Demand Facility Owner, Closed Distribution System Operator** or **DSO** and the **TSO**.

GC.9.4.3.10 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 GC.9.4.6.2.

GC.9.4.4 Request for a Derogation by the TSO

GC.9.4.4.1 The **TSO** may request derogations for classes of **Demand Facilities**, **Closed Distribution Systems** or **DSO(s)** connected or to be connected to their **Network**.

GC.9.4.4.2 The **TSO** shall submit their requests for derogations, using form CNCD3, to the **CRU**. Each request for a derogation shall include:

(a) identification of the **TSO**, and a contact person for any communications;

(b) a description of the **Demand Facilities, Closed Distribution Systems** or **Distribution Systems** for which a derogation is requested and the total installed capacity and number of **Demand Facilities**, **Closed Distribution Systems** or **Distribution Systems**;

(c) the **DCC Unit** clauses in the **Grid 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.

GC.9.4.4.3 The **CRU** shall adopt a decision concerning a request for derogation within six months from the day after it receives the request.

GC.9.4.4.4 The six-month time limit referred to in GC.9.4.4.3 may, before its expiry, be extended by an additional three months where the **CRU** requests further information from the **TSO** requesting the derogation or from any other interested parties. That additional period shall run from the day following the date of receipt of the complete information.

The **TSO** shall provide any additional information requested by the **CRU** within two months from the date of the request. If the **TSO** 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 **TSO** informs the **CRU** by means of a reasoned submission that the request for derogation is complete.

GC.9.4.4.5 The **CRU** shall issue a reasoned decision concerning a request for derogation. Where the **CRU** grants a derogation, it shall specify its duration.

GC.9.4.4.6 The **CRU** shall notify its decision to the **TSO** and ACER.

GC.9.4.4.7 The **CRU** may lay down further requirements concerning the preparation of requests for derogation by the **TSO**. 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 the **DSO**, the **Closed Distribution System Operator**, **Demand Facilities Owners** and stakeholders, including manufacturers.

GC.9.4.4.8 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 GC.9.4.6.2

GC.9.4.5 Register of Derogations

GC.9.4.5.1 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.

GC.9.4.5.2 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.

GC.9.4.6 Monitoring of Derogations

GC.9.4.6.1 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.

GC.9.4.6.2 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.

GC.9.4.6.3 The European Commission may request ACER to report on the application of GC.9.4.6.1 and GC.9.4.6.2 and to provide reasons for requesting or not requesting derogations to be revoked.

GC.10 PLANT FAILURES

GC.10.1 When partial breakage or partial failure of a **Plant** and/or **Apparatus** occurs which causes a non-compliance but does not necessarily prevent the **Plant** and/or **Apparatus** being operated safely or securely then the **User** shall promptly notify the **TSO** of the non-compliance and the **User**'s proposed programme for remedying the non-compliance.

GC.10.2 Where time permits and if the **TSO** reasonably considers that a non-compliance of a **User** as described in GC.10.1 may have a materially adverse impact on another **User** or **Users**, the **TSO** will consult the affected **User** or **Users** as to the impact of the intended non-compliance on the **User** or **Users**. If the **TSO** considers that non-compliance may have an impact on the **SEM**, it shall inform the **Other TSO** of the non-compliance.

GC.10.3 If the **TSO**, acting reasonably, and taking into account the operation of the **Transmission System** and the consultation with any affected **Users** in GC.10.2, is satisfied as to the **User's** programme for remedying the non-compliance, and the breakage or failure is not causing or is not likely to cause the **Plant** and/or **Apparatus** to materially affect the security and stability of the **Transmission System** or other **Users** and is not likely to impose unreasonable and unforeseen costs on the operation of the **Transmission System** or other **Users**, then the **TSO** may, for so long as the **TSO** is so satisfied, treat the **User** as being in compliance with the relevant provision of the **Grid Code**, and the **User** will be deemed to be so compliant.

GC.10.4 If the **TSO**, at its discretion, taking into account the operation of the **Transmission System** and the consultation with any affected **Users** in GC.10.2, is not satisfied as to the **User's** programme for remedying the non-compliance, the **User** shall apply for a derogation under the terms of GC.9.

GC.10.5 When breakage or failure of a **Plant** and/or **Apparatus** occurs which causes a non-compliance which prevents the **Plant** and/or **Apparatus** being operated safely or securely then the **User** shall promptly notify the **TSO** of the non-compliance and reflect such non-compliance in **Availability Notices** and **Technical Parameters**

Notices and other data submitted under SDC1 until such time as the non-compliance has been remedied.

GC.10.6 Failing agreement between the **User** and the **TSO**, the **User** shall immediately apply for derogation in accordance with **GC.9**.

GC.11 ASSISTANCE IN IMPLEMENTATION

GC.11.1 The **TSO** has a duty to implement, and comply with, the **Grid Code** as approved by the **CRU**.

GC.11.2 In order to fulfil its duty to implement the **Grid Code** the **TSO** may, in certain cases, need access across boundaries, or may need services and/or facilities from **Users**. This could, for example, include **De-Energising** and/or disconnecting **Plant** and/or **Apparatus**. It is hoped that these cases would be exceptional and it is not, therefore, possible to envisage precisely or comprehensively what the **TSO** might reasonably require in order to put it in a position to be able to carry out its duty to implement the **Grid Code** in these circumstances.

GC.11.3 Accordingly, all **Users** are required not only to abide by the letter and spirit of the **Grid Code**, which shall include providing the **TSO** with such rights of access, services and facilities as provided for in appropriate agreements, and complying with such instructions as the **TSO** may reasonably require in implementing the **Grid Code**.

GC.12 UNFORESEEN CIRCUMSTANCES

GC.12.1 If circumstances arise which the provisions of the **Grid Code** have not foreseen, the **TSO** shall to the extent reasonably practicable in the circumstances, consult promptly and in good faith with all affected **Users**, and where the **TSO** deems it appropriate, with the **Other TSO**, in an effort to reach agreement as to what should be done.

GC.12.2 If agreement between the **TSO** and those **Users** as to what should be done cannot be reached in the time available, the **TSO** shall determine what should be done. If the unforeseen circumstance may have an impact on the **SEM**, the **TSO** shall, where possible, consult with the **Other TSO**, with a view to jointly determining what should be done. Whenever the **TSO** makes such a determination it shall have regard wherever practicable in accordance with this GC.12.2 to the views expressed by **Users** and, in any event, the **TSO** will act reasonably and in accordance with **Prudent Utility Practice** in all circumstances. In addition the **TSO** will, following such a determination and upon request, make available to any affected **User** its reasons for the determination.

GC.12.3 Each **User** shall comply with all instructions given to it by the **TSO** following such a determination provided the instructions are consistent with the then current technical parameters of the **User System** as notified under the **Grid Code**. The **TSO** shall promptly refer all such unforeseen circumstances, and any such determination, to the **Grid Code Review Panel** or the **Joint Grid Code Review Panel** as appropriate for consideration in accordance with GC.5.1(c).

GC.13 HIERARCHY

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

GC.14 OWNERSHIP OF PLANT AND/OR APPARATUS

References in the **Grid Code** to **Plant** and/or **Apparatus** of a **User** include **Plant** and/or **Apparatus** used by a **User** under any agreement with a third party.

GC.15 SYSTEM CONTROL

Where a **User System** (or part thereof) is, by agreement, under the **TSO** control, then for the purposes of communication and the co-ordination of operational time scales the **TSO** can (for these purposes only) treat that **User** System (or part thereof) as part of the Transmission System, but as between the **TSO** and other **Users** it will continue to be treated as the **User System**.

GC.16 ILLEGALITY AND PARTIAL INVALIDITY

GC.16.1 If any provision of the **Grid Code** should be found to be illegal or partially invalid for any reason, the legality and validity of all remaining provisions of the **Grid Code** shall not be affected.

GC.16.2 If part of a provision of the **Grid Code** is found to be unlawful or invalid but the rest of such provision would remain valid if part of the wording were deleted, the provision shall apply with such modification as may be necessary to make it valid and effective, but without affecting the meaning or validity of any other provision of the **Grid Code.**

PC PLANNING CODE

PC.1 INTRODUCTION

Development of the **Transmission System** will arise for a number of reasons including, but not limited to:

(a) development on a **User System** already connected to the **Transmission System**;

(b) the introduction of a new **Connection Site** or the **Modification** of an existing **Connection Site** between a **User System** and the **Transmission System**;

(c) changing requirements for electricity transmission facilities due to changes in factors such as **Demand**, **Generation**, technology reliability requirements, and/or environmental requirements; and

(d) a development on the **NI System;**

(e) the cumulative effect of a number of such developments referred to in (a), (c) and (d) by one or more **Users**.

Accordingly, the development of the **Transmission System** may involve work:

(a) at a new or existing **Connection Site** where **User's Plant** and/or **Apparatus** is connected to the **Transmission System**;

(b) on new or existing transmission circuits or other facilities which join that **Connection Site** to the remainder of the **Transmission System**; and

(c) on new or existing transmission circuits or other facilities at or between points remote from that **Connection Site**.

The time required for the planning and subsequent development of the **Transmission System** will depend on the type and extent of the necessary 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 on the existing **Transmission System**.

PC.2 OBJECTIVES

The objectives of the **Planning Code** are to provide for:

(a) **TSO/User** interaction in respect of any proposed development on the **User System** that may impact on the performance of the **Transmission System** or the direct connection with the **Transmission System**;

(b) the supply of information required by the **TSO** from **Users** in order for the **TSO** to undertake the planning and development of the **Transmission System** in accordance with the **Transmission System Security Planning Standards** and relevant standards;

(c) the supply of information required by the **TSO** from **Users** in order for the **TSO** to participate in the co-ordinated planning and development of both the **Transmission System** and the **Other Transmission System**; and

(d) the supply of information required by the **TSO** for the purposes of the **Forecast Statement**.

PC.3 SCOPE

The **Planning Code** applies to the **TSO** and to the following **Users:**

(a) **Generators** and **Generator Aggregators** with **Registered Capacity** greater than 10 MW;

(b) all **Generators** connected to the **Transmission System**;

(c) **Interconnector Operators**;

(d) **Transmission Asset Owner**;

(e) **Demand Customers**; and

(f) **Demand Side Unit Operators**.

The above categories of **User** will become bound by the **Planning Code** prior to generating, distributing or consuming electricity, as the case may be, and references to the various categories (or to the general category) of **User** should, therefore, be taken as referring to a prospective **User** in that role as well as to **Users** actually connected.

PC.4 PLANNING PROCEDURES FOR CONNECTION

PC.4.1 **Information**

Users and prospective **Users** of the **Transmission System** are able to assess opportunities for connecting to, and using, the **Transmission System**, through:

(a) the statement, prepared by the **TSO**, enabling prospective **Users** to assess for each of the seven succeeding years, the opportunities available for connecting to and using the **Transmission System** and to assess those parts of the **Transmission System** most suited to new connections and transport of further quantities of electricity;

(b) a **Connection Offer** by the **TSO** to enter into or amend a **Connection Agreement**; and

(c) published **Use of System Tariffs**.

PC.4.2 **Application for Connection**

PC.4.2.1 **Users** proposing a new **Connection Site** or **Modification** of an existing **Connection Site** shall send an application form to the **TSO**.

PC.4.2.2 The application form to be submitted by a **User** when making an application for a **Connection Offer** shall include:

(a) a description of the **Plant** and/or **Apparatus** to be connected to the **Transmission System** or, as the case may be, of the **Modification** relating to the **User's Plant** and/or **Apparatus** already connected to the **Transmission System,** each of which shall be termed a **"User Development**" in the **Planning Code**;

(b) the relevant data as listed in the **Planning Code** Appendix; and

(c) the desired **Connection Date** and **Operational Date** of the proposed **User Development**.

PC.4.2.3 The application form for a **Connection Offer** shall be sent to the **TSO** as more particularly provided in the connection offer process documentation.

PC.4.2.4 Data supplied in the application form or data submitted along with the application form which is directly relevant to the application and has been submitted in support of it will be treated as **Preliminary Project Planning Data** until such time as the **Connection Offer** has been made and accepted.

PC.4.3 Connection Offer

PC.4.3.1 A **Connection Offer** shall include, but shall not be limited to, the following:

(a) details of how the connection is to be made, including details of the **Plant** and **Apparatus** that will be required to implement the connection;

(b) a description of any **Modification** that the applicant **User** is required to pay for;

(c) an indication of the **Connection Date** and the **Operational Date**; and

(d) an estimate of the charges for connection.

PC.4.3.2 Any **Connection Offer** will provide that it must be accepted by the applicant **User** within the period stated in the **Connection Offer**. Acceptance of the **Connection Offer** shall be effected by execution of the **Connection Agreement** by both parties which renders the connection works relating to that **User Development** committed and binds both parties in accordance with its terms. The **User** shall supply the data pertaining to the **User Development** as listed in the Appendix to this Planning Code in accordance with the terms of the **Connection Agreement**.

PC.4.3.3 Once a **Connection Offer** has been accepted then all data supplied in the application form and any data submitted along with the application form will be treated as Committed Project Planning Data.

PC.4.4 Complex Connections

PC.4.4.1 The magnitude and complexity of any **Transmission System** development will vary according to the nature, location and timing of the proposed **User Development** which is the subject of the application and it may, in certain circumstances, be necessary for the **TSO** to carry out additional or more extensive system studies to evaluate more fully the impact of the proposed **User Development** on the **Transmission System**. A proposed **User Development** may also require system studies to be carried out to evaluate the impact of the proposed **User Development** on the **NI System**. Where the **TSO** judges that such additional or more extensive studies are necessary the **TSO** shall advise the **User** the areas that require more detailed analysis and before such additional studies are carried out, the **User** shall indicate whether it wishes the **TSO** to undertake the work necessary to proceed to make a **Connection Offer** within the period allowed or such extended time as the **TSO**, acting reasonably considers is necessary.

PC.4.4.2 To enable the above detailed system studies to be carried out, the **TSO** may require the **User** to supply some or all of the data items listed in the Appendix to this Planning Code as **Committed Project Planning Data** in advance of the normal time-scale, provided that the **TSO** considers that it is relevant and necessary. In the event that such data items are supplied they will be treated as **Preliminary Project Planning Data** submitted in support of the application as outlined in PC.4.2.4.

PC.4.5 Notice Required

Any **User** proposing to de-rate, close, retire, withdraw from service or otherwise cease to maintain and keep available for **Dispatch** in accordance with **Good Industry Practice** any **Generation Unit** or **Generation Units** or **Controllable PPMs** with **Registered Capacity** greater than 50 MW in aggregate shall give the **TSO** at least 36 calendar months notice of such action and any **Generation Unit** or **Generation Units** or **Controllable PPMs** with **Registered Capacity** less than or equal to 50 MW in aggregate shall give the **TSO** at least 24 calendar months notice of such actio

PC.5 SYSTEM PLANNING

PC.5.1 In order for the **TSO** to undertake the planning and development of the **Transmission System,** in accordance with the relevant standards as provided for in PC.7, and, where appropriate, to participate in the co-ordinated planning and development of both the **Transmission System** and the **Other Transmission System**, the **TSO** will require **Users** to provide data and information on a regular basis. Information received for this purpose will be treated as **System Planning Data**.

PC.5.2 The **TSO** may also require additional data or information from a **User**. Where the **TSO** considers that this information is required then the **User** where reasonable shall submit the information to the **TSO** without delay. Such information may be required so that the **TSO** can:

(a) plan and develop the **Transmission System** in accordance with the relevant standards;

(b) undertake co-ordinated planning and development of both the **Transmission System** and the **Other Transmission System**;

(c) monitor **Power System** adequacy and **Power System** performance and project future **Power System** adequacy and **Power System** performance; and

(d) fulfil its statutory and regulatory obligations.

PC.5.3 In the planning and development of the **Transmission System** and, where appropriate, in the co-ordinated planning and development of both the **Transmission System** and the **Other Transmission System**, the **TSO** may require an individual **User**, or group of **Users**, to modify or install new **Plant** or **Apparatus**, where the **TSO** can reasonably show that it is prudent or necessary to do so. A **User** may object on grounds that to modify or install new **Plant** or **Apparatus** as required, in accordance with **Good Industry Practice,** would be technically infeasible. This may include, but shall not be limited to, for example, the installation of **Power System Stabilisers**.

PC.6 DATA

PC.6.1 As far as the **Planning Code** is concerned, there are three relevant types of data; **Preliminary Project Planning Data, Committed Project Planning Data** and **System Planning Data**.

PC.6.1.1 These three types of data, which relate to differing levels of confidentiality, commitment and validation, are described below.

PC.6.1.2 **Preliminary Project Planning Data** and **Committed Project Planning Data** relate to the data required from a **User** at various stages during the process for introduction of a new **Connection Site** or **Modification** of an existing **Connection Site** as outlined in PC.4, and more specifically in the application form for a Connection or Modification**.** **System Planning Data** relates to the data that must be submitted at regular periods by all **Users,** or other such data or information as requested by the **TSO** under PC.6.

PC.6.2 An existing **User** proposing a new **Connection Site** will need to supply data both in an application for a **Connection Offer** and under the **Planning Code** in relation to that proposed new **Connection Site** and such information will be treated as **Preliminary Project Planning Data** or **Committed Project Planning Data** (as the case may be), but the data an existing User supplies under the **Planning Code** relating to its existing **Connection Sites** will be treated as **System Planning Data**

PC.6.3 **Preliminary Project Planning Data**

PC.6.3.1 At the time the **User** applies for a **Connection Offer** but before such an offer is made by the **TSO**, the data relating to the proposed **User Development** will be considered as **Preliminary Project Planning Data**. This data will be treated as confidential within the scope of the provisions relating to confidentiality in the **TSO** policy on confidentiality. The **TSO** may disclose **Preliminary Project Planning Data** to the **Other TSO**.

The following information shall be published on the **TSO** website:

(i) **User's** name (legal and project name);

(ii) **User's** contact details;

(iii) **User's** date of completed application;

(iv) Status of application, for example in progress or issued;

(v) Specific location, including grid co-ordinates;

(vi) The **Registered Capacity** applied for; and

(vii) Interacting group where applicable.

PC.6.3.2 **Preliminary Project Planning Data** contains such data as may be reasonably required by the **TSO or Other TSO** to evaluate the connection application/ as outlined in PC.4.2 and, if applicable, any other data directly relevant to, and submitted in support of, the application.

PC.6.4 **Committed Project Planning Data**

PC.6.4.1 Once the **Connection Offer** has been formally accepted by the prospective **User**, the data relating to the **User Development,** already submitted as **Preliminary Project Planning Data**, and any subsequent data required by the **TSO** under this **Planning Code**, will become **Committed Project Planning Data**. This data, together with other data held by the **TSO** and the **Other TSO** relating to the **Transmission System** and the **Other Transmission System,** will form the basis from which new applications by any **User** will be considered and from which planning of the **Transmission System** or **Other Transmission System** and power system analysis will be undertaken. Accordingly, **Committed Project Planning Data** will not be treated as confidential to the extent that the **TSO** is obliged:

(a) to use it in the preparation of the **Forecast Statement** and in any further information given pursuant to the **Forecast Statement**;

(b) to use it when considering and/or advising on applications (or possible applications) of other **Users** (including making use of it by giving data from it, both orally and in writing, to other **Users** making an application (or considering or discussing a possible application) which is, in the **TSO's** view, relevant to that other application or possible application);

(c) to use it for the **TSO** planning purposes and to use it when participating in co-ordinated planning and development of both the **Transmission System** and the **NI System**;

(d) the **TSO** may disclose it to the **Other TSO** for the purposes of consideration of developments on the **Other Transmission System**; and

(e) the **TSO** may disclose it to the **External TSO** for the purposes of consideration of **Interconnector** developments with **the External System**.

PC.6.5 To reflect different types of data, **Preliminary Project Planning Data** and **Committed Project Planning Data** are themselves divided into those items of Data which:

(a) will always be forecast, known as **Forecast Data**;

(b) upon connection become fixed (subject to any subsequent changes), known as **Registered Data**; and

(c) relate to **Plant** and/or **Apparatus** which upon connection will become **Registered Data**, but which prior to connection will be an estimate of what is expected, known as **Estimated Registered Data.**

PC.6.6 **System Planning Data**

PC.6.6.1 The **Planning Code** requires that, as soon as is practical, and not later than a date which is the earlier of 18 months prior to the scheduled **Operational Date** or six months after the signing of the **Connection Agreement**, unless otherwise directed by the **CRU**, all data requirements as stated in the Appendix to the Planning Code, not previously requested by the **TSO** and supplied by the **User**, will be submitted by the **User** to the **TSO.** This will include confirming any estimated values assumed for planning purposes or, where practical, replacing them by validated actual values and by updated estimates for the future and by updating forecasts for **Forecast Data** items such as **Demand**. As more accurate data becomes available, due to completion of detailed design, test measurements/results or any other sources, this information will be submitted by the **User** to the **TSO** as soon as practicable and not later than the **Operational Date**.

PC.6.6.2 The **Planning Code** requires that **Users** submit to the **TSO**, each year, the **System Planning Data** as listed in section PC.A3.3 of the Appendix to the Planning Code. This data should be submitted by calendar week 9 of each year and should cover each of the ten succeeding years (and in certain instances the current year). Where from the date of one submission to the/a subsequent date submission there is no change in the data to be submitted for any given year, instead of resubmitting the data, a **User** may submit a written statement that there has been no change from the data submitted the previous time, pertaining to the particular year specified.

PC.6.7 **System Planning Data**, together with other data held by the **TSO** and the **Other TSO** relating to the **Transmission System** and the **Other Transmission System**, will form the basis from which new applications by any **User** will be considered and from which planning of the **Transmission System** will be undertaken. Accordingly**, System Planning Data** will not be treated as confidential to the extent that the **TSO** is obliged:

(a) to use it in the preparation of the **Forecast Statement** and in any further information given pursuant to the **Forecast Statement**;

(b) to use it when considering and/or advising on applications (or possible applications) of other **Users** (including making use of it by giving data from it, both orally and in writing, to other **Users** making an application (or considering or discussing a possible application) which is, in the **TSO's** view, relevant to that other application or possible application);

(c) to use it when participating in co-ordinated planning and development of both the **Transmission System** and the **NI System**;

(d) to use it for the **TSO** planning purposes;

(e) to disclose it to the **Other TSO** so that it can meet its statutory and legal requirements for the **NI System** and;

(f) to disclose it to the **External TSO** as the case may be, so that it can meet its statutory and legal requirements for the **External System**.

To reflect the different types of data referred to above **System Planning Data** is itself divided into those terms of data:

1) which will always be forecast, known as **Forecast Data**;

2) which upon connection become fixed (subject to any subsequent changes), known as **Registered Data**; and

3) which relate to **Plant** and/or **Apparatus** which for the purposes of the **Plant** and/or **Apparatus** concerned as at the date of submission are **Registered**

Data but which for the ten succeeding years will be an estimate of what is expected, known as **Estimated Registered Data**.

PC.7 PLANNING STANDARDS

PC.7.1 The **TSO** shall apply the **Transmission System Security Planning Standards** and relevant standards in the planning and development of the **Transmission System** and where appropriate when participating in the co-ordinated planning and development of both the **Transmission System** and the **Other Transmission System**.

PC.7.2 In assessing the technical requirements of a **User's** connection, the **TSO** shall not unfairly discriminate between **Users** of a similar category, location or size although it will not be technically or economically practicable to achieve uniformity of method of connection at all times.

PC.7.3 The **Transmission System Voltage** level at which a **User's System** will be connected and the busbar configuration which a **User's System** uses will depend upon but shall not be limited to the following:

(a) the size of the **Generation Units** and the number of **Generation Units** comprising the **User's System;**

(b) the size and rating of the **Interconnector**;

(c) proximity to the existing **Transmission System**; and

(d) the cost of the proposed connection.

PC.7.4 The **Transmission System Voltage** level at which a **Demand Customer** will be connected to the **Transmission System** will depend upon but shall not be limited to the following:

(a) the size of the **MW Demand** at the **Connection Point;**

(b) consistency with future development of the **Transmission System** or the **Other Transmission System;**

(c) proximity to the existing **Transmission System**.; and

(d) the cost of the proposed connection.

PC.7.5 The **Transmission System Voltage** level at which the **Distribution System Operator** will be connected to the **Transmission System** will depend upon but shall not be limited to the following:

(a) the size of the **MW Demand** at the **Connection Point;**

(b) consistency with future development of the **Transmission System** or the **Other Transmission System;**

(c) consistency with co-ordinated planning of the **Transmission System** and of the **Distribution System**;

(d) proximity to the existing **Transmission System**; and

(e) the cost of the proposed connection.

PC.7.6 The method of connection used may exceed the relevant standards where this is required by the **User** and is acceptable to the **TSO**.

PC.8 VALIDATION AND VERIFICATION OF DATA

PC.8.1 Where a **User** submits data, which in the opinion of the **TSO** (or in its opinion following referral with the **Other TSO**) is incorrect then the **TSO** may request that that **User** supply such additional information as the **TSO** deems necessary to verify the accuracy of the data.

PC.8.2 Where, following consideration of such information submitted under PC.8.1, the **TSO** maintains (or maintains following referral with the **Other TSO**), acting reasonably, that the additional information is insufficient to verify the accuracy of the original data then the **TSO** may request that the **User** carry out specific **Tests** to verify the data. Where such a **Test** or **Tests** are requested, they will be subject to the provisions of the relevant operational codes.

PC.8.3 In the event that the data as submitted by the **User** is verified by the **Test** or **Tests** to be correct then all costs reasonably incurred as a result of such **Test** or **Tests** as agreed will be borne in full by the **TSO**.

PC.8.4 In the event that any of the data items submitted are shown to be incorrect or inaccurate then the **User** will bear the cost of the **Test** in full and the data values as ascertained by the **Tests** will be the values used in the data. If, as a result of the changes to the data arising from the **Test** or **Tests**, the **TSO** have to redo or perform additional system studies then the **User** will also bear the cost reasonably incurred as a result of this additional work.

PC.A PLANNING CODE APPENDIX

INTRODUCTION

This appendix specifies data to be submitted to the **TSO** by **Users** or prospective **Users** of the **Transmission System**. The requirement to provide data is governed by the Planning Code (PC.4.2, PC.4.3, PC.4.4, 0 and 0).

The specific data requirements depend on whether the **User** is a **Customer** or a **Generator** or **Interconnector** or a **Demand Side Unit Operator** or more than one combined. PC.A1 and PC.A2 apply to all **Users**. PC.A3 applies to demand **Users**. PC.A4 applies to **Generators**. PC.A5 applies to **Controllable PPM.** PC.A6 applies to **Interconnectors**. PC.A7 applies to **Demand Side Unit Operators**. PC.A8 refers to the dynamic **Model** requirements for **Users**. For the avoidance of doubt, PC.A8 may apply to the **DSO,**, where the need for such **Models** is identified.

Any material changes to the data specified in PC.A3, PC.A4, PC.A5, PC.A6 or PC.A7 must be notified to the **TSO** as soon as practicable.

PC.A1 GENERAL INFORMATION

PC.A1.1 Full name of the **User**(s)____________________________________

PC.A1.2 Address of the **User**(s)______________________________________

PC.A1.3 Contact Person____

PC.A1.4 Telephone Number____

PC.A1.5 Telefax Number____

PC.A1.6 Email Address____

PC.A2 NEW CONNECTIONS

PC.A2.1 General Details.

PC.A2.1.1 Projected or target **Operational Date**.

PC.A2.1.2 Target **Connection Date.**

PC.A2.1.3 Reliability of connection requested (number of connecting circuits e.g. one, two?): (subject to technical and system security and reliability standards).

PC.A2.2 **Map and Diagrams**

PC.A2.2.1 Provide a 1:50,000 "Discovery Series" Ordnance Survey map, with the location of the facility clearly marked with an "X". In addition, please specify the Ordnance Survey Grid Co-ordinates of the electrical connection point which is assumed to be at the HV bushings of the Grid Connected Transformer. See Figure 1 for an example of how to correctly specify the grid co-ordinates.

PC.A2.2.2 Provide a plan of the site (1:200 or 1:500) of the proposed facility, indicating the proposed location for a transmission station compound, location of the connection point, generators, transformers, converter stations, site buildings etc. The plan is to be submitted in hard copy format. A digitised format may be required and should also be provided if available.

PC.A2.2.3 Provide an electrical single line-diagram of the proposed facility detailing all significant items of plant. The plan is to be submitted in hard copy format. A digitised format may be required and should also be provided if available.

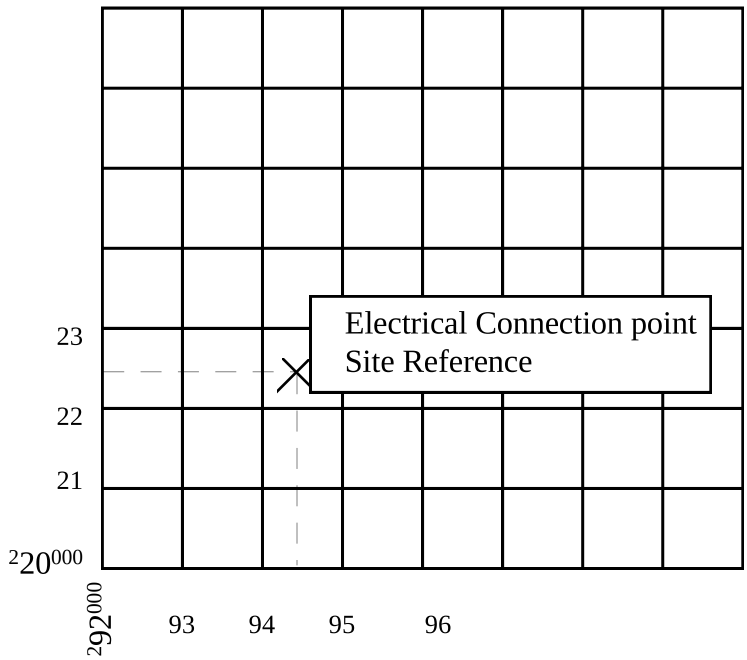
PC.A2.3 Licensing and Authorisation (For Generation, Interconnector and other applications requested by the TSO)

PC.A2.3.1 Licence

Details of any **Generation** or **Interconnector** or **Supply Licence** held by the applicant, or of any application for a **Generation** or **Interconnector** or **Supply Licence**.

PC.A2.3.2 **Authorisation**

Details of any authorisation or application for authorisation to construct or reconstruct the **Generation** station, **Interconnector** or other applications requested by the **TSO** for which the connection is being sought.



Site co-ordinates: Easting 294500, Northing 222500

Figure 1: Example of a Discovery Series Map grid

Easting and Northing co-ordinates should be stated to six digits.

The co-ordinates should be labelled clearly so as to identify which is Easting and which is Northing.

The numbers on the horizontal axis are Easting co-ordinates.

The numbers on the vertical axis are Northing co-ordinates.

Example:

The **Easting** site co-ordinates are QYYZZZ, where:

Q refers to the first number (in superscript) of the bottom left hand corner of the map (i.e. $^{2}92^{000}$ Q=2), YY are the numbers on the horizontal axis directly below the site to the left (i.e. 94)

ZZZ is the actual position in the grid expressed from 0 to 999 (e.g. if half way horizontally within the grid square, the Easting number is approximately 500.

The **Northing** co-ordinates are similarly identified, except the vertical axis rather than the horizontal axis is used.

PC.A2.3.3 **Exemptions and Policy Documents**

Any existing EU exemption applications, pending EU exemption applications, and/or any National or European policy decisions relevant for the application.

PC.A3 DEMAND DATA REQUIREMENTS

PC.A3.1 Treatment of Demand Data

At the time the **User** applies for a connection offer but before an offer is made by the **TSO** and accepted by the applicant **User** the above data will be considered as **Preliminary Project Planning Data** as described in PC.6.3.

Once the **Connection Offer** has been formally accepted by the prospective **User** all data shall be provided by the **User** and treated as **Committed Project Planning Data** as discussed in PC.6.4.

Following the **Operational Date** or **Modification Date** as appropriate, all data requirements as listed in this appendix shall be submitted by the **User** to the **TSO** and shall be treated as **System Planning Data** as discussed in PC.6.6. This will include confirming any estimated values assumed for planning purposes and replacing them by validated actual values and by updated estimates for future **Forecast Data**.

PC.A3.2 **Registered Connection Capacity**

The registered connection capacity is required in MW and Mvar, corresponding to the maximum MVA. It should be stated whether the **User** is producing or absorbing Mvar.

PC.A3.3 **Measured and Forecast Data**

This section details the measurements of demand and 10-year demand forecasts that are required from each **User** of the **Transmission System** who is a **Demand Customer** in respect of each infeed from the **Transmission System** to the Customer's network(s)**.** This section applies equally to the **Distribution System Operator (DSO).**

The **TSO** shall notify each **User** who is a **Demand Customer** in advance of each load reading day. These load reading days are winter peak, summer and summer minimum as specified in sections PC.A3.3.2, PC.A3.3.3 and PC.A3.3.4 respectively.

The measurements of demand and 10-year demand forecasts should be submitted <u>by the end of calendar week 9</u> of each year.

PC.A3.3.1 **Measurement Point**

Demand measurements and forecasts for each infeed from the **Transmission System** shall relate to the appropriate **Measurement Point**.

PC.A3.3.2 **Winter 12.30 and 18.00 - Load Readings and Forecast**

A coincident set of measurements of MW and Mvar values both at 12.30 and 18.00 hours on the second Thursday in December is required. If the second Thursday in December is the 8^{th}, then the measurements should be taken on the following Tuesday, December 13^{th}. The readings should be taken with both the transmission and distribution networks intact, and with normal sectionalising of the **Distribution System**, i.e. under normal feeding conditions. The load reading shall take account of embedded generation as detailed in section PC.A3.3.6.

A forecast of the expected MW and Mvar winter peak demand at the **Measurement Point** at 12.30 and 18.00 hours for the next ten (10) years is required. For example, the forecasts to be received by calendar week 9 of 2003 should cover years 2003 through 2012. The load forecast shall take account of sections PC.A3.3.6 through PC.A3.3.9 dealing with embedded generation, description of forecast methodology, transformer reinforcements and permanent load transfer.

The **DSO,** in preparing the forecast for winter peak load, shall bear in mind that the coincident load readings taken on the second Thursday in December may be lower than at system peak.

PC.A3.3.3 **Summer 12.30 - Load Readings and Forecast**

A coincident set of measurements of MW and Mvar values at 12.30 hours on the fourth Thursday in June is required. The load reading shall take account of embedded generation as detailed in section PC.A3.3.6.

A corresponding 10-year forecast of the MW and Mvar demand at the **Measurement Point** in June at 12.30 hours for the next ten (10) years is also required. For example, the forecasts to be received by calendar week 9 of 2003 should cover years 2003 through 2012. The load forecast shall take account of sections PC.A3.3.6 through PC.A3.3.9 dealing with embedded generation, description of forecast method, transformer reinforcements and permanent load transfer.

PC.A3.3.4 **Summer Night Valley - Load Reading and Forecast**

A coincident set of measurements of MW and Mvar values at 06.00 hours on the Sunday preceding the early August Monday Public Holiday is required. The load readings shall take account of embedded generation as detailed in section PC.A3.3.6.

A corresponding 10-year forecast of the MW and Mvar minimum demand at the **Measurement Point** in August at 06.00 hours for the next ten (10) years is also required. For example, the forecasts to be received by calendar week 9 of 2003 should cover years 2003 through 2012. The load forecast shall take account of sections PC.A3.3.6 through PC.A3.3.9 dealing with embedded generation, description of forecast method, transformer reinforcements and permanent load transfer.

PC.A3.3.5 **Non Coincident Peak Demand - Load Reading and Forecast**

Each **User** of the **Transmission System** who is a **Demand Customer**, including the **DSO**, is required to specify by calendar week 9 of each year, the MW and Mvar values corresponding to the maximum MVA demand which occurred at the **Measurement Point** during the previous year. The date and time of the occurrence of this maximum demand should be stated by the **User**.

PC.A3.3.6 **Embedded Generation**

All load readings shall specify, separately, the MW and Mvar contribution from significant embedded generation. The **User** should indicate whether the generator is producing or absorbing Mvar from the system. The type or types of significant embedded generation should be specified – hydro, wind, CHP, biomass, diesel or other.

All load forecasts shall specify, separately, the installed capacity of existing and projected significant embedded generation. Both MW and Mvar capability should be given, indicating the Mvar limits both for production and absorption. The type or types of embedded generation should be specified – hydro, wind, CHP, biomass, diesel or other.

PC.A3.3.7 **Load Forecast - Methodology**

The **User** shall provide, with the forecast data, a brief description of the basis for the forecast.

PC.A3.3.8 **Load Forecast - Transformer Reinforcements**

The **User** shall provide, with the forecast data, details of planned changes in transformer capacity between the **Measurement Point** and the **Connection Point**.

PC.A3.3.9 **Load Forecast - Permanent Load Transfer**

There are two separate characteristics of **Distribution System** load forecasts; expected load growth and expected permanent load transfer between infeeds from the **Transmission System**. In order to identify separately the load growth, the **DSO** demand forecasts shall be prepared for the load at each **Measurement Point** without taking account of any proposed load transfers.

Then, in order to identify separately the proposed load transfer, the **DSO** shall provide, with the forecast data, details of each planned load transfer as follows:

(a) Date of transfer

(b) Reason for transfer e.g. proposed 110kV station, transformer capacity, etc.

(c) MW and Mvar at each of the measurement points expected to be transferred

(d) Existing source of supply for the load to be transferred.

Only proposed permanent load transfers for which there is a firm commitment should be included. For example, proposed 110kV stations should be included only where there is a connection agreement between the **TSO** and the **DSO.**

For a proposed new 110kV station which will supply new load and for which there is a connection agreement between the **TSO** and the **DSO**, a load forecast is required.

PC.A3.3.10 **Special Load Reading**

The **DSO** shall continue to provide the **TSO** with the **DSO** special load readings.

PC.A3.3.11 **Data Templates**

For uniformity of data capture, and to facilitate **Users** of the **Transmission System** who are **Demand Customers**, the **TSO** will provide to each such **User** prepared templates with data validation to facilitate entry of the required data.

Users shall provide data to the **TSO** using these data templates or in such other form as may be agreed by the **TSO**.

PC.A3.4 **User Network Data**

Single-line diagram of user network to a level of detail to be agreed with the **TSO**.
Electrical characteristics of all 110 kV circuits and equipment (R, X, B, R_0, X_0, $B_{0,}$) continuous and overload ratings.
Contribution from **User** network to a three-phase short circuit at connection point.
Connection details of all 110 kV-connected transformers, shunt capacitors, shunt reactors etc. (star, delta, zigzag, etc.)

Electrical characteristics of all 110kV circuits and equipment at a voltage lower than 110 kV that may form a closed tie between two connection points on the **Transmission System**.

PC.A3.5 **Standby Supply Data**

For each **User** who is a **Demand Customer**, that can take supply from more than one supply point, the following information is required:

Source of the standby supply (alternative supply point(s))
Standby capacity required (MW and Mvar)

PC.A3.6 **Fluctuating Loads**

For each demand that can fluctuate by more than 5 MVA at the point of connection to the **Transmission System**, the following information is required:

PC.A3.6.1 Rate of change of **Active Power** and **Reactive Power**, both increasing and decreasing (kW/s. kvar/s).

PC.A3.6.2 The shortest repetitive time interval between fluctuations in **Active Power** and **Reactive Power Demand** (Seconds).

PC.A3.6.3 The magnitude of the largest step changes in **Active Power** and **Reactive Power Demand** (kW, Kvar).

PC.A3.7 **Disturbing Loads**

Description of any **Disturbing Load** to be connected to the **Transmission System**.

PC.A3.8 **Grid Connected Transformer**

	Symbol	Units
Number of windings		
Vector Group		
Rated current of each winding		A
Transformer Rating		MVA_{Trans}
Transformer nominal LV voltage		kV
Transformer nominal HV voltage		kV
Tapped winding		
Transformer Ratio at all transformer taps		
Transformer Impedance (resistance R and reactance X) at all taps	R+jX	% on rating MVA_{Trans}

For 3 winding transformers, where there are external connections to all 3 windings, the impedance (resistance R and reactance X) between each pair of windings is required, measured with the third set of terminals open-circuit.	$Z_{HV:LV1}$ $Z_{HV:LV2}$ $Z_{LV1:LV2}$	% on rating MVA_{Trans} % on rating MVA_{Trans} % on rating MVA_{Trans}

Transformer zero sequence impedances at nominal tap

Zero Phase Sequence impedance measured between the HV terminals (shorted) and the neutral terminal, with the LV terminals open-circuit.	$Z_{HT\,0}$	Ohm
Zero Phase Sequence impedance measured between the HV terminals (shorted) and the neutral terminal, with the LV terminals short-circuited to the neutral.	$Z_{HL\,0}$	Ohm
Zero Phase Sequence impedance measured between the LV terminals (shorted) and the neutral terminal, with the HV terminals open-circuit.	$Z_{LT\,0}$	Ohm
Zero Phase Sequence impedance measured between the LV terminals (shorted) and the neutral terminal, with the HV terminals short-circuited to the neutral.	$Z_{LH\,0}$	Ohm
Zero Phase Sequence leakage impedance measured between the HV terminals (shorted) and the LV terminals (shorted), with the Delta winding closed.	$Z_{L\,0}$	Ohm

Earthing Arrangement including LV neutral earthing resistance & reactance	
Core construction (number of limbs, shell or core type)	
Open circuit characteristic	Graph

PC.A3.9 Shunt Capacitor / Reactor Data

For each shunt capacitor or reactor with a rating in excess of 1 Mvar connected to or capable of being connected to a user network, the following information shall be provided.

PC.A3.9.1 Rating (Mvar).

PC.A3.9.2 Resistance / Reactance / Susceptance of all components of the capacitor or reactor bank.

PC.A3.9.3 Fixed or switched.

PC.A3.9.4 If switched, control details (manual, time, load, voltage, etc.).

PC.A3.9.5 If automatic control, details of settings.

PC.A4 GENERATOR DATA REQUIREMENTS

PC.A4.1 General Details

Each **Generator** shall submit to the **TSO** detailed information as required to plan, design, construct and operate the **Transmission System**.

Station Name ___

Number of **Generating Units** ___

Primary Fuel Type / Prime Mover (e.g. gas, hydro etc.) ___

Secondary Fuel Type (e.g. oil) ___

Generation Export Connection Capacity Required (MW) ___

PC.A4.2 **Treatment of Generator Data**

* data item which must be provided by the applicant and which shall be treated as **Preliminary Project Data** as discussed in PC.6.3**.**

§ data item which, if not provided by the applicant as **Preliminary Project Data,** will be estimated by the **TSO** at the applicant's sole risk. The **TSO** puts the applicant on notice that this data estimate shall be treated as **Preliminary Project Data** as discussed in PC.6.3.

Once the **Connection Offer** has been formally accepted by the prospective **User** all data shall be provided by the **User** and treated as **Committed Project Planning Data** as discussed in PC.6.4.

Following the **Operational Date** or **Modification Date** as appropriate, all data requirements as listed in this appendix shall be submitted by the **User** to the **TSO** and shall be treated as **System Planning Data** as discussed in PC.6.6. This will include confirming any estimated values assumed for planning purposes and replacing them by validated actual values and by updated estimates for future **Forecast Data**.

PC.A4.3 **Generator Operating Characteristics and Registered Data**

Minimum requirements for generator operating conditions are specified in the **Connection Conditions**.

* For thermal plant, provide a functional block diagram of the main plant components, showing boilers, alternators, any heat or steam supplies to other processes etc. indicate whether single shaft or separate shaft.

For each individual unit, on **Primary Fuel** and on **Secondary Fuel where applicable**, fill in the following:

Unit Number ____

Registered Capacity (MW) ____

Fuel ____

	Symbol	Units
* Normal Maximum Continuous Generation Capacity:		MW
* Normal Maximum Continuous Export Capacity		MW
Primary Fuel Switchover Output		MW
Secondary Fuel Switchover Output		MW
* **Power Station Auxiliary Load**		MW
§ **Power Station Auxiliary Load**		Mvar
* Maximum (Peaking) Generating Capacity		MW
* Maximum (Peaking) Export Capacity		MW
* Normal Minimum Continuous Generating Capacity		MW
* Normal Minimum Continuous Export Capacity		MW
* Generator Rating:	Mbase	MVA
* Normal Maximum Lagging Power Factor		Mvar
* Normal Maximum Leading Power Factor		Mvar
§ **Governor Droop**	R	
§ **Forbidden Zone**s		MW
§ Terminal Voltage adjustment range		kV
§ Short Circuit Ratio		
§ Rated Stator Current		Amps

* Number of available hours of running at Registered Capacity from on-site fuel storage stocked to its full capacity	

Description	
§ Capability Chart showing full range of operating capability of the generator including thermal and excitation limits.	Diagram
§ Open Circuit Magnetisation Curves	Graph
§ Short Circuit characteristic	Graph
§ Zero power factor curve	Graph
§ V curves	Diagram

	Symbol	Units
§ Time to synchronise from warm		Hour
§ Time to synchronise from cold		Hour
§ **Minimum Up Time**		Hour
§ **Minimum Down Time**		Hour
§ Normal loading rate		MW / min
§ Normal deloading rate		MW / min
§ Can the G**enerator** start on each fuel		
§ Ability to change fuels on-load		
§ Available modes (lean burn, etc.)		
§ Time to change modes on-load		
§ Control range for **AGC** operation		MW
Other relevant operating characteristics not otherwise provided....		

§ Reserve Capability

Primary Spinning Reserve

Secondary Spinning Reserve

Tertiary Reserve

Give details of reserve capability of the **Generator** in different operating modes:

Unit co-ordinating, turbine follow, recirculation, base load, etc.

What reserve, if any, is available when the unit is off load?

CCGT Installation Matrix

This matrix is a look up table determining which **CCGT Unit** will be operating at any given MW **Dispatch** level. This information will be applied for planning purposes and for scheduling, **Dispatch** and control purposes as covered in the **SDC**s unless by prior agreement with the **TSO.**

As an example of how the matrix might be filled out, consider a sample unit with a total capacity of 400 MW made up of two 150 MW combustion turbines and one 100 MW steam turbine. In this case, the following ranges might be specified:

0 MW to 50 MW	GT1
50 MW to 170 MW	GT1 and ST
170 MW to 400 MW	GT1 and GT2 and ST

Please insert MW ranges and tick the boxes to indicate which units are synchronised to deliver each MW range at the following atmospheric conditions: Temperature 10°C, Pressure 1.01 bar and 70% Humidity.

CCGT INSTALLATION	**CCGT UNIT AVAILABLE**					
OUTPUT USABLE	1st GT	2nd GT	3rd GT	1st ST	2nd ST	3rd ST
	OUTPUT USABLE					
Unit MW Capacity →	*e.g. 150*	*150*	-	*100*	-	-
Total MW Output Range ↓						

[ ] MW to [ ] MW						
[ ] MW to [ ] MW						
[ ] MW to [ ] MW						
[ ] MW to [ ] MW						
[ ] MW to [ ] MW						
[ ] MW to [ ] MW						

PC.A4.4 Generator Parameters

	Symbol	Units
* direct axis Synchronous reactance	X_d	% on rating
* direct axis Transient reactance saturated	$X'_{d\ sat}$	% on rating
* direct axis Transient reactance unsaturated	$X'_{d\ unsat}$	% on rating
* Sub-transient reactance unsaturated	$X''_d = X''_q$	% on rating
§ quad axis Synchronous reactance	X_q	% on rating
§ quad axis Transient reactance unsaturated	$X'_{q\ unsat}$	% on rating
§ Negative Phase Sequence Synchronous reactance	X_2	% on rating
§ Zero phase sequence reactance	X_0	% on rating
* Turbine generator Inertia constant for entire rotating mass	H	MW s/MVA
§ Stator resistance	Ra	% on rating
§ Stator Leakage reactance	X_L	% on rating
§ Poiter reactance	X_P	% on rating

Generator Time Constants

	Symbol	Units
§ Direct axis open Circuit Transient	Tdo’	sec
§ Direct axis open Circuit sub-Transient	Tdo’’	sec
§ Quad axis open Circuit Transient	Tqo’	sec
§ Quad axis open Circuit sub-Transient	Tqo’’	sec
§ Direct axis short Circuit Transient	Td’	sec
§ Direct axis short Circuit sub-Transient	Td’’	sec
§ Quad axis short Circuit Transient	Tq’	sec
§ Quad axis short Circuit sub-Transient	Tq’’	sec

PC.A4.5 **§ Mechanical Parameters:**

Provide mechanical parameters of the **Generator** that affect the dynamic performance of the **Generator**. This may include the stiffness of the shaft, a multi-mass model of the **Plant** components, torsional modes, mechanical damping or parameters as specified by the **TSO**.

PC.A4.6 **§ Excitation System:**

Provide parameters and supply a Laplace-domain control block diagram (or as otherwise agreed with the **TSO**) completely specifying all time constants and gains to fully explain the transfer function from the compensator or generator terminal voltage and field current to generator field voltage. These parameters may include but are not limited to:

Description	Symbol	Units
Excitation system type (AC or DC)		Text
Excitation feeding arrangement (solid or shunt)		Text
Excitation system Filter time constant	Tr	sec
Excitation system Lead time constant	Tc	sec
Excitation system Lag time constant	Tb	sec
Excitation system Controller gain	Ka	
Excitation system controller lag time constant	Ta	sec
Excitation system Maximum controller output	Vmax	p.u.
Excitation system minimum controller output	Vmin	p.u.
Excitation system regulation factor	Kc	
Excitation system rate feedback gain	Kf	
Excitation system rate feedback time constant	Tf	sec

PC.A4.7 **§ Speed Governor System**

Supply a Laplace-domain control block diagram and associated parameters of prime mover models for thermal and hydro units (or as otherwise agreed with the **TSO**) completely specifying all time constants and gains to fully explain the transfer function for the **Governor Control System** in relation to **Frequency** deviations and setpoint operation.

PC.A4.8 **§ Control Devices (including Power System Stabilisers) and Protection Relays**

Supply any additional Laplace domain control diagrams and associated parameters for any outstanding control devices including **Power System Stabiliser** or special protection relays in the generating unit, which automatically impinge on its operating characteristics within 30 seconds following a system disturbance and which have a minimum time constant of at least 0.02 seconds.

PC.A4.9 § Environmental Impact

CO_2	tonne CO_2 / tonne fuel
	Unit CO_2 removal efficiency
SO_2	tonne SO_2 / tonne fuel
	Unit SO_2 removal efficiency
NO_X	tonne NO_X / exported MWh curve

PC.A4.10 § Pumped Storage

Reservoir Capacity	MWh pumping
Max Pumping Capacity	MW
Min Pumping Capacity	MW
Efficiency (generating / pumping ratio)	%

PC.A4.11 § Generator Transformer

	Symbol	Units
Number of windings		
Vector Group		
Rated current of each winding		Amps
Transformer Rating		MVA_{Trans}
Transformer nominal LV voltage		kV
Transformer nominal HV voltage		kV
Tapped winding		
Transformer Ratio at all transformer taps		
Transformer Impedance at all taps[1]		% on rating MVA_{Trans}
Transformer zero sequence impedance at nominal tap	Z_0	Ohm
Earthing Arrangement including neutral earthing resistance & reactance		
Core construction (number of limbs, shell or core type)		
Open circuit characteristic		Graph

[1] For Three Winding Transformers the HV/LV1, HV/LV2 and LV1/LV2 impedances together with associated bases shall be provided.

PC.A4.12 Generator Forecast Data

PC.A4.12.1 § Expected Maintenance Requirements

Expected Maintenance Requirements weeks/year

PC.A4.12.2 § Forecast Availability of Registered Capacity

Apart from the expected scheduled maintenance requirements

Availability of Registered Capacity	Reason	Available Exported MW	Time %
Registered Capacity			
Restricted Rating			
Forced Outage Probability			
	Total		100%

Reasons for restricted rating might include poor fuel, loss of mill, loss of burners, hydro flow restrictions, etc.

PC.A4.12.3 § Energy Limitations

Daily	GWh
Weekly	GWh
Monthly	GWh
Annual	GWh

PC.A4.12.4 § Hydro Expected Monthly GWh

January	GWh
February	GWh
March	GWh
April	GWh
May	GWh
June	GWh
July	GWh
August	GWh
September	GWh
October	GWh
November	GWh
December	GWh

PC.A4.13 § Generator Aggregators

For each **Generator Aggregator**, the following information shall be provided:

(i) Name of **Generator Aggregator** group;

(ii) Total **Generation Capacity** at their **Connection Points** of all **Generation Units** being aggregated (MW) (**Aggregated Maximum Export Capacity**);

For each **Generator Site** within the **Generator Aggregator** group, the following information shall be provided:

(iii) Location;

(iv) **Registered Capacity**; and

(v) Name of the Transmission Station to which the Generation Site is normally connected.

PC.A5 Controllable PPM Data Requirements

All information for **Controllable PPM** connection applications shall include details of the **Transmission System Connection Point**. This shall include details listed in **PC.A2.1**, **PC.A2.2** for the **Connection Point**. The minimum technical, design and operational criteria to be met by **Controllable PPM** are specified in the **Connection Conditions**.

PC.A5.1 § Wind Turbine Generators and Mains Excited Asynchronous Generators

State whether turbines are Fixed Speed or Variable Speed:

Provide manufacturer details on electrical characteristics and operating performance with particular reference to Flicker and Harmonic performance.

For **Mains Excited Asynchronous Generators**, state:

	Units
How the generator is run up to synchronous speed	
Magnitude of inrush / starting current	Amps
Duration of inrush / starting current	ms
Starting / paralleling frequency	Hz
Power factor on starting	
Reactive power demand at zero output ('no load')	kvar
Give details of reactive power compensation to be installed	

PC.A5.2 Wind Turbine Generator parameters

Provide electrical parameters relative to the performance of the **Wind Turbine Generator**. This may include but is not limited to parameters of electrical generator, power electronic converters, electrical control and/or protection systems. Laplace diagrams and associated parameters shall be provided to the **TSO** where appropriate.

PC.A5.3 **Mechanical parameters of the WTG**

Provide mechanical parameters relative to the performance of the **Wind Turbine Generator**. This may include but is not limited to the drive train characteristics of the **WTG**, the stiffness of the shaft of the **WTG** and/or a multi-mass model of the **WTG** components. Laplace diagrams and associated parameters shall be provided to the **TSO** where appropriate.

PC.A5.4 **Aerodynamic performance of WTG**

Provide details on the aerodynamic performance of the **Wind Turbine Generator**. This may include but is not limited to variation of power co-efficient with tip speed ratio and **WTG** blade pitch angle, aerodynamic disturbance from **WTG** tower, **WTG** blade pitch control and high and low wind speed performance of the **WTG**. Laplace diagrams and associated parameters shall be provided to the **TSO** where appropriate.

PC.A5.5 **Wind Turbine Generator transformer**

Provide details of the transformer that connects the **WTG** with the internal **Controllable PPM** network. This may include but is not limited to the rating of **WTG** transformer (MVA or kVA), the **WTG** transformer voltage ratio (kV) or the **WTG** transformer impedance (%).

PC.A5.6 **Reactive Compensation**

Provide details of any additional reactive compensation devices and control systems employed by the **Controllable PPM**. This shall include **Mvar** capability, the number of stages in the device and the **Mvar** capability switched in each stage and any control or protection systems that influence the performance of the **Controllable PPM** at the **Connection Point**. Laplace diagrams and associated parameters shall be provided to the **TSO** where appropriate.

PC.A5.7 **Controllable PPM control and protection systems**

Provide details of any control or protection systems that affect the performance of the **Controllable PPM** at the **Connection Point.** This shall include any systems or modes of operation that activate during system **Voltage** or **Frequency** excursions including Low **Voltage** Ride Through (FRT), High **Voltage** Ride Through, Low **Frequency** Response and High **Frequency** Response. The transition between

Controllable PPM control modes shall also be specified. Laplace diagrams and associated parameters shall be provided to the **TSO** where appropriate.

PC.A5.8 Grid connection transformer of Controllable PPM

Provide details of the transformer that connects the **Controllable PPM** site with the **Distribution/Transmission System (equivalent to the Generator Transformer of a conventional power station)**. This shall include but is not limited to rating of grid transformer (MVA or kVA), transformer **Voltage** ratio (kV), transformer impedance (%), transformer tap changing control and no-load losses.

PC.A5.9 Internal network of Controllable PPM

Provide details of the **Controllable PPM's** internal network structure (**Collector Network**) and lay out (by means of a single-line diagram or other description of connections). This shall include but is not limited to a breakdown of how the individual **WTGs** are connected together as well as how they are connected back to the **Controllable PPM** substation. Please specify different cable or overhead line types and the individual length of each section of circuit.

	Type1	Type2	Type3	Extend
Total length (m)				Table as
Conductor cross section area per core (mm)				appropriate
Conductor type (Al, Cu, etc)				
Type of insulation				
Charging capacitance (µF/km)				
Charging current (Ampere/km)				
Positive sequence				

resistance

(R1 Ohm/km)

Positive sequence

reactance (X1 Ohm/km)

PC.A5.10 **Flicker and harmonics**

Provide details of harmonic or flicker contribution from the **Controllable PPM** that may affect the performance of the **Controllable PPM** at the **Connection Point.** This may include harmonic current injections and phase angles associated with the **Controllable PPM**. Details of any additional AC filter devices shall also be provided by the **Controllable PPM** to the **TSO.**

PC.A5.11 **Short Circuit Contribution**

Provide details of the single-phase to ground, phase-phase and three-phase to ground short circuit contribution from the **Controllable PPM** at the **Connection Point.** The **Controllable PPM** shall provide the **TSO** with the single-phase and three-phase short circuit contribution for rated conditions, i.e. maximum output from the **Controllable PPM** with all **WTGs** and any additional devices in the **Controllable PPM** contributing to the short circuit current. The **Controllable PPM** shall also provide the single-phase to ground, phase-phase and three-phase to ground short circuit contribution from an individual **WTG.** Signature plots of the short circuit contribution from an individual **WTG** shall also be supplied by the **Controllable PPM**.

PC.A6 Interconnector Data Requirements

All information for **Interconnector** connection applications shall include details of the **Transmission System Connection Point** and external **Transmission System Connection Point**. This shall include details listed in PC.A2.1, PC.A2.2 for each **Connection Point**. The minimum technical, design and operational criteria to be met by **Interconnectors** are specified in the **Connection Conditions**.

PC.A6.1 Interconnector Operating Characteristics and Registered Data

(i) **Interconnector Registered Capacity**

(a) **Interconnector Registered Import Capacity** for import to the **Transmission System** (MW);

(b) **Interconnector Registered Export Capacity** for export from the **Transmission System** (MW).

Interconnector Registered Capacity figures (a) and (b) above shall include transmission power losses for the Interconnector and be considered Registered Data.

(ii) General Details

(a) single line diagram for each converter station;

(b) proposed **Transmission** connection point;

(c) **Control Facility** location;

(d) **Interconnector Operator** details.

(iii) Technology details

(a) **Interconnector** technology type (i.e. current or voltage source technology);

(b) DC network cable or overhead line type & characteristics i.e. length, resistance (R), reactance (X), susceptance (B);

(c) rated DC Network Voltage/pole (kV);

(d) number of poles and pole arrangement;

(e) Earthing / return path arrangement;

(f) short circuit contribution (three phase to ground, single line to ground, phase to phase);

(g) **Interconnector** losses (**MW**/**Mvar**);

i. converter station;
ii. line circuits;
iii. house load demand;
iv. losses on de-block at minimum transfer;
v. total losses at max import / export.

(h) overload capability including details of any limitations i.e. time, temperature;

(iv) AC filter reactive compensation equipment parameters

(a) total number of AC filter banks;

(b) type of equipment (e.g. fixed or variable);

(c) single line diagram of filter arrangement and connections;

(d) **Reactive Power** rating for each AC filter bank, capacitor bank, or operating range of each item or reactive compensation equipment, at rated voltage;

(e) performance chart (PQ), showing **Reactive Power** capability of the **Interconnector**, as a function of **Interconnector Registered Capacity** transfer.

(f) harmonic and/or flicker contribution from the **Interconnector** that may affect the performance of the **Interconnector** at the **Connection Point**.

(v) **Interconnector** power electronic converter and control systems

(a) parameters related to the power electronic converters. **Interconnector** converter characteristics to be represented may include but is not limited by the following; converter firing angle, modulation index, Valve winding voltage, DC Voltage, DC Current as the output variables;

(b) transfer function block diagram representation including parameters of the **Interconnector** transformer tap changer control systems, including time delays;

(c) transfer function block diagram representation including parameters of AC filter and reactive compensation equipment control systems, including any time delays;

(d) transfer function block diagram representation including parameters of any **Frequency** and/or load control systems;

(e) transfer function block diagram representation including parameters of any small signal modulation controls such as power oscillation damping controls or sub-synchronous oscillation damping controls, which have not been submitted as part of the above control system data;

(f) transfer block diagram representation including parameters of the **Active Power** control, DC **Voltage** control, **AC Voltage** control and **Reactive Power** control at converter ends for a voltage source converter for both the rectifier and inverter modes.

(g) transfer block diagram representation including parameters of any control modes that affect the performance of the **Interconnector** at the **Connection Point** which have not been submitted as part of the above control system data. Features to be represented shall include but are not limited to the following; start-up sequence, shutdown sequence, Normal operating mode, VSC control mode, Island mode and Emergency Power control.

(vi) **Interconnector** Transformer;

	Symbol	Units
number of windings		
vector Group		
rated current of each winding		A
transformer rating		MVA_{Trans}
transformer nominal LV voltage		kV
transformer nominal HV voltage		kV
tapped winding		
transformer ratio at all transformer taps		

transformer impedance at all taps[1]		% on rating MVA_{Trans}
transformer zero sequence impedance at nominal tap	Z_0	Ohm
Earthing arrangement including neutral Earthing resistance & reactance		
core construction (number of limbs, shell or core type)		
open circuit characteristic		graph

PC.A7 Demand Side Unit Operators

For each **Demand Side Unit Operator**, the following information shall be provided:

(a) General Details

(i) name of **Demand Side Unit**;

(ii) address of the **Demand Side Unit Control Facility**;

(iii) address of each **Individual Demand Site(s)** comprising the **Demand Side Unit**;

(iv) Irish Grid Co-ordinates of the **Connection Point** of each **Individual Demand Site** comprising the **Demand Side Unit**;

(v) Meter Point Reference Number for each **Individual Demand Site** comprising the **Demand Side Unit**;

(vi) classification of operation of each **Individual Demand Site** comprising the **Demand Side Unit** as one of:

- avoided **Demand** consumption only,
- combination of avoided **Demand** consumption and **Shaving Mode** operation of **Generation Units**,
- combination of avoided **Demand** consumption and **Continuous Parallel Mode** operation of **Generation Units**,
- combination of avoided **Demand** consumption and **Lopping Mode** operation of **Generation Units**,

[1] For Three Winding Transformers the HV/LV1, HV/LV2 and LV1/LV2 impedances together with associated bases shall be provided.

- combination of avoided **Demand** consumption and **Standby Mode** operation of **Generation Units**,
- combination of avoided **Demand** consumption and **Automatic Mains Failure Mode** operation of **Generation Units,**
- **Shaving Mode** operation of **Generation Units** only,
- **Continuous Parallel Mode** operation of **Generation Units** only,
- **Lopping Mode** operation of **Generation Units** only,
- **Standby Mode** operation of **Generation Units** only,
- **Automatic Mains Failure Mode** operation of **Generation Units** only;

(vii) current classification of operation of each **Individual Demand Site** comprising the **Demand Side Unit** if different to above;

(viii) details of all **Generation Units** used as part of the **Demand Side Unit** operated in **Continuous Parallel Mode, Shaving Mode** or **Lopping Mode**, including the make, model, **Capacity**, MVA rating, fuel type~~,~~ and protection settings;

(ix) whether a change is required to the current **Maximum Export Capacity** or **Maximum Import Capacity** of **Individual Demand Sites** comprising the **Demand Side Unit**;

(x) whether the operation of **Embedded Generator Interface Protection** trips a **DSO**-operated interface circuit breaker, **DSO Demand Customer** main incomer, **Generation Unit LV** circuit breaker, **Generation Unit HV** transformer circuit breaker or other on a **Distribution System**-connected **Individual Demand Site** comprising a **Demand Side Unit** containing **Generation**;

(xi) the current operation **Embedded Generator Interface Protection** if different to above;

(xii) details of all **Demand** loads with **Demand** reduction capability of 5 MW or greater, including size in MW and demand reduction capability from load;

(xiii) whether the **Distribution System Operator** has been informed about the intention of the **Demand Side Unit Operator** to operate a **Demand Side Unit** (the **Demand Side Unit Operator** is obliged to inform the **Distribution System Operator**);

(xiv) whether each **Individual Demand Site** comprising the **Demand Side Unit** is currently participating as or part of any **Aggregated Generator Unit** or other **Demand Side Unit**;

(xv) proposed effective date in **Single Electricity Market** for first-time applicants; and

(xvi) proposed date for **Grid Code Testing**.

(b) Technical Details

(i) total **Demand Side Unit MW Capacity** (**MW**) of the **Demand Side Unit**;

(ii) **Demand Side Unit MW Capacity** (**MW**) of each **Individual Demand Site** comprising the **Demand Side Unit**;

(iii) total **Demand Side Unit MW Capacity** of the **Demand Side Unit** available from on-site **Generation** (**MW**) operated in **Shaving Mode** or **Continuous Parallel Mode**;

(iv) **Demand Side Unit MW Capacity** of each **Individual Demand Site** comprising the **Demand Side Unit** available from on-site **Generation** (**MW**) operated in **Shaving Mode** or **Continuous Parallel Mode**;

(v) total **Demand Side Unit MW Capacity** of the **Demand Side Unit** available from avoided **Demand** consumption (**MW**) and on-site **Generation** (**MW**) operated in **Lopping Mode** and on-site **Generation** (**MW**) operated in **Standby Mode**;

(vi) **Demand Side Unit MW Capacity** of each **Individual Demand Site** comprising the **Demand Side Unit** available from avoided **Demand** consumption (**MW**) or on-site **Generation** (**MW**) operated in **Lopping Mode** or on-site **Generation** (**MW**) operated in **Standby Mode**;

(vii) **Demand Side Unit MW Response Time** of the **Demand Side Unit**;

(viii) **Demand Side Unit Notice Time** of the **Demand Side Unit**;

(ix) **Minimum Down Time** of the **Demand Side Unit**;

(x) **Maximum Down Time** of the **Demand Side Unit**;

(xi) **Minimum off time** of the **Demand Side Unit**;

(xii) **Maximum Ramp Up Rate** of the **Demand Side Unit**;

(xiii) **Maximum Ramp Down Rate** of the **Demand Side Unit**;

PC.A8 Modelling Requirements for Users

PC.A8.1 Introduction

The **TSO** requires suitable and accurate dynamic **Models** for all **Users** connected to, or applying for a connection to, the **Transmission System,** in order to assess the impact of the proposed installation on the transient and dynamic performance, and security and stability of the **Power System** for a range of timeframes, disturbances and system conditions. The **TSO** bases the safe and secure design and operation of the **Power System** on the **Models** provided by the **Users**. All **Users** of the **Power System** shall provide suitable **Models** of their **Plant** in a timeframe and manner specified by the **TSO** in this **Grid Code.**

PC.A8.2 Model Capabilities

The **Users** shall supply **Models** that shall be capable of representing the behaviour of the **Plant** in balanced root mean-square positive phase-sequence, time-domain studies and where specified, electromagnetic transient and harmonic studies.

The balanced, root mean-square positive phase-sequence time-domain **Model** shall include all material elements that affect the **Active Power** and **Reactive Power** output of the **Plant** with respect to changes or excursions in **Voltage** and **Frequency** at the **Connection Point.** The **Model** shall include all electrical and mechanical phenomena, where applicable, that impact on the **Active Power** and **Reactive Power** output of the **Plant** for sub-transient, transient and synchronous dynamics up to and including **Primary Operating Reserve** and **Secondary Operating Reserve** timeframe.

The three-phase electromagnetic transient **Model** shall include all material aspects of the **Plant** that affect the symmetrical and asymmetrical voltage and current outputs from the **Plant.** The **Model** shall represent phenomena that materially affect the **Voltage** and **Frequency** at the **Connection Point** over timeframes of sub-cycles up to 500 cycles including but not limited to switching of power electronic devices, transformer saturation or equipment energisation.

PC.A8.2.1 Model Aggregation

The **TSO** requires the **Model** to represent the operation of the **User's Plant** at the **Connection Point** and therefore it is essential that the **Models** of individual **Generation Units** can be aggregated into a smaller number of **Models**, each representing a number of **Generation Units** at the same **Site**. If all **Generation Units** in the **User Site** are not identical, the **Model** shall account for this by accurately representing the overall performance of the **User's Plant** at the **Connection Point**. A representation of the collector network and any additional equipment such as **Reactive Power** compensation may be included in the aggregate **Model** of the **User's Plant. Models** for the simulation studies must be single lumped **Models**, scalable for different **Active Power** outputs as seen at the **Connection Point**.

PC.A8.3 Model Documentation and Source Code

Users are obliged to provide appropriate balanced, root mean-square positive-phase sequence time-domain **Models** and three-phase electromagnetic transient **Models** in accordance with specifications in this **Grid Code**. The **TSO** requires that sufficient information be provided by the **User** to allow for **Models** to be redeveloped in the event of future software environment changes or version updates. All **Models** must be accompanied with appropriate documentation with sufficient detail as specified by the **TSO**, such agreement not to be unreasonably withheld. The **User** shall provide information including, but not limited to, a full description of the **Model** structure and functionality, Laplace diagrams or other suitably understandable information. The **User** may also choose to provide the **TSO** with detailed **Model** source code. The **Models** shall be provided in a software format as specified by the **TSO**. Alternatively, the **User** may provide an unambiguous reference to a standard open-source **Model**, such as a standard IEEE **Model**, or to a dynamic **Model** previously submitted to the **TSO** provided this **Model** accurately reflects the **User's Plant**.

The **TSO** may, when necessary to ensure the proper operation of its complete system representation or to facilitate its understanding of the results of a dynamic simulation, request additional information concerning the **Model**, this may include

Model documentation or the source code of one or more routines in the model. The **User** shall comply with any such request without delay.

PC.A8.4 **Confidentiality**

The dynamic **Models**, supporting documentation and associated data are provided to the **TSO** in order to carry out its duties to meet its statutory and legal requirements. In that regard the **TSO** is entitled to share the information with third party consultants, other **TSO**s or **DSO**s working for or with the **TSO** to perform co-ordinated operational and/or planning studies.

Where the **User** or any other party, acting reasonably, designates such information as confidential on the basis that it incorporates trade secrets, the obligation will be with the **TSO** to ensure the confidentiality of data shared with other **TSO**s or **DSO**s working for or with the **TSO** to perform co-ordinated operational and/or planning studies. Where such data is shared with third party consultants working for or with the **TSO** such third party consultants will be obliged to carry out any activities will be subject to stringent confidentiality agreements.

It is the responsibility of the **User** to provide the dynamic **Models**, supporting documentation and associated data to the **TSO**. Where the **User** or any other party, acting reasonably, designates such information as confidential on the basis that it incorporates trade secrets, the **TSO** will accept the dynamic **Models**, supporting documentation and associated data from a third party manufacturer provided the third party manufacturer agrees to enter into the **TSO'**s standard confidentiality agreement for **Users**. In the event that the manufacturer cannot agree to this confidentiality contract, the **User** shall be responsible for the provision of the dynamic **Models**, supporting documentation and associated data to the **TSO**.

PC.A8.5 **Time to comply**

The **User** shall provide a **Model** of the **User's Plant** in accordance with **PC.6.6.1**. 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, **PC.A8.2** and **PC.A8.3**, the **User** may apply to the **TSO** to be deemed compliant with the provisions of **PC.A8.2** and **PC.A8.3** on the basis of **GC.10.3** of the **General Conditions** of the **Grid Code.** The **TSO** shall consider any such application in accordance with **GC.10.3,** and if the

TSO is satisfied as to the **User's** programme for developing and testing the necessary dynamic model, the **TSO** may, for so long as the **TSO** is so satisfied, treat the **User** as being in compliance with the provisions of this section**.** 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 **PC.A8.2** and **PC.A8.3**, the provisions of **GC.10.4** shall apply and the **User** shall apply for a derogation under the terms of **GC.9**.

PC.A8.6 **Validation of Model**

All **Models** provided to the **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 **User** 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 **User's Plant,** appropriate tests shall be carried out and measurements taken at the **User's** site to assess the validity of the dynamic **Model**. The tests and measurements required shall be agreed between the **User** and the **TSO.**

The **User** shall provide the **TSO** with 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 **User System** under laboratory conditions and/or actual observed behaviour of the real **User System** as installed and connected to a transmission or distribution network.

The **User** shall simulate the dynamic **Models** such that **Model** outputs can be compared against measurements from **Grid Code** compliance testing to ensure appropriate responses from the **Model**. Tests may include but are not limited to Steady State Reactive Capability, **Voltage** Control & **Reactive Power** Stability, Low **Voltage** Ride Through (FRT), High **Voltage** Ride Through, Low **Frequency** Response and High **Frequency** Response. The tests and measurements required shall be agreed between the **User** and the **TSO.** The **TSO** shall provide sufficient information on system conditions at the **User's Connection Point** to allow for the **User** to conduct their studies.

After commissioning, the **User** shall provide the **TSO** with documentation comparing the predicted behaviour of the balanced, root mean square, positive phase-sequence time-domain **Model** against the tested performance. If no significant changes are required to the **Model** structure the **TSO** shall update the three-phase electromagnetic transient **Model** based on the parameters submitted by the **User** provided the **TSO** has sufficient access to update the relevant **Model** parameters. The **TSO** shall also perform studies and ongoing validation to ensure that **Models** submitted by the **User** are representative of the **User's Plant** throughout its operational lifetime.

If the on-site measurements, **Grid Code** compliance tests or other information provided indicate that the dynamic **Model** is not valid in one or more respects, the **User** shall provide the revised dynamic **Model**, source code and documentation whose behaviour corresponds to the observed on-site behaviour as soon as reasonably practicable, but in any case no longer than 90 **Business Days** after the conclusion of the **Grid Code** compliance tests.

PC.A8.7 Maintenance of Model

All **Models** provided to the **TSO** must be maintained and updated to accurately reflect the operational performance of the **User's Plant** over the lifetime of the **Plant**. The **User** shall inform the **TSO** of any changes to the **Plant** which may materially affect the accuracy of the dynamic **Model** in predicting the **Active Power** and **Reactive Power** output of the **Plant** with respect to changes or excursions in **Voltage** and **Frequency** at the **Connection Point.** In this case the **User** shall re-submit the parameters associated to the dynamic **Model** or fully re-submit the dynamic **Model** of the **Plant**. Changes which shall be reported to the **TSO** may include but are not limited to alterations in **Plant** protection settings, modifications to **Plant** controller settings and alterations to **Governor Droop** or **Plant Frequency** response. In the event of scheduled **Plant** outages or maintenance the **User** must provide appropriate **Model** updates in advance of the scheduled outage.

Updates of the dynamic **Model** version shall be supplied by the **User** to the **TSO** in a timeframe agreed with the **TSO**.

The **TSO** is entitled to alter, modify and adjust **Model** parameters or data for the purposes of better reflecting **Plant** behaviour with respect to observed operational performance over the life of the **Plant**. The **TSO** shall inform the **User** of any **Model** changes prior to implementing these in their **System Models**.

PC.A8.8 Software Environment and Model Usability

The **User** must provide **Models** in software packages as defined by the **TSO**. Details of the current software version, computer platform, compiler version~~,~~ and **Model** usability guidelines, will be provided by the **TSO** upon request and shall be published on the **TSO**'s website. The **TSO** may from time to time request that the **Models** be updated to be compatible with changes in the **TSO's** computing environment, namely software version and/or compiler version. Each **User** shall ensure that such updated **Models** are provided without undue delay or in any event, within 90 **Business Days** of the date of the request. The **User** shall provide **Models** in the software formats as defined by the **TSO**, or additionally in such other format as may be agreed between the **User** and the **TSO**. Changes in the software format requirements for **Models** shall be subject to the **Grid Code** revision process defined in **GC.7**.

All **Models**, irrespective of software format, shall be accompanied by a sample case such that the **Model** can be tested before being integrated into the **Model** of the Irish network in the respective software environment. The sample case shall include the **User's Plant** model, grid transformer and any other associated equipment connected to an infinite bus via an impedance that is appropriate to represent the **Connection Point**.

CC CONNECTION CONDITIONS

CC.1 INTRODUCTION

CC.1.1 For the protection of the **Transmission System** and **Users' Plant** and **Apparatus** directly connected to the **Transmission System**, and in order to maintain, insofar as is possible by **Good Industry Practice,** stable and secure operation of the **Transmission System** for the benefit of all **Users**, it is necessary to require certain minimum technical, design and operational criteria to be met by **Users' Plant** and **Apparatus.**

CC.1.2 These **Connection Conditions** establish certain principles and standards relating to connection, method of connection, **Plant** and **Apparatus** designation and nomenclature, technical standards, performance standards, data requirements.

CC.1.3 These **Connection Conditions** supply information as to the performance characteristics of the **Transmission System** at the **Connection Point**, in order to enable **Users** and prospective **Users** to design their **Plant** and **Apparatus** and to provide appropriate control systems and **Plant** protection schemes.

CC.1.4 In addition to the **Connection Conditions**, there are **Connection Agreements**, which are bilateral agreements between the **TSO** and each **User** and which contain the detail specific to each **User's** connection to the **Transmission System**. The **Connection Agreement** requires the **User** and the **TSO** to comply with the terms of the **Grid Code**, except to the extent that a derogation has been granted under the **General Conditions**.

CC.2 OBJECTIVE

CC.2.1 The **Connection Conditions** define the minimum standards for the method of connection to the **Transmission System**.

CC.2.2 The **Connection Conditions** define the technical, design and operational standards which must be complied with by any **User** connecting to the **Transmission System**.

CC.2.3 The **Connection Conditions** define the normal **Transmission System** performance standards at the **Connection Point**.

CC.2.4 The **Connection Conditions** outline the types of signals and indications that will be required to be made available to the **TSO** by each **User**.

CC.2.5 The **Connection Conditions** detail requirements for the designation and nomenclature of all **User Plant** and **Apparatus** connected to the **Transmission System.**

CC.3 SCOPE

The **Connection Conditions** apply to the **TSO** and to the following **Users**:

(a) **Generators** with **Registered Capacity** greater than 2MW;

(b) **Interconnectors**;

(c) **Demand Customers**;

(d) **Demand Side Unit Operators**; and

○

(e) **Generators** connected to the **Transmission System**.

⌂

(f) **Demand Facilities**, **Closed Distribution Systems** and **Distribution Systems**.

CC.4 TRANSMISSION STATION COMPOUND

CC.4.1 The **User** shall provide a **Transmission Station** compound, as provided for in the **Connection Agreement**, immediately adjacent to the **User's** facility and otherwise acceptable to the **TSO** for the erection of a **Transmission Station,** as necessary, for the **TSO** and for installing other equipment required for connecting the **User's System** to the **Transmission System**.

CC.4.2 Connection to the **Transmission System** must meet the standards defined in the **Planning Code** and in these **Connection Conditions**. The method of connection used may exceed the standards where this is required by the **User** and is acceptable to the **TSO**.

CC.5 PLANT DESIGNATIONS

CC.5.1 The name of the **User Site** shall be designated by the **User** and subsequently agreed with the **TSO,** such agreement not to be unreasonably withheld.

CC.5.2 The designation and proposed nomenclature of **User Plant** and **Apparatus** connected to the **Transmission System** shall be in accordance with the **TSO** 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 **TSO** who may, if the **TSO** determines that such proposed designation may lead to confusion or does not conform with the **TSO** standard practice, notify substitute designation which shall apply to such **User Plant** and/or **Apparatus**.

CC.5.3 The **TSO's** standard practice currently requires that, unless otherwise agreed with the **TSO**, the following standard designations apply:

(a)	**Generation Units**:	for hydro and wind: G1, G2 etc.
		for thermal: U1, U2 etc.
(b)	**Interconnectors**:	for: I1, I2 etc
(c)	**Generator transformers** and	
	Interconnector Transformers:	at 400 kV; T4001, T4002 etc.
	(i.e. transformers for	at 220 kV; T2001, T2002 etc.
	Generation Unit production)	at 110 kV; T101, T102 etc.
(d)	**Power Station** transformers:	at 400 kV; ST4001, ST4002 etc.
	(i.e. dedicated transformers	at 220 kV; ST2001, ST2002 etc.
	supplying both the **Generation**	at 110 kV; ST101, ST102 etc.
	Unit and the **Power Station**	
	auxiliaries from the **HV** busbar)	

(e)	Unit transformers: (i.e. transformers supplying auxiliaries of a **Generation Unit**)	UT1, UT2 etc.
(f)	Load transformers:	for 400/110 kV; T4101, T4102 etc. for 220/110 kV; T2101, T2102 etc. for 110/38kV; T141, T142 etc. for 110/20kV; T121, T122 etc. for 110/11kV and below; T101, T102 etc.
(g)	Bus sections, conventional busbars:	single bus; A1, A2 etc. double bus; A1, A2, B1, B2 etc.
(h)	Bus sections, ring busbars:	each section identified by designation of **Plant** and/or **Apparatus** item connected to it.
(i)	Bus Couplers:	K1, K2 etc.
(j)	Lines and cables:	each line or cable at a station identified by name of station or stations at the remote end or ends of the line or cable in alphabetical order.
(k)	Circuit Breakers	CB.
(l)	Main Earth Disconnects	DE.
(m)	Line Disconnect	DL.

(n)	Busbar Disconnects	DA, DB, etc.
(o)	Coupler Disconnects	DA, DB, etc.

CC.5.4 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**.

CC.6 RELEVANT TECHNICAL STANDARDS APPLYING TO USER PLANT AND APPARATUS

CC.6.1 All **User Plant** and **Apparatus** associated with the connection to the **Transmission System** shall comply with the:

(a) Irish and EU Law and

(b) the relevant European standards; or

(c) if there is no relevant European standards, such other relevant standard which is in common use in the European Union;

in each case as current at the date of the **User's** applicable **Connection Agreement**. Where the **TSO**, acting reasonably, determines that in order to ensure safe and co-ordinated operation of a **User's Plant** and/or **Apparatus** with the **Transmission System**, there is a requirement for supplemental specifications and/or standards to apply to the design of a **User's Plant** and/or **Apparatus,** the **TSO** shall notify the **User** and the **User** shall comply with the additional requirements. On request from the **User**, the **TSO** shall provide reasonable evidence as necessary to demonstrate the need for the supplemental specifications and/or standards.

CC.6.2 In the event that any standard or specification with which a **User's Plant** and/or **Apparatus** is required to comply under PC.6.1 is amended, the **TSO** will, having consulted with the affected **Users** and with the **Grid Code Review Panel**, make a recommendation to the **CRU** as to what action should be taken.

CC.7 SPECIFIC DESIGN AND PERFORMANCE STANDARDS

CC.7.1 In order to facilitate secure and stable operation of the **Transmission System** for the benefit of all **Users**, it is necessary that **Users' Plant** and **Apparatus** is designed to be capable of sustained operation within a range of **Transmission System** conditions.

CC.7.2 All Users

CC.7.2.1 Earthing

CC.7.2.1.1 The **Earthing** of all **Users Plant** and **Apparatus** and provision of an **Earthing** system shall as a minimum requirement be in accordance with the recommendations contained in the "Guide for Safety in Alternating Current Substations", ANSI/IEEE No. 80, 1986.

CC.7.2.1.2 The **TSO** shall consult with each **User** regarding the specification for the **Earthing** grid to be provided.

CC.7.2.1.3 Each **User's** earth disconnecFts must be earthed directly to the main station earth grid.

CC.7.2.1.4 The **User** will be obliged to certify (by a competent body) that remote earths have been isolated from the **User's** site plus any other affected third parties 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 **Transmission Station** cannot be energised until this certification has been received by the **TSO**.

CC.7.2.1.5 Each **User's Earthing** system shall be bonded to the **Transmission Station** earth grid so that both **Earthing** systems are effectively integrated.

CC.7.2.1.6 Each **User** shall ensure that all staff working on the **User's Earthing** system shall be adequately trained to perform such work in a safe manner.

CC.7.2.2 Design

CC.7.2.2.1 **User Plant** and **Apparatus** shall be designed with the following minimum capabilities (at the applicable **Voltage** levels):

Parameter (Minimum)	**110kV**	**220kV**	**400kV**
Insulation Level (kV);			
- Lightning Impulse (1.2/50 μsec.)	550	1050	1550
- Switching Impulse (0.25/2.5 ms)	-	-	1175
- Power Frequency (50 Hz, for 1 min)	230	460	-
Clearance outdoor in air of live metal parts (mm) phase to earth	1100	2400	4100
Height of live parts above pedestrian passageways (mm)	3400	4700	6400
Height of bottom of unscreened live bushings above ground (mm)	2300	2300	2300
Height of live conductors above roadways (mm)	8000	9000	10500

CC.7.2.2.2 **User Plant** and **Apparatus** at the **Connection Point** shall be designed taking account of the short circuit current levels specified in CC.8.6. **User** circuit breakers shall be capable of safely making and interrupting currents due to faults, taking account of the current levels specified in CC.8.6. Circuit breakers with a higher rating than the current levels specified in CC.8.6 may be necessary for a number of reasons, including, but not limited to the need to provide an adequate safety margin or to cater for a high DC component in the fault current. It shall be the responsibility of the **User** to determine, what safety margin if any to apply when selecting the **User's Plant** and **Apparatus.**

CC.7.2.3 LV cables and wiring

CC.7.2.3.1 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.

CC.7.2.3.2 LV supply cable and auxiliary wiring shall be routed from the **Transmission 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 **Transmission Station.**

CC.7.2.4 Locking

CC.7.2.4.1 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 **TSO**. The specific details of this requirement will be outlined at the design phase.

CC.7.2.4.2 Existing **Power Stations** with **ESB Power Generation Electrical Safety Rules**, in accordance with OC11, in operation will be deemed to comply with CC.7.2.4.1 subject to review by the **TSO**.

CC.7.2.5 Grid Connected Transformers

CC.7.2.5.1 **Generators** shall provide on-load tap-changing (OLTC) facilities for all **Generator Transformers**. **Demand Customers** are advised to provide on-load-tap-changing (OLTC) facilities for all **Grid Connected Transformers**. All **Users** shall liase with the **TSO** on the design specification for the performance of the tap-chaning facility on **Grid Connected Transmformers.**

Demand Customers are advised to provide on-load tap-changing (OLTC) facilities for all **Grid Connected Transformers**.

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Where the **TSO** specifies the use of blocking of OLTC, the **Grid Connected Transformers** at **Distribution Facilities** shall be capable of automatic or manual OLTC blocking. The **TSO** will specify the automatic OLTC blocking functional capability.

CC.7.2.5.2 **Generator Transformer** windings shall be connected in star (with the star point or neutral brought out) on the higher **Voltage** side and in delta on the lower **Voltage** side.

Other **Grid Connected Transformers** may be connected either:

(a) in delta on the lower voltage side and in star (with the star point or neutral brought out) on the higher **Voltage** side; or

(b) in star on both higher and lower **Voltage** sides with a delta tertiary winding provided.

CC.7.2.5.3 **Demand Customers** and **Generators** are advised that provision should be made for the **Earthing** of the neutral of each of their **Transformers** connected to the 110kV **System** by bringing out the neutral and ensuring that the insulation is such that the **Transformers** can be operated unearthed.

The **TSO** will consider on a case by case basis the required treatment of the 110kV neutral connection of these **Transformers**. A 110 kV neutral earth switch may be required to be installed in specific instances and **Demand Customers** or **Generators,** as applicable, will be advised of this at the time of the **Connection Offer**. The **TSO** will be responsible for the status of the 110 kV neutral earth switch on these **Transformers**. For the avoidance of doubt, this clause does not apply to **Transformers** located at the **TSO**-**DSO**, boundary where such issues are agreed between the **TSO** and **DSO**.

CC.7.2.5.4 **Demand Customers** and **Generators** are advised that provision should be made for the **Earthing** of the neutral of each of their **Transformers** connected to the 220 kV **System** by bringing out the neutral and ensuring that the insulation is such that these **Transformer**s can be operated unearthed. The **TSO** will consider on a case by case basis the required treatment of the 220kV neutral connection of these **Transformers**. A 220 kV neutral earth switch may be required to be installed in specific instances and **Demand Customers** or **Generators,** as applicable, will be advised of this at the time of the **Connection Offer**. The **TSO** will be responsible for the status of the 220 kV neutral earth switch on these **Transformers**. For the avoidance of doubt, this clause does not apply to **Transformers** located at the **TSO-DSO** boundary, where such issues are agreed between the **TSO** and **DSO.**

CC.7.2.5.5 The **HV** neutrals of all **Transformers** connected to the 400 kV **System** should be solidly earthed. The capability of being operated unearthed is unnecessary.

CC.7.2.5.6 The **TSO** will provide the facility for the tripping of **Grid Connected Transformer HV** circuit breakers from the **User's** transformer protection.

CC.7.2.5.7 An **Interconnector Transformer** shall be designed such that the **Reactive Power** capability is possible over the full range of **Transmission System Voltages** (specified in (f) The **TSO** and an **Interconnector** owner will liaise on matters related to the **Interconnector Transformer** at the design stage.

CC.7.2.5.8 **Interconnector Transformer** windings shall be connected in star (with the star point or neutral brought out) on the higher **Voltage** side and in delta on the lower **Voltage** side or as agreed with the **TSO**.

CC.7.3 GENERATORS

CC.7.3.1 The conditions specified in this section of the code apply to all **Generation Units** connected to or connecting to the **Transmission System**. Unless explicitly stated all conditions specified apply over the full operating capabilities of the **Generation Unit** at the **Connection Point**.

For all **Generation Units** where **Secondary Fuel Registered Capacity** is different than **Primary Fuel Registered Capacity** all appropriate **Connection Conditions** must be met or agreed with the **TSO**.

CC.7.3.1.1 Each **Generation Unit,** shall, as a minimum, have the following capabilities:

(a) operate continuously at normal rated output at **Transmission System Frequencies** in the range 49.5Hz to 50.5Hz;

(b) remain synchronised to the **Transmission System** at **Transmission System Frequencies** within the range 47.5Hz to 52.0Hz for a duration of 60 minutes;

(c) remain synchronised to the **Transmission System** at **Transmission System 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)

(i) remain synchronised to the **Transmission System** during rate of change of **Transmission System Frequency** of values up to and including 0.5 Hz per second;

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(ii) remain synchronised to the **Transmission System** for a **Rate of Change of Frequency** up to and including 1 Hz per second as measured over a rolling 500 milliseconds period. **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 **Fault-Ride Through** clause CC.7.3.1.1(y) supersedes this clause (CC.7.3.1.1(d)). For the avoidance of doubt, this requirement relates to the capabilities of **Generating Units** only and does not impose the need for **Rate of Change of Frequency** protection nor does it impose a specific setting for anti-islanding or loss-of-mains protection relays;

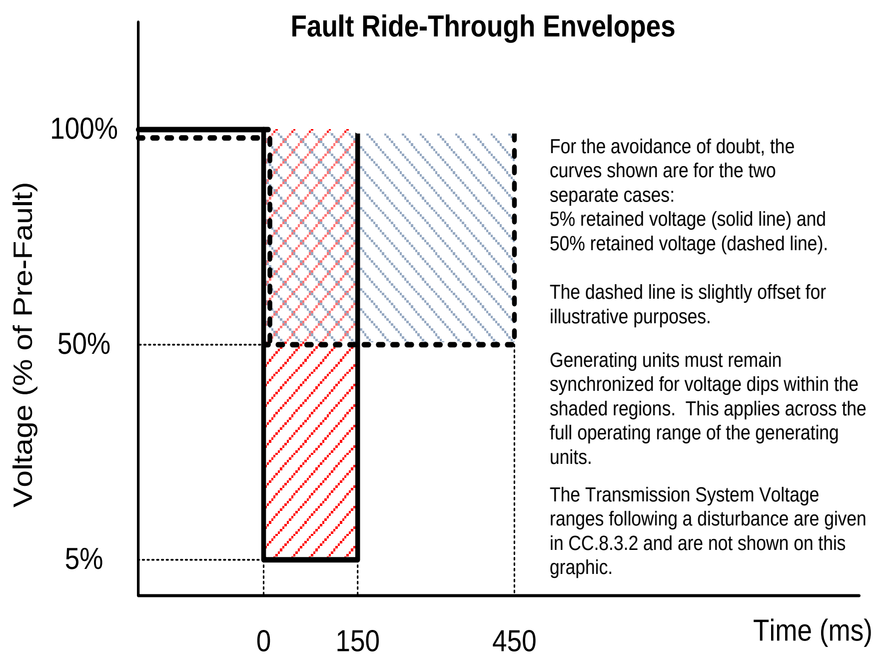
(e) sustained operation at the specified **Minimum Generation** within the range 49.8 to 51.0 Hz;

(f) remain synchronised to the **Transmission System** at normal rated output at **Transmission System Voltages** within the ranges specified in CC.8.3.2 for step changes in **Transmission System Voltage** of up to 10%.

(g) sustained operation in accordance with the **Reactive Power** capability as required by CC.7.3.6 at **Transmission System Voltages** within the ranges specified in CC.8.3.2, unless otherwise specified;

(h) remain synchronised during and following any **Fault Disturbance** anywhere on the **Power System** which could result **in Voltage** dips at the **HV** terminals of the **Generator Transformer** of no greater than 95% of nominal **Voltage** (5% retained) for fault durations up to and including the **Fault Ride-Through Times** as defined in the table below and **Voltage** dips of no greater than 50% of nominal **Voltage** (i.e. 50% retained) for fault durations up to and including the **Fault Ride-Through Times** as defined in the table below (see also **Fault Ride-Through** Envelopes below). Following the fault clearance the **Generation Unit** should return to prefault conditions subject to its normal **Governor Control System** and **Automatic Voltage Regulator** response. The use of **Extraordinary Governor Response** and/or **Extraordinary AVR Response** to remain synchronised during and following a fault is prohibited unless specifically agreed with the **TSO**, such agreement not be unreasonably withheld.

VOLTAGE DIP MAGNITUDE	**Fault Ride-Through Times**		
	400 kV System	**220 kV System**	**110 kV System**
95% (5% retained)	150 ms	150 ms	150 ms
50% (50% retained)	450 ms	450 ms	450 ms



(i) remain synchronised to the **Transmission System** during a negative phase sequence load unbalance in accordance with IEC 60034-1.

(j) The short circuit ratio of each **Generation Unit** shall be in accordance with IEC 60034-1.

(k) **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**. For **CCGT Installations** whilst operating in **Open Cycle Mode** as a result of combined cycle plant capability being unavailable, the **Minimum Load** of each **Combustion Turbine Unit** must be not greater than 35% of the **Registered Capacity** divided by the number of **Combustion Turbine Units**.

(l) **Ramp up capability** not less than 1.5% of **Registered Capacity** per minute when the **Unit** is in the **Normal Dispatch Condition**.

(m) **Ramp down capability** not less than 1.5% of **Registered Capacity** per minute when the **Unit** is in the **Normal Dispatch Condition.**

(n) **Minimum up-time** not greater than 4 hours for **Thermal Units.**

(o) **Minimum down-time** not greater than 4 hours for **Thermal Units.**

(p) **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.**

(q) **Block Loading** not greater than 10% of **Registered Capacity.**

(r) 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.

(s) Time to **Synchronise** from instruction:

hot: not greater than 3 hours

warm: not greater than 8 hour

cold: not greater than 12 hours

(t)

(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 deload from **Minimum Load** to **De- Synchronising:**

not greater than 40 minutes, except where agreed with the TSO.

(u) **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 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.

(iii) **TOR1** not less than 8% **Registered Capacity**

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% output

(iv) **TOR2** not less than 10% **Registered Capacity**
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% output to 0 at 100% output.

(v) The **TSO** may request **Generation Units** of **Registered Capacity** greater than or equal to 60MW to have the capacity to operate under **AGC** at all loads between **AGC Minimum Load** and **AGC Maximum Load**

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(w) Remain synchronised to the **Transmission System** and operate within the frequency ranges and time periods specified in *Table CC.7.3.1.1*.

Table CC.7.3.1.1: Minimum Time Periods for Generation Units to Remain Operational without Disconnecting

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

(x) Remain synchronised to the **Transmission System** and operate within the ranges of the **Transmission System Voltage** at the connection point, for an unlimited time period, as specified below:

(i) 400 kV system: 360 kV to 420 kV (0.9 p.u. – 1.05 p.u.)
(ii) 220 kV system: 198 kV to 245 kV (0.9 p.u. – 1.114 p.u.)
(iii) 110 kV system: 99 kV to 123 kV (0.9 p.u. – 1.118 p.u.)

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(y) Remain synchronised to the **Transmission System** and continue to operate stably during and following any **Fault Disturbance** anywhere on the **Power System** which could result in **Voltage Dips** at the **Connection Point**. The voltage-against-time profile specifies the required capability as a function of voltage and **Fault Ride-Through Time** at the **Connection Point** before, during and after the **Fault Disturbance**. That capability shall be in accordance with the voltage-against-time profile as specified in *Figure CC.7.3.1.1.y.*

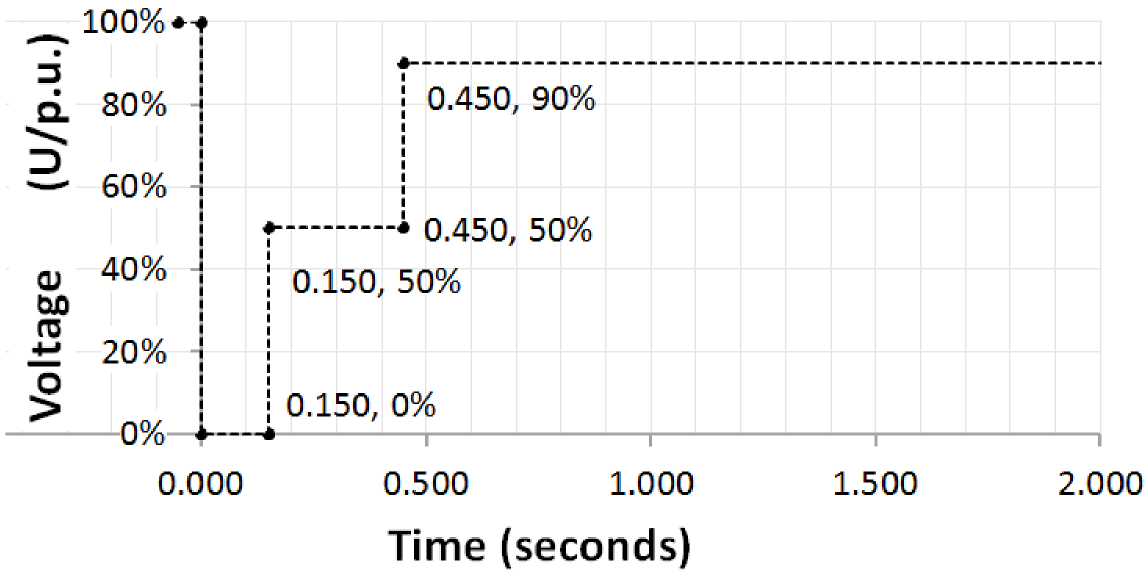

Figure CC.7.3.1.1.y: Voltage-against-time profile at the connection point for fault conditions

Following the fault clearance the **Generation Unit** should return to prefault conditions subject to its normal **Governor Control System** and **Automatic Voltage Regulator** response. The use of **Extraordinary Governor Response** and/or **Extraordinary AVR Response** to remain synchronised during and following a fault is prohibited unless specifically agreed with the **TSO**, such agreement not be unreasonably withheld.

(z) Capable of disconnecting automatically from the **Transmission System** in order to help preserve system security or to prevent damage to the **Generation Unit**. The **Generator** and the **TSO** shall agree on the criteria for detecting loss of angular stability or loss of control.

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(aa) Enter into an agreement with the TSO regarding technical capabilities of the **Generation Units** to aid angular stability under fault conditions.

(bb) Equipped with a facility to provide fault recording and monitoring of dynamic system behaviour. This facility shall record the following parameters:

— voltage;
— active power;
— reactive power; and
— frequency.

The **TSO** will specify the quality of supply parameters for fault recording and monitoring of dynamic system behaviour. The settings of the fault recording equipment and the communications protocols for the recorded data shall be agreed between the **Generator** and the **TSO**. The dynamic system behaviour monitoring shall include an oscillation trigger specified by the **TSO**, with the purpose of detecting poorly damped power oscillations. The facilities for quality of supply and dynamic system behaviour monitoring shall include arrangements for the **Generator** and the **TSO** to access the information.

(cc) With regard to the installation of devices for system operation and devices for system security, if the **TSO** considers that it is necessary for a **Generator** to install additional devices in order to preserve or restore system operation or security, the **TSO** and the **Generator** shall investigate that matter and agree on an appropriate solution.

(dd) The maximum admissible **Active Power** reduction from **Registered Capacity** with falling frequency shall be no greater than;

(i) Steady State Domain: 2% of the **Registered Capacity** at 50 Hz, per 1 Hz frequency drop, below 49.5 Hz; and

(ii) Transient Domain: 2% of the **Registered Capacity** at 50 Hz, per 1 Hz frequency drop, below 49 Hz.

and subject to the ambient condition correction curves as provided by each individual **Generation Unit** as well as other relevant technical factors as agreed between the **TSO** and the **Generator.**

For **Generation Units** 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.

For all applicable **Generation Units:**

(ee) The **Generation Unit** must be capable of starting up on **Secondary Fuel.** The **Generation Unit** must be capable of carrying out an online fuel changeover from **Primary Fuel** to **Secondary Fuel** at **Primary Fuel Switchover Output** in no greater than five hours. When operating on **Secondary Fuel**, the generator must be capable of operating on **Secondary Fuel** at no less than 90% of **Primary Fuel Registered Capacity**. The **Generation Unit** must also be capable of carrying out an online fuel changeover from **Secondary fuel** to **Primary Fuel** at **Secondary Fuel Switchover Output.**

(ff) The **Generation unit** must store sufficient stocks of **Secondary Fuel** equivalent to one, three or five days of continuous running at **Primary Fuel Registered Capacity** as defined by Clause CC.7.3.1.2. A minimum of one day of running at **Primary Fuel Registered Capacity** on **Secondary Fuel** must be stored at the **Generator Site**. The remainder of the **Secondary Fuel** stock requirement can be stored at an **Off-Site Storage Location**.

CC.7.3.1.2 A **Generation Unit** is designated as high merit or low merit by the **CRU**. The **Generation Unit** that is designated as high merit will be required to hold 5 days of **Secondary Fuel** stocks, low merit designated **Plant** will be required to hold 3 days of **Secondary Fuel** stocks. Other **Plant** as designated by the **CRU** will be required to hold **Secondary Fuel** stocks equivalent to one day continuous running at **Primary Fuel Registered Capacity**.

CC.7.3.1.3 **Users** shall install **Generation Unit** governors that comply with OC.4.3.4. **Users** shall not change frequency or load related control settings of **Unit** governors without agreement with the **TSO**.

CC.7.3.1.4 Notwithstanding CC.7.3.1.1 combustion turbine, 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 ensure that there are no unnecessary delays in responding to **Dispatch** instructions in accordance with the technical capabilities of the **Generation Plant**.

CC.7.3.1.5 Where the **TSO** approaches a **Generator**, the **Generator** will co-operate with the **TSO** 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 **Generation Unit(s)** or in advance of an anticipated loss of **Generation Unit(s)**. This shall be subject to the agreement of the **Generator** that the procedures are consistent with secure operation of the **Generator's Plant**, such agreement not to be unreasonably withheld.

CC.7.3.2 Where start-up time of **Generation Units** exceeds thirty minutes, they shall be designed to have the capability, where supply from the **Transmission System** is lost, to reduce output to match house load and sustain operation (i.e. tripping to **Auxiliaries**).

CC.7.3.2.1 In case of disconnection of the **Generation Unit** from the **Transmission System**, the **Generation Unit** shall be capable of quick re-synchronisation as agreed between the **TSO** and the **Generator.**

CC.7.3.2.2 Where start-up time of **Generation Units** exceeds fifteen minutes, they shall be designed to have the capability, where supply from the **Transmission System** is lost, to reduce output to match house load and sustain operation (i.e. tripping to **Auxiliaries**). **Generation Units** must be designed to trip to house load from any operating point in its **Reactive Power** capability. In this case, the identification of house load operation must not be based solely on the system operator's switchgear position signals.

CC.7.3.2.3 **Generation Units** shall be capable of continuing operation for 4 hours following tripping to house-load, irrespective of any auxiliary connection to the external **Transmission System**.

CC.7.3.3 **Control Synchronising** shall be provided by **Generators** at circuit breakers identified by the **TSO**, which, depending on the **Plant** configuration may include:

(a) the **Generation Unit** circuit breaker;

(b) the **Generator Transformer LV** and **HV** circuit breakers;

The **TSO** will provide to the **Generator** signals from the **TSO** 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**.

CC.7.3.4 The **Synchronising** facilities in CC.7.3.3 shall facilitate **Synchronising** under the following conditions:

(a) **Transmission System Frequency** within the limits 48.0 to 52.0 Hz;

(b) **Transmission System Frequency** within the limits 47.0 to 52.0 Hz;

(c) **Transmission System Voltage** within the limits as specified in CC.8.3.2, notwithstanding CC.7.3.6;

CC.7.3.5 Each **Generation Unit** shall be designed, where practicable, to mitigate the risk of common mode failure with other **Generation Units**. In particular each **Generation Unit** shall be designed so that it can operate with its essential auxiliaries supplied through a 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 **TSO**. Auxiliary supplies 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.

CC.7.3.6 **Reactive Power** capability

CC.7.3.6.1 Each **Generation Unit** shall have the following **Reactive Power** capability as measured at their alternator terminals:

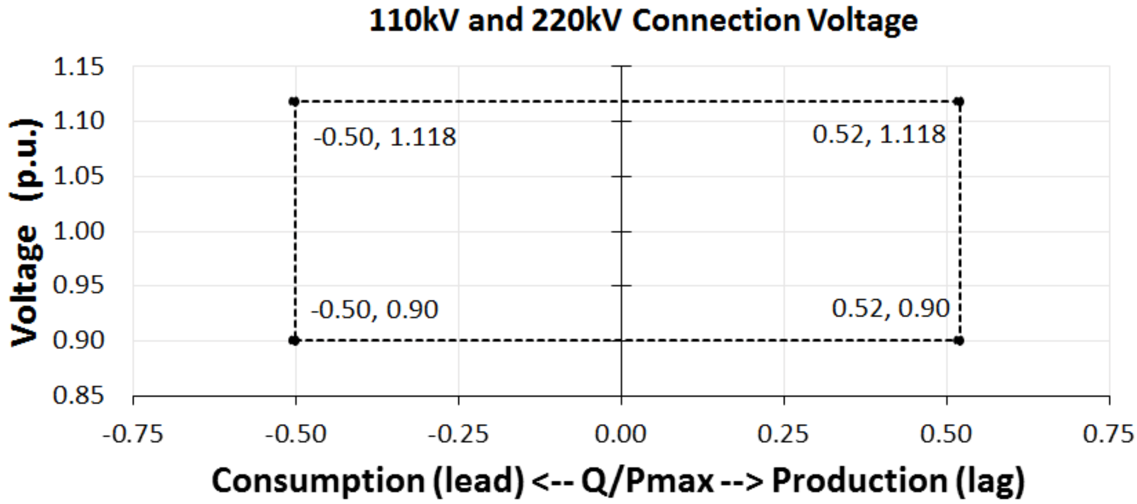
Voltage Range	Connected at:	At **Registered Capacity** between:	At 35% **of Registered Capacity** between:
99kV ≤ **V** ≤ 123kV	110kV	0.93 power factor leading to 0.85 power factor lagging	0.7 power factor leading to 0.4 power factor lagging
85kV ≤ **V** < 99kV		Unity power factor to 0.85 power factor lagging	0.7 power factor leading to 0.4 power factor lagging
200kV ≤ **V** ≤ 245kV	220kV	0.93 power factor leading to 0.85 power factor lagging	0.7 power factor leading to 0.4 power factor lagging
190kV ≤ **V** < 200kV		Unity power factor to 0.85 power factor lagging	0.7 power factor leading to 0.4 power factor lagging
360kV ≤ **V** ≤ 420kV	400kV	0.93 power factor leading to 0.85 power factor lagging	0.7 power factor leading to 0.4 power factor lagging
350kV ≤ **V** < 360kV		Unity power factor to 0.85 power factor lagging	0.7 power factor leading to 0.4 power factor lagging

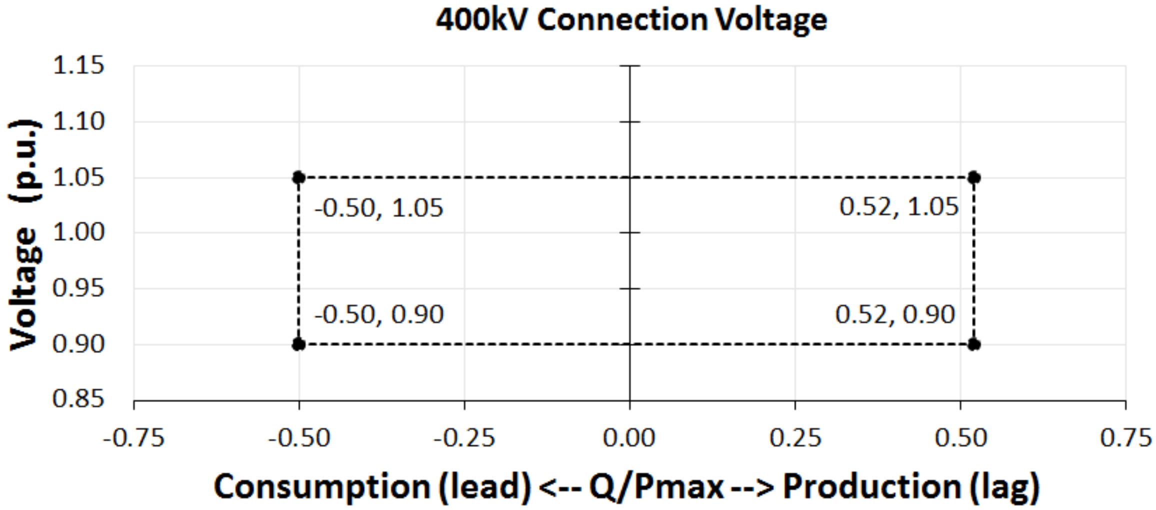
CC.7.3.6.2 At between **Registered Capacity** and 35% **Registered Capacity**, Mvar capability to be not less than indicated by a straight line drawn between the two points derived from the above, on a plot of Mvar capability against MW output.

CC.7.3.6.3 At below 35% **Registered Capacity**, Mvar capability to be not less than that at 35% **Registered Capacity**.

CC.7.3.6.4 The **Generator Transformer** shall be designed such that the **Reactive Power** capability is possible over the full range of **Transmission System Voltages** (specified in CC.7.3.6.1).

CC.7.3.6.5 **Generation Units** connecting to the **Transmission System** shall comply with the following **Reactive Power** requirements at **Registered Capacity** (P_{max}) at the **Connection Point**;





The **Generation Unit** shall be capable of moving to any operating point with its U-Q/P_{max} profile in appropriate timescale to target values. The appropriate timescale shall be identified during the **TSO's Connection Offer** process.

CC.7.3.6.6 The **TSO** and the **Generator** will liaise on matters related to CC.7.3.6 at the design stage.

CC.7.3.6.7 For **Generation Units** where the **Connection Point** is remote from the **Grid Connected Transformer**, any supplementary **Reactive Power** compensation required to offset the **Reactive Power** demand of the HV line, or cable, between the **Connection Point** and the **Generation Unit** shall be identified during the TSO's **Connection Offer** process.

CC.7.3.6.8 **Generation Units** shall be capable of providing **Reactive Power** at least down to **Minimum Generation**.

Even at reduced **Active Power** output, **Reactive Power** supply at the **Connection Point** shall correspond fully to the **Reactive Power** capability of that **Generation Unit**, taking the auxiliary supply power and the **Active** and **Reactive Power** losses of the step-up transformer, if applicable, into account.

In the event of power oscillations, **Generation Units** shall retain steady-state stability when operating at any operating point of the **Reactive Power** capability.

CC.7.3.7 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 OC.4. The governor must be designed and operated to the appropriate

(a) European Standards; or

(b) In the absence of a relevant European Standards, such other standard which is in common use within the European Union as at the time when the installation of which it forms a part was designed. Normal governor regulation shall be between 3% and 5%.

Generation Units shall be capable of setting governor regulation between 2% and 12%. The default governor regulation setting shall be 4%.

CC.7.3.8 All **Generation Units** shall be capable of contributing to control of **Transmission System Voltage** by continuous modulation of **Generator Voltage** by means of a suitable continuously 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 **TSO** prior to the **Connection Date**, such acceptance not to be unreasonably withheld.

CC.7.3.9 Each **Generator Transformer** shall have on-load tap changing facilities (OLTC). The tap step shall not alter the **Voltage** ratio at the **HV** terminals by more than:

(a) 2.5% on the 110kV system

(b) 1.6% on the 220kV and 400kV systems or as agreed with the **TSO.**

CC.7.4 Each **Demand Side Unit** shall, as a minimum, have the following capabilities:

(a) Able to provide **Demand Side Unit MW Response** between 0 MW and the **Demand Side Unit MW Capacity;**

(b) **Maximum Ramp Up Rate** not less than 1.67% per minute of **Demand Side Unit MW Response** as specified in the **Dispatch Instruction;**

(c) **Maximum Ramp Down Rate** not less than 1.67% per minute of **Demand Side Unit MW Response** as specified in the **Dispatch Instruction;**

(d) **Minimum Down Time** not greater than 30 minutes;

(e) **Maximum Down Time** not less than 2 hours**;**

(f) **Minimum off time** not greater than 2 hours;

(g) **Demand Side Unit MW Response Time** of not greater than 1 hour;

(h) maintain **Demand Side Unit MW Response** at **Transmission System**

Frequencies in the range 49.5Hz to 50.5Hz;

(i) maintain **Demand Side Unit MW Response** at **Transmission System Frequencies** within the range 47.5Hz to 49.5Hz and 50.5Hz to 52Hz for a duration of 60 minutes;

(j) maintain **Demand Side Unit MW Response** at **Transmission System Frequencies** within the range 47.0Hz to 47.5Hz for a duration of 20 seconds required each time the **Frequency** is below 47.5Hz; and

(k) maintain **Demand Side Unit MW Response** for a rate of change of **Transmission System Frequency** up to and including 0.5 Hz per second as measured over a rolling 500 milliseconds period.

On-site **Generation** operated in **Continuous Parallel Mode** or **Shaving Mode** that forms part of a **Demand Side Unit**, shall, as a minimum, have the following capabilities:

(l) operate continuously at normal rated output at **Transmission System Frequencies** in the range 49.5Hz to 50.5Hz;

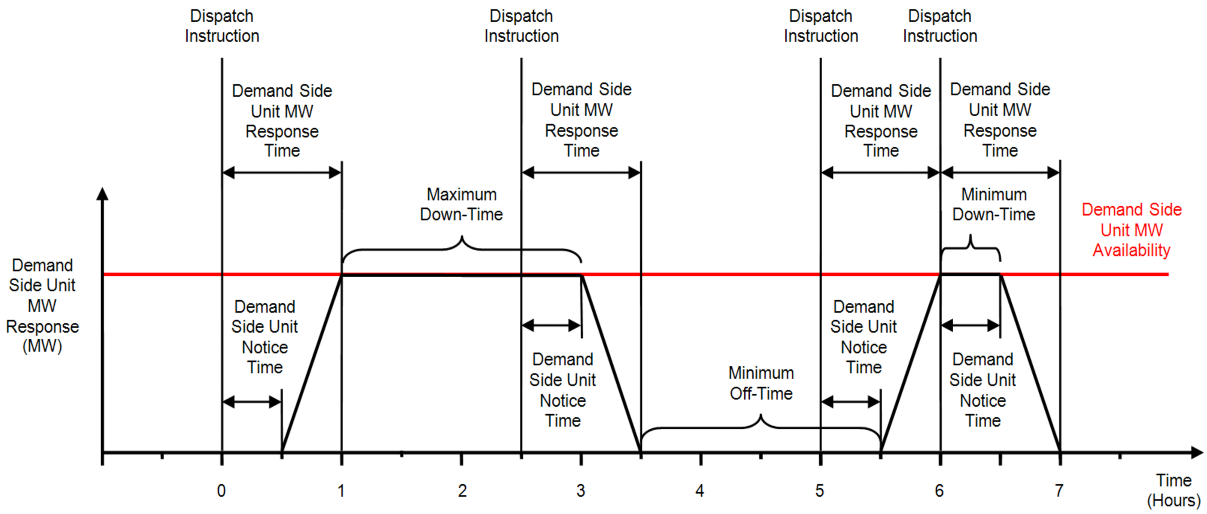
(m) remain synchronised to the **Transmission System** at **Transmission System Frequencies** within the range 47.5Hz to 52.0Hz for a duration of 60 minutes;

(n) remain synchronised to the **Transmission System** at **Transmission System Frequencies** within the range 47.0Hz to 47.5Hz for a duration of 20 seconds required each time the **Frequency** is below 47.5Hz; and

(o) remain synchronised to the **Transmission System** during a rate of change of **Transmission System Frequency** of values up to and including 0.5 Hz per second.

On-site **Generation** operated in **Lopping Mode** or **Automatic Mains Failure Mode** that forms part of a **Demand Side Unit**, shall, as a minimum, have the following capabilities:

(p) operate continuously at normal rated output at **Transmission System Frequencies** in the range 49.5Hz to 50.5Hz;



CC.7.4.2 **Demand Facilities, Closed Distribution Systems** and **Distribution Systems** shall:

CC.7.4.2.1 Remain synchronised to the **Transmission System** and operate within the frequency ranges and time periods specified in *Table CC.7.4.2.1*.

Table CC.7.4.2.1: Minimum Time Periods for ***Demand Facilities,*** **Closed Distribution Systems** and **Distribution Systems** *to Remain Operational without Disconnecting*

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

CC.7.4.2.2 Remain synchronised to the **Transmission System** and operate within the ranges of the **Transmission System Voltage** at the connection point, for an unlimited time period, as specified below:

(i) 400 kV system: 360 kV to 420 kV (0.9 p.u. – 1.05 p.u.)

(ii) 220 kV system: 198 kV to 245 kV (0.9 p.u. – 1.114 p.u.)

(iii) 110 kV system: 99 kV to 123 kV (0.9 p.u. – 1.118 p.u.)

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CC.7.4.2.3 **Demand Facilities** which alter their **MW** consumption at their **Connection Point**, based on changes in **Transmission System Frequency** and/or **Voltage**, shall co-ordinate and agree their controls, protection, triggers and/or settings with the **TSO** in advance of such alterations as appropriate.

CC.7.4.2.4 **Reactive Power**

CC.7.4.2.4.1. **Demand Facilities** without onsite generation shall be capable of maintaining their steady-state operation at their **Connection Point** within a **Reactive Power** range of 0 to 0.48 [Q_{max}/P_{MIC}] equal to a power factor of 1 to 0.9 lagging.

CC.7.4.2.4.2. **Demand Facilities** with onsite generation shall be capable of maintaining their steady-state operation at their **Connection Point** within a **Reactive Power** range of -0.48 [$Q_{min}/\max\{P_{MEC},P_{MIC}\}$] to 0.48 [$Q_{max}/P_{MEC}$] which is equal to a power factor of 0.9 lagging to 0.9 leading.

CC.7.4.2.4.3. The **Distribution System** shall be capable of maintaining steady-state operation at the **Connection Point** within a **Reactive Power** range of -0.48 $Q_{min}/\max\{P_{MEC},P_{MIC}\}$ during **Reactive Power** import/consumption, and 0.48 Q_{max}/P_{MEC} during **Reactive Power** export/production equal to a power factor of 0.9 lagging to 0.9 leading, except in situations where either technical or financial system benefits are proved by the **TSO** and the **DSO** through joint analysis. The **TSO** and **DSO** shall agree on the scope of such an analysis, which shall address the possible solutions, and determine the optimal solution for **Reactive Power** exchange between their systems, taking adequately into consideration the specific system characteristics, variable structure of power exchange, bidirectional flows and the **Reactive Power** capabilities in the **Distribution System**.

CC.7.4.2.4.4. The **TSO** may require a **Closed Distribution System or Distribution System** to have the capability at the **Connection Point** to not export **Reactive Power** (at reference 1 p.u. voltage) at an **Active Power** flow of less than 25 % of the **Maximum Import Capacity**. The request will be justified through a joint analysis with the **Closed Distribution System** or the **Distribution System Operator** and the **TSO**. If the requirement is not justified based on the joint analysis, the **TSO** and the **Closed Distribution System** or **Distribution System Operator** shall agree on necessary requirements according to the outcomes of the joint analysis.

CC.7.4.2.4.5. Without prejudice to CC.7.4.2.4.3, the **TSO** may require a **Closed Distribution System** or the **Distribution System** to actively control the exchange of **Reactive Power** at the **Connection Point** for the benefit of the entire system. The **TSO** and the **Closed Distribution System** or **Distribution System Operator** shall agree on a method to carry out this control, to ensure the justified level of security of supply for both parties. The justification shall include a roadmap in which the steps and the timeline for fulfilling the requirement are specified.

CC.7.4.2.4.6. The **Closed Distribution System** or **Distribution System Operator** may require the **TSO** to consider its **Closed Distribution System** or **Distribution System** for **Reactive Power** management.

CC.7.4.2.5 **Reconnection**

CC.7.4.2.5.1 The **TSO** will specify the conditions under which **Demand Facilities**, **Closed Distribution Systems** and **Distribution Systems** can reconnect following a **Disconnection**.

CC.7.4.2.5.2 **Demand Facilities**, **Closed Distribution Systems** and **Distribution Systems** shall facilitate **Synchronising** to the **Transmission System** within the limits 47 – 52.0 Hz.

CC.7.4.2.5.3 The **TSO** shall agree the settings for synchronisation devices with **Demand Facilities**, **Closed Distribution Systems** and **Distribution Systems** prior to connection.

CC.7.4.2.6 **Disconnection**

CC.7.4.2.6.1 **Demand Facilities**, **Closed Distribution Systems** and **Distribution Systems** shall be capable of remote **Disconnection** from the **Transmission System**. The equipment required for automated remote **Disconnection** will be specified by the **TSO**. The automated remote **Disconnection** system will be required to operate without any time delays, other than those inherent in the design of the system.

CC.7.4.2.7 **Short-circuit**

Demand Facilities, **Closed Distribution Systems** and **Distribution Systems** shall be capable of withstanding maximum short-circuit currents as specified in CC.8.6.

CC.7.5 INTERCONNECTOR

CC.7.5.1 The conditions specified in this section of the **Grid Code** apply to all **Interconnectors** connected to or connecting to the **Transmission System**. The provision of services affecting the **Transmission System** shall be in accordance with the **Interconnector Operating Protocol** as agreed with the **TSO** and the **External System Operator**.

CC.7.5.1.1 Each Interconnector, shall have the following minimum capabilities, for the avoidance of doubt, additional performance capabilities are required from OC.4 System Services:

(a) operate continuously at **MW Output** at **Transmission System Frequencies** in the range 49.5Hz to 50.5Hz;

(b) operate and remain connected to the **Transmission System** at **Transmission System Frequencies** within the range 47.5Hz to 52.0Hz;

(c) remain connected to the **Transmission System** at **Transmission System Frequencies** within the range 47.0Hz to 47.5Hz for a duration of 30 seconds required each time the Frequency is below 47.5Hz;

(d) remain connected to the **Transmission System** during rate of change of **Transmission System Frequency** of values up to and including 1 Hz per second;

(e) remain connected to the **Transmission System** at **MW Output** at **Transmission System Voltages** within the ranges specified in CC.8.3.2 for step changes in **Transmission System Voltage** of up to 10%;

(f) sustained operation in accordance with the **Reactive Power** capability referred to in CC.7.5.10 at **Transmission System Voltages** within the ranges specified in CC.8.3.2, unless otherwise specified;

(g) remain connected during and following **Voltage** dips at the **HV** terminals of the **Interconnector Transformer** of 95% of nominal **Voltage** (5% retained) for duration 0.2 seconds and **Voltage** dips of 50% of nominal **Voltage** (i.e. 50% retained) for duration of 0.6 seconds. Following the fault clearance the **Interconnector** should return to prefault conditions subject to normal **Frequency Response** and **Voltage Regulation**;

(h) operate within all normal operating characteristics at a minimum short circuit level at the **Connection Point** of 1000 MVA;

(i) remain connected to the **Transmission System** during a negative phase sequence load unbalance in accordance with IEC 60034-1;

(j) have support triggers to allow the **Interconnector** to provide **System Services** as outlined in OC.4;

(k) in **Emergency** capable of reversing the power flow on the **Interconnector** at a rate which shall be no less than the **Interconnector Registered Capacity** within five seconds, up to ten times during the life of the plant and no more than two

(l) times in any given twelve months;

(m) **Interconnector Minimum Load:** not greater than the lesser of 3% of the **Interconnector Registered Capacity** or 50 **MW**;

(n) **Interconnector Ramp-up Capability:** not less than the greater of 10% of the **Interconnector Registered Capacity** per minute or 50 **MW** per minute, when the **Interconnector** is in the **Normal Dispatch Condition**;

(o) **Interconnector Ramp-down Capability:** not less than the greater of 10% of the **Interconnector Registered Capacity** per minute or 50 **MW** per minute, when the **Interconnector** is in the **Normal Dispatch Condition;**

(p) **Forbidden Zones:** within the lesser range of between + and -
3% of the **Interconnector Registered Capacity** or 30 **MW** in
either flow direction and not more than 2 specified zones.

(q) **Block Load** for an **Interconnector:** not greater than the lesser of 3% of the **Interconnector Registered Capacity** or 30 **MW** in either flow direction.

(r) Time from off-line to **Interconnector Minimum Load** in either flow direction: Not greater than 30 minutes.

(s) Time from **Interconnector Minimum Load** in either flow direction to off-line: Not greater than 30 minutes.

(t) The **TSO** may request **Interconnectors** to have the capacity to operate under **AGC** at all loads between **AGC Minimum Load** and **AGC Maximum Load.**

(u) remain connected to the **Transmission System** and operate within the **Frequency** ranges and time priods specified in Table CC.7.5.1.1.

Table CC.7.5.1.1 Minimum Time Periods for Interconnectors to Remain Operational without Disconnecting for Different Frequency Ranges

Frequency range	***Time period for operation***
47 – 47.5 Hz	60 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

(v) For the remote end **Interconnector Converter Station**, this is the end connecting to the **Transmission System**, provisions of CC.7.5.1.1.(t), CC.7.5.1.3, CC.7.5.1.4 and CC.7.5.1.5 shall apply.remain connected to the **Transmission System** and operate during rate of change of **Transmission System Frequency** values between – 2.5 and + 2.5 Hz/s, as measured at any point in time as an average of the rate of change of **Frequency** for the previous 1 s.

(w) **Interconnector Converter Stations** shall remain synchronised to the **Transmission System** and operate within the ranges of the **Transmission System Voltage** at the connection point, for an unlimited time period, as specified below:

(i) 400 kV system: 360 kV to 420 kV (0.9 p.u. – 1.05 p.u.)
(ii) 220 kV system: 198 kV to 245 kV (0.9 p.u. – 1.114 p.u.)
(iii) 110 kV system: 99 kV to 123 kV (0.9 p.u. – 1.118 p.u.)

(x) A remote end **Interconnector Converter Station** shall remain connected to the remote end **Interconnector Converter Station** network and operate within the **Voltage** ranges and time periods specified below based on the reference 1 p.u. **Voltage**:

(i) **Voltage** base for p.u. values from 300kV to 400kV, both inclusive
0.85 p.u. – 0.9 p.u. (60 minutes)
0.9 p.u. – 1.05 p.u. (unlimited)
1.05 p.u. - 1.15 p.u. (not allowed)

(ii) **Voltage** base for p.u. values from 110kV (inclusive) to 300kV (not including)
0.85 p.u. – 0.9 p.u. (60 minutes)
0.9 p.u. – 1.12 p.u. (unlimited)
1.12 p.u. - 1.15 p.u. (not allowed)

Wider **Voltage** ranges or longer minimum times of operation may be agreed between the remote end network operator in coordination with the **TSO** and the DC connected **Controllable PPM** owner in accordance with PPM1.6.1.

For **Interconnector** interface point at AC **Voltages** other than the ranges given in points (i) and (ii) above, the remote end network operator in coordination with the **TSO** shall specify applicable requirements at the **Connection Points**.

Where frequencies other than nominal 50Hz are used, the **Voltag**e ranges and time periods specified in points (i) and (ii) above may be adjusted in coordination with the **TSO** and the adjustments shall be proportional to those given above.

(y) The **Interconnector** shall be capable of operating within the range of short circuit power and network characteristics specified by the **TSO**.

(z) The **Interconnector** shall be capable of finding stable operation points with a minimum change in **Active Power** flow and **Voltage** level, during and after any planned or unplanned change in the **Interconnector** or **Transmission System** to which it is connected. The **Interconnector** shall be capable of remaining stable for changes in the system conditions within the ranges defined in CC.7.5.1.1(t) and CC.7.5.1.1(v).

(aa) The **Interconnector Owner** shall ensure that the tripping or disconnection of an **Interconnector Converter Station**, as part of any multi-terminal or embedded **HVDC** system, does not result in transients at the **Connection Point** beyond the limit specified by the **TSO**.

(bb) The **Interconnector** shall be capable of adjusting its **Active Power** up to its **Registered Capacity**, following an instruction from the **TSO.** The minimum and maximum allowable step change in the **Active Power** shall be specified by the **TSO** on a case-by-case basis.

(cc) The **TSO** may, on a site-specific basis, specify that the **Interconnector** be capable of fast **Active Power** reversal. The **Active Power** reversal shall be possible from the maximum **Active Power** transmission **Capacity** in one direction to the maximum **Active Power** transmission **Capacity** in the other direction as fast as technically feasible and reasonably justified by the **Interconnector Owner** to the **TSO** if greater than 2 seconds.

CC.7.5.1.2 Where the **TSO** approaches an **Interconnector Operator**, the **Interconnector Operator** will co-operate with the **TSO** in the development of procedures and facilities to improve the response of each **Interconnector** during conditions of system stress. This shall be subject to the agreement of the **Interconnector Operator** that the procedures are consistent with secure operation of the **Interconnector Operator's Plant**, such agreement not to be unreasonably withheld.

CC.7.5.1.3 The **TSO** and **Interconnector Operator** may agree on a site-specific basis, wider **Frequency** ranges or longer minimum times for operation, if needed to preserve or to restore system security. If wider **Frequency** ranges or longer minimum times for operation are economically and technically feasible, the **Interconnector** shall not unreasonably withhold consent.

CC.7.5.1.4 An **Interconnector** shall be capable of automatic disconnection at frequencies specified by the **TSO** on a site-specific basis.

CC.7.5.1.5 The **TSO** may specify a maximum admissible **Active Power** output reduction from its operating point if the **Transmission System Frequency** falls below 49 Hz.

CC.7.5.1.6 Unless otherwise instructed by the **TSO**, during the energisation or synchronisation of an **Interconnector Converter Station** to the AC network or during the connection of an energised **Interconnector Converter Station** to an **Interconnector**, the **Interconnector Converter Station** shall have the capability to limit any **Voltage** changes to a steady-state level specified by the **TSO**. The maximum magnitude, duration and measurement window of the **Voltage** transient shall be specified on a site specific basis and shall not exceed 5 per cent of the pre-synchronisation **Voltage**.

CC.7.5.1.7 In the case where the **Interconnector** is connecting a DC-connected **Controllable PPM**, the remote end **Interconnector Converter Station**, shall be subject to the provisions of CC.7.5.1.1.(t), CC.7.5.1.3, CC.7.5.1.4 and CC.7.5.1.5 even if a nominal **Frequency** other than 50Hz, or a **Frequency** variable by design is used in the network connecting the DC-connected **Controllable PPM**.

CC.7.5.1.8 In the case where the **Interconnector** is connecting a DC-connected **Controllable PPM**, the remote end **Interconnector Converter Station Owner** and the **Generator** shall agree on the technical modalities of the fast signal communication in accordance with the provision of PPM1.5.3.1. Where the **TSO** requires, the **Interconnector** shall be capable of providing the network **Frequency** at the **Connection Point** as a signal.

CC.7.5.2 The **Interconnector Operator** must ensure that the reversal of flow capabilities is provided for such that the average **Interconnector Ramp Rate** from **Interconnector Registered Export Capacity** to **Interconnector Minimum Import Load** or **Interconnector Registered Import Capacity** to the **Interconnector Registered Export Capacity** of at least 50 **MW** per minute. For the avoidance of doubt this aggregate **Interconnector Ramp Rate** will include any time needed to pass through deadbands or **Forbidden Zones** of operation.

CC.7.5.3 The **Interconnector** will be able to connect to the **Transmission System** under the following conditions:

(a) **Transmission System Frequency** within the limits 48.0 to 52.0 Hz;

(b) **Transmission System Voltage** within the limits as specified in CC.8.3.2, notwithstanding CC.7.5.9;

(c) **Transmission System** Short Circuit Level at the point of connection no less than 1000 MVA.

Where supply from the **Transmission System** is temporarily lost, **Interconnectors** must be able to reconnect to the **Transmission System** and reach **Minimum Load** within 30 minutes of the **Transmission System** supply being restored.

CC.7.5.4 Each **Interconnector**:

(a) Must ensure that they do not cause any sub synchronous resonance, undamped oscillations or harmful shaft torsional oscillations to **Users** on the **Transmission System**. This shall be demonstrated by simulation prior to connection by the **Interconnector** using best industry practice as agreed by the **TSO**.

(b) Where it is determined by the **TSO** that the **Interconnector** does cause such harmful oscillations or resonances the operation of the **Interconnector** shall cease until a solution is agreed with the **TSO**;

(c) Where further studies are required to examine an oscillation or resonance issue there shall be an exchange of the necessary data between the **Interconnector Operator** and the **TSO**, such exchange of data shall not be unreasonably withheld. The **Interconnector Operator** shall provide a report to show the contribution that the **Interconnector** control system design will have on the torsional mode frequencies.

(d) Input provisions for addition of a future sub synchronous damping controller shall be made by the **Interconnector Operator**;

(e) When several **Interconnector Converter Stations** or other plant and equipment are in close electrical proximity, the **TSO** may specify control interaction studies on site specifc basis with defined scope and extent in order to demonstrate no adverse ineraction effect. The control interaction study shall identify possible mitigation actions to be implemented if adverse control interaction is identified.

(f) Shall be capable of contributing to electrical damping of torsional frequencies. The **TSO** shall specify on a case by case basis the necessary extent of subsynchronous torsional interaction studies. Subsynchronous torsional interaction studies shall identify conditions, if any, where torsional interaction exists and propose mitigation action.

(g) The **TSO** shall identify all relevant parties to participate in the control interaction and subsynchronous torsional interaction studies referred to in CC.7.5.4.(e) and CC.7.5.4.(f). The interaction studies shall be carried out by the connecting **Interconnector**. The **TSO** shall obtain all the relevant data from all identified parties including **TSO** system dynamic data and shall pass this to to the **Interconnector** carrying out the studies.

(h) The **TSO** shall assess the results of the control interaction and subsynchronous torsional interaction studies and, may request further studies in line with the scope and extent specified. The **TSO** may also review or replicate some of the control interaction and subsynchronous torsional interaction studies and in such a case, the **Interconnector Operator** shall provide all relevant data and models to the **TSO** to allow such study to be performed.

(i) Any mitigating actions identified as part of the control interaction and subsynchronous torsional interaction studies and reviewed by the **TSO** shall be undertaken by the **Interconnector Owner** as part of the connection of the new **Interconnector Converter Station**.

(j) The **TSO** may specify transient levels of performance associated with events for the invidual **Interconnector** or collectively across commonly impacted **Interconnector** systems in order to protect the integrity of both **TSO** equipment and that of **Users.**

(k) Shall be capable of contributing to the damping of power oscillations in the connected AC networks. The control system of the **Interconnector** shall not reduce the damping of power oscillations. The **TSO** shall specify a **Frequency** range of oscillations that the control scheme shall positively damp along with the network conditions resulting in such a condition taking into account potential stability problems on a site specifc basis. The selection of the control parameter settings shall be agreed between the **TSO** and the **Interconnector**.

CC.7.5.5 Each **Interconnector** must be capable of:

(a) contributing to **Frequency Control** by continuous modulation of **Active Power** supplied to the **Transmission System**;

(b) contributing to **Voltage Control** by continuous changes to the **Reactive Power** supplied to the **Transmission System**;

CC.7.5.6 **Users** shall install Interconnector controllers that comply with OC.4 **System Services**. **Users** shall not change **Frequency** or load related control settings of the **Interconnector** controllers without agreement with the TSO.

CC.7.5.7 Standards for Frequency Response

CC.7.5.7.1 Each **Interconnector** must be fitted with a fast acting control device to provide **Frequency Response** under normal operating conditions in accordance with OC.4.3. The control device must be designed and operated to the appropriate:

(a) European Standards; or

(b) In the absence of a relevant European Standards, such other standard which is in common use within the European Union; and

(c) **Interconnection Agreement**.

CC.7.5.8 Interconnector Frequency Response

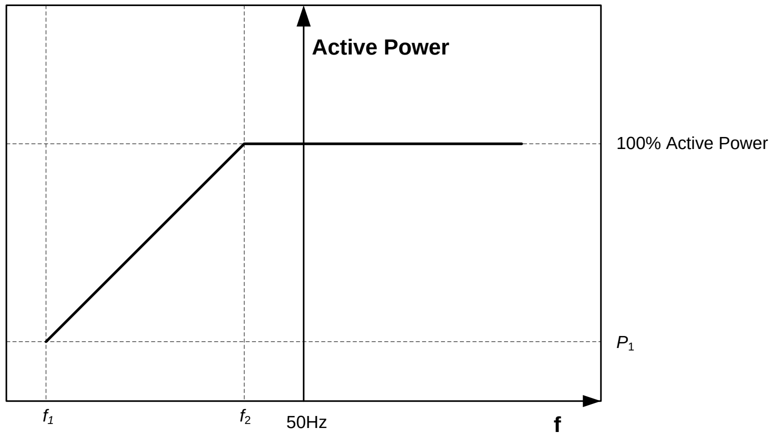
CC.7.5.8.1 An **Interconnector** must be capable of maintaining its **Active Power** output (i.e. when operating in Import mode) to the **Transmission System** at a level not less than the amount determined by the linear relationship shown in the figure below for **System Frequency** changes within the range f_1 to f_2 Hz, such that if the **System Frequency** drops to f_1 Hz the **Active Power** output shall not decrease by more than 100 - P_1 where P_1 is the upper **Active Power** limit as a percentage of the **Active Power** output before the **Frequency** change event, where;

(i) $f_2 \geq f_1$

(ii) $48Hz \leq f_1 \leq 50Hz$

(iii) $48Hz \leq f_2 \leq 50Hz$

(iv) $95\% \leq P_1 \leq 100\%$ Active Power



Settings for each of f_1, f_2 and P_1 shall be specified by the **TSO** at least 120 **Business Days** prior to the **Interconnector's** scheduled **Operational Date**. The **Interconnector Operator** shall be responsible for implementing the appropriate settings during **Commissioning**.

Alterations to these settings may be requested in real-time by the **TSO** and the implementation of the settings shall commence within 10 seconds of receipt of the signal from the **TSO**.

Note: This clause is in addition to any other obligations for **Frequency** Performance that the **Interconnector** may already have.

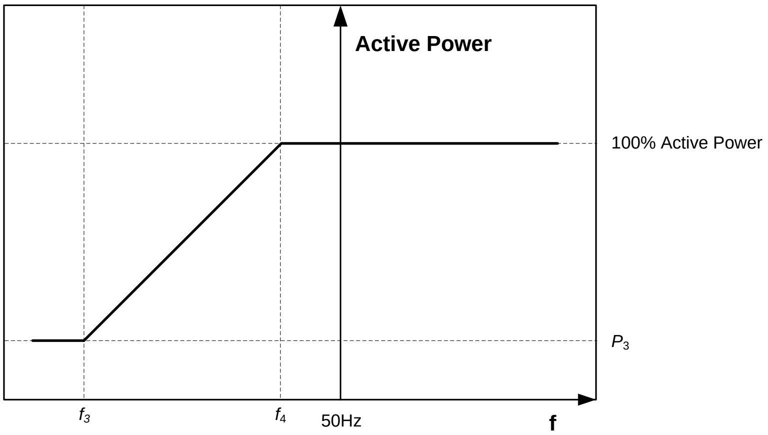
CC.7.5.8.2 An **Interconnector** must be capable of maintaining its **Active Power** input (i.e. when operating in Export mode) from the **Transmission System** at a level not greater than the amount determined by the linear relationship shown in the figure below for **System Frequency** changes within the range f_3 to f_4 Hz, such that if the **System Frequency** drops to f_3 Hz the **Active Power** input decreases by more than 100 - P_3 where P_3 is the lower **Active Power** limit as a percentage of the **Active Power** output before the frequency change event, where;

(i) $f_4 \geq f_3$

(ii) $48Hz \leq f_3 \leq 50Hz$

(iii) $48Hz \leq f_4 \leq 50Hz$

(iv) $0\% \leq P_3 \leq 100\%$ Active Power



Settings for each of f_3, f_4 and P_3 shall be specified by the **TSO** at least 120 **Business Days** prior to the **Interconnector's** scheduled **Operational Date**. The **Interconnector Operator** shall be responsible for implementing the appropriate settings during **Commissioning**.

Alterations to these settings may be requested in real-time by the **TSO** and the implementation of the settings shall commence within 10 seconds of receipt of the signal from the **TSO**.

Note: This clause is in addition to any other obligations for **Frequency** Performance that the **Interconnector** may already have.

CC.7.5.8.3 At the **Grid Connection Point** the **Active Power** output under steady state conditions of any **Interconnector** directly connected to the **Transmission System** should not be affected by **Voltage** changes in the normal operating range specified by more than the change in **Active Power** losses at reduced or increased **Voltage**. The **Reactive Power** output under steady state conditions should be fully available at normal operating range.

CC.7.5.8.4 The **Frequency Deadband** for all **Interconnectors** should be no greater than 0.03Hz (for the avoidance of doubt, ±0.015Hz).

CC.7.5.8.5 The **TSO** shall specify, on a site-specific basis, how an **Interconnector** shall be capable of modifying the transmitted **Active Power** infeed in case of disturbances into one or more of the AC networks to which it is connected. If the initial delay prior to the start of the change is greater than 10 milliseconds from receiving the triggering signal sent by the **TSO**, it shall be reasonably justified by the **Interconnector** to the **TSO**.

CC.7.5.8.6 An **Interconnector** shall limit its loss of **Active Power** injection in a synchronous area to a value specified by the relevant **TSOs** for their respective load **Frequency** control area, based on the **Interconnector's** impact on the power system. The value will be specified on a site-specific basis.

Where an **Interconnector** connects two or more control areas, the relevant TSOs will consult each other in order to set a coordinated value, on a case-by-case basis, of the maximum loss of **Active Power** injection, taking into account common mode failures.

CC.7.5.8.7 In the case where the **Interconnector** is connecting a DC-connected **Controllable PPM**, the adjustment of **Active Power Frequency** response shall be limited by the capability of the DC-connected **Controllable PPM**.

CC.7.5.9 Automatic Voltage Regulation

CC.7.5.9.1 All **Interconnectors** (excluding **Current Source Technology**) shall be capable of contributing to control of **Transmission System Voltage** by continuous modulation of **Interconnector Voltage** by means of a suitable continuously acting **Automatic Voltage Regulation (AVR)** which shall be in accordance with European Standards and the characteristics of which have been accepted by the **TSO** prior to the **Connection Date**, such acceptance not to be unreasonably withheld.

Interconnectors using **Current Source Technology** shall be capable of meeting the **Reactive Power** requirements to satisfy unity **Power Factor** at rated **MW** import / export at the **Connection Point**.

CC.7.5.9.2 The **Voltage Regulation System** shall be capable of receiving a **Voltage Regulation 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 **Interconnector's Reactive Power** output, within its **Reactive Power** range. A change to the **Voltage Regulation Set-point** shall be implemented by the **Interconnector** within 20 seconds of receipt of the appropriate signal from the **TSO**.

CC.7.5.9.3 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 **TSO** at least 120 **Business Days** prior to the **Interconnector's** scheduled **Operational Date.** The **Interconnector** shall be responsible for implementing the appropriate settings during **Commissioning**. The slope setting may be varied from time to time depending on **Transmission System** needs. The **TSO** shall give the **Interconnector** a minimum of 1 **Business Days** notice if a change is required. The **Interconnector** shall formally confirm that any requested changes have been implemented within 1 **Business Days** of receiving the **TSO's** formal request.

CC.7.5.9.4 The speed of response of the **Voltage Regulation System** shall be such that, following a step change in **Voltage** at the **Connection Point** the **Interconnector** 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.

CC.7.5.9.5 An **Interconnector Converter Station** shall be capable of implementing the following **Reactive Power** control modes which shall be available to the **TSO:**

(a) The speed of response of the **Voltage Regulation System** shall be such that, following a step change in **Voltage** at the **Connection Point** the **Interconnector Converter Station** shall achieve 90 % of its steady-state **Reactive Power** response within 1 second. The **Reactive Power** must settle at the steady-state **Reactive Power** response within 5 seconds, with a steady-state **Reactive Power** tolerance no greater than 5 % of the maximum **Reactive Power**.

Subject to agreement with **TSO**, the **Voltage Regulation Set-point** may be operated with or without a deadband selectable in a range from zero to ±5% of reference 1 p.u. **Transmission System Volta**ge, with continuous setting.

Voltage Regulation Set-point shall include the capability to change **Reactive Power** output based on a combination of a modified set-point **Voltag**e and an additional instructed **Reactive Power** component. The **TSO** will specify a slope with a range and step on a site-specific basis.

(b) **Reactive Power** control (Q) set-point to maintain the **Reactive Power** set-point at the **Connection Point**. The **Interconnector Converter Station** shall be capable of setting the **Reactive Power** set-point at least within the **Reactive Power** range specified in CC.7.5.10, and controlling the **Reactive Power** at the **Connection Point** to an accuracy within ± 5 % of the **Reactive Power** set-point. The required **Reactive Power** range shall be agreed and co-ordinated between the **TSO** and the **Interconnector** owner;

(c) **Power Factor** control (PF) set-point to maintain the **Power Factor** set-point at the **Connection Point**. The **Interconnector Converter Station** shall be capable of controlling the **Reactive Power** at least within the **Reactive Power** ranges specified in CC.7.5.10, with maximum setting steps as specified by the **TSO** but no greater than 0.01 p.u.;

(d) The maximum **Voltage** step allowed at the **Connection Point** due to operation of the **Reactive Power** control modes is 0.03 p.u..

(e) An **Interconnector Converter Station** shall be capable of operating in additional **Reactive Power** control modes specified by the **TSO**.

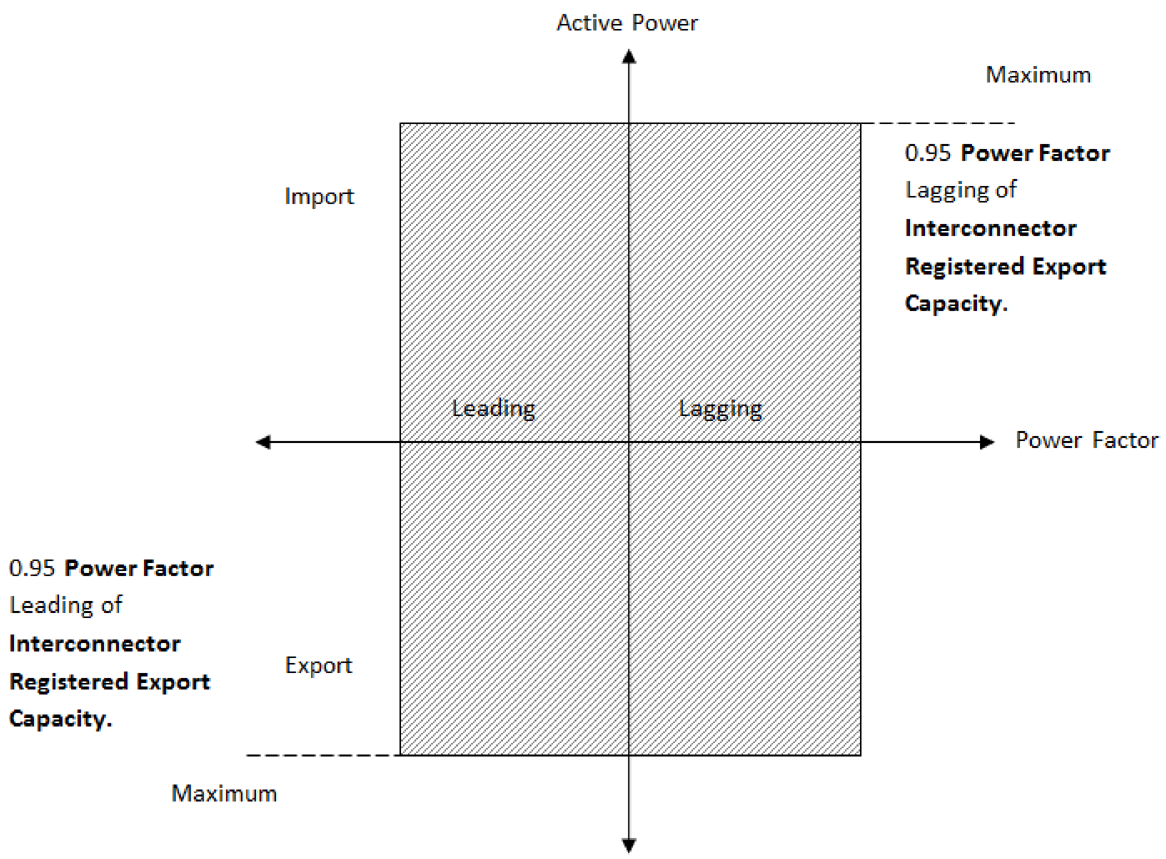
(f) The **TSO** shall specify any equipment needed to enable the remote selection of **Reactive Power** control modes and set-points.

CC.7.5.10 Interconnector Reactive Power

(a) There is a requirement for a continuously-acting automatic control system to provide control of the **Voltage** (or zero transfer of **Reactive Power** as applicable for **Current Source Technology**) at the **Grid Connection Point** without instability over the entire operating range of the **Interconnector**.

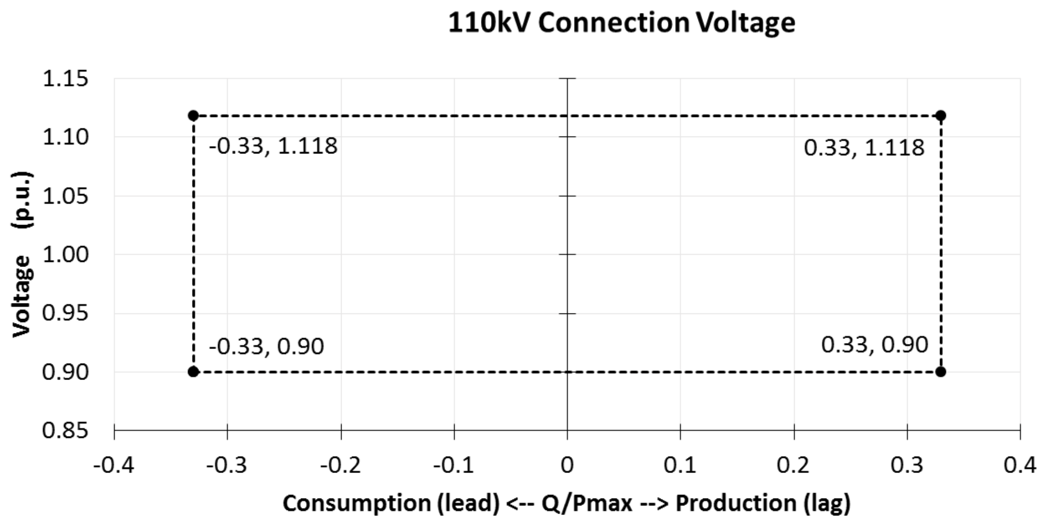
(b) An **Interconnector** must be capable of maintaining zero transfer of **Reactive Power** at the **Grid Connection Point** at all **Active Power** output levels under steady state **Voltage** conditions. The steady state tolerance on **Reactive Power** transfer to and from the **Transmission System** expressed in **Mvar** shall be no greater than 5% of the rated **MW**.

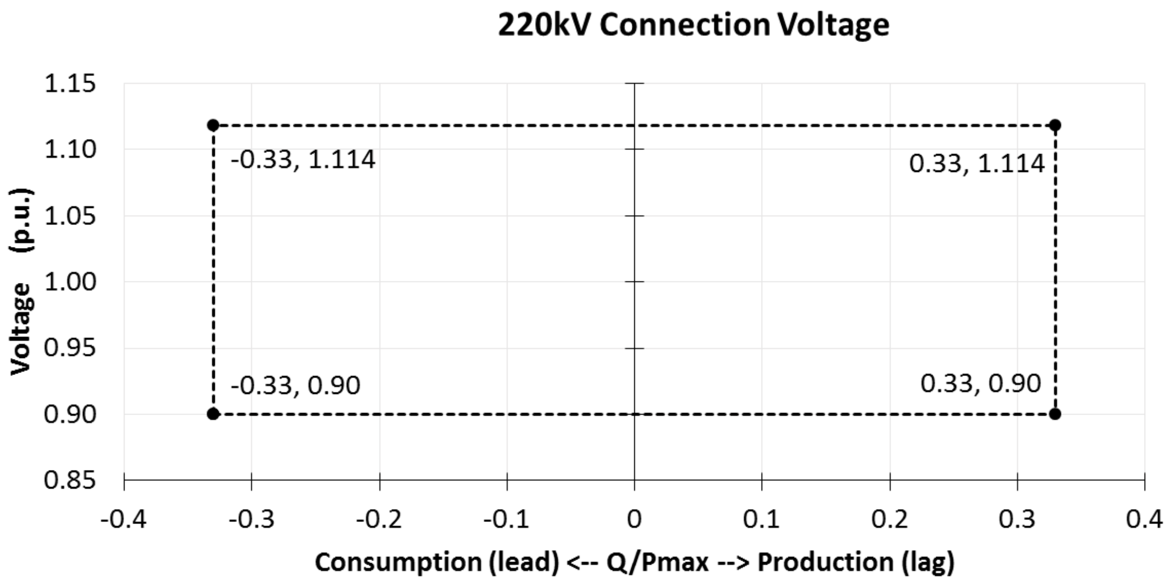
(c) An **Interconnector** (excluding **Current Source Technology**) must be capable of supplying rated **MW** import / export at any point between the limits 0.95 **Power Factor** lagging and 0.95 **Power Factor** leading based on the **Interconnector Registered Export Capacity** at the **Connection Point.** For the avoidance of doubt, **Interconnectors** shall be capable of operating at any point within the shaded section for the **Power Factor** ranges for **Registered Import Capacity** or **Registered Export Capacities** illustrated in Figure CC.7.5.10. The box shape is defined by the higher figure between **Interconnector Registered Import Capacity** and **Interconnector Registered Export Capacity**.



(d) An **Interconnector Converter Station** connecting to the **Transmission System** shall be capable of providng **Reactive Power** as per the following requirement at its maximum **Active Power** transmission capacity (at **Active Power** less than or equal to **Registered Capacity** (Pmax)) at the **Connection Point**.

The **Reactive Power** variation by the **Reactive Power** control mode of the **Interconnector Converter Station** shall not result in a **Voltage** step exceeding 0.03 pu at the connection point.

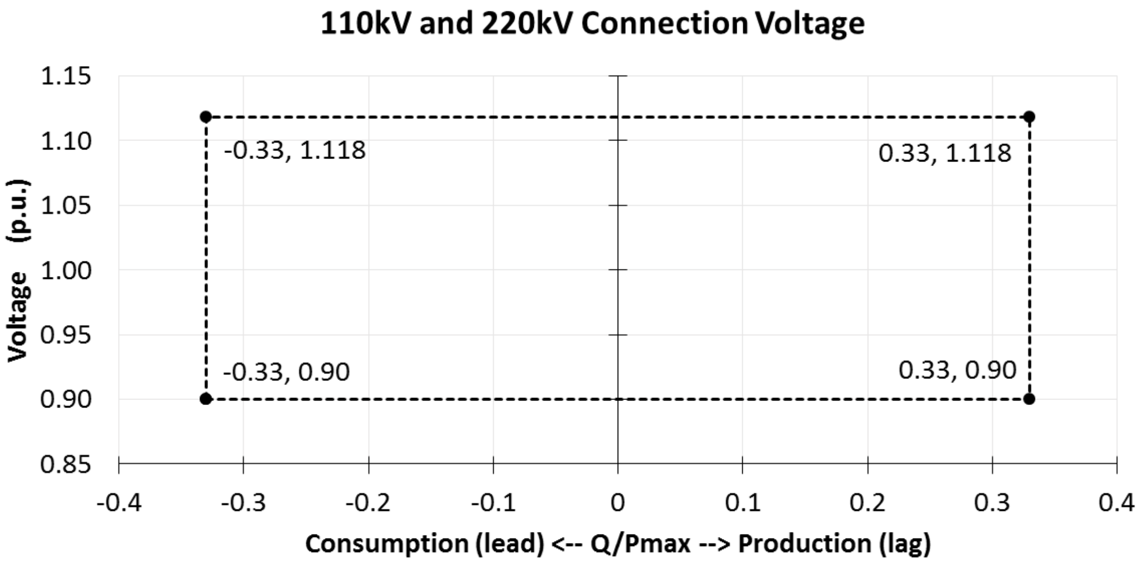


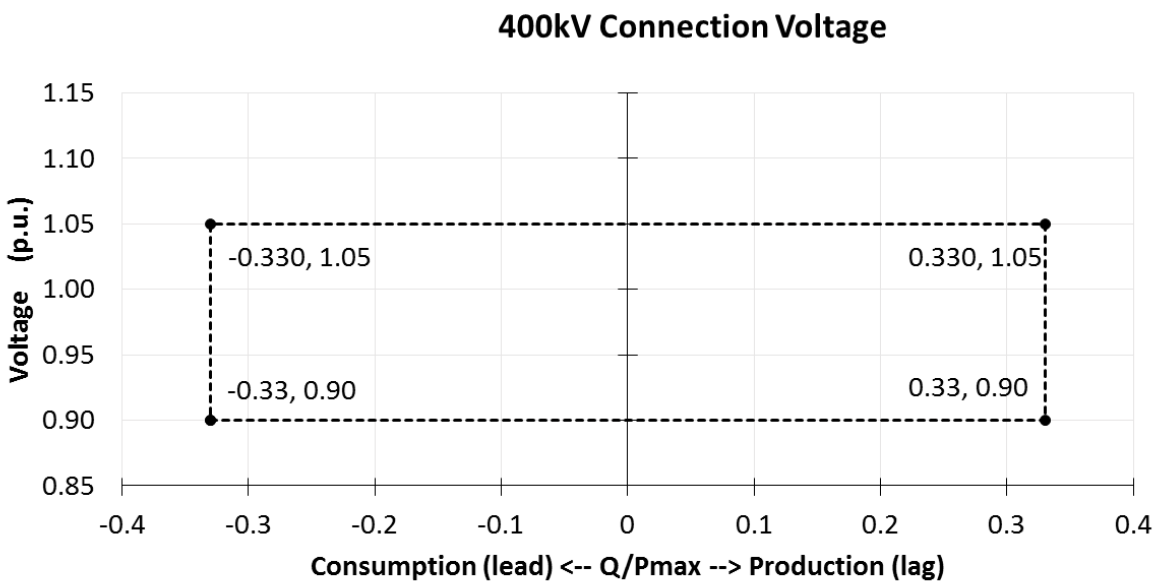


An **Interconnector** shall be capable of moving to any operating point within their U-Q/P_{max} profile, without undue delay, and shall be capable of moving from its minimum **Reactive Power** capability Q_{min}/P_{max} (Import/Lead) to its maximum **Reactive Power** capability Q_{max}/P_{max} (Export/Lag) within 120 seconds, depending on **the Active Power** output.

(e) The **Interconnector** shall ensure that the reactive power of its **Interconnector Converter Station** exchanged with the **Transmission System** at the **Connection Point** is limited to values specified by the **TSO**.

(f) A remote end **Interconnector Converter Station** shall be capable of providing **Reactive Power** as per the following requirement at its maximum **Active Power** transmssion capacity (Pmax) at the **Connection Point**:





CC.7.5.11 **Interconnection Agreement**

CC.7.5.11.1 The **Interconnection Agreement** shall consist of an **Interconnector Operating Protocol** between at least, the **TSO** and the **External System Operator** but may include the **Interconnector Operator.** The agreement shall provide operational details; requirements and services affecting the **System** and the **External System.** For clarity, this shall not supersede any other agreements and is required to ensure **System** Security when operating the **Interconnector.** The **Interconnection Agreement** shall be agreed not less than 6 months prior to operation.

CC.7.5.12 **Fault Ride Through**

CC.7.5.12.1 **Interconnector Converter Stations** connected to the **Transmission System** shall be capable of staying connected to the **Transmission System** and continuing to operate stably during symmetric and asymmetric **Voltage Dips**. The voltage-against-time profile specifies the required capability for the minimum **Voltage** and **Fault Ride-Through Time** at the **Connection Point** before, during and after the **Voltage Dip**. That capability shall be in accordance with the voltage-against-time profile as specified in Figure CC.7.5.12.

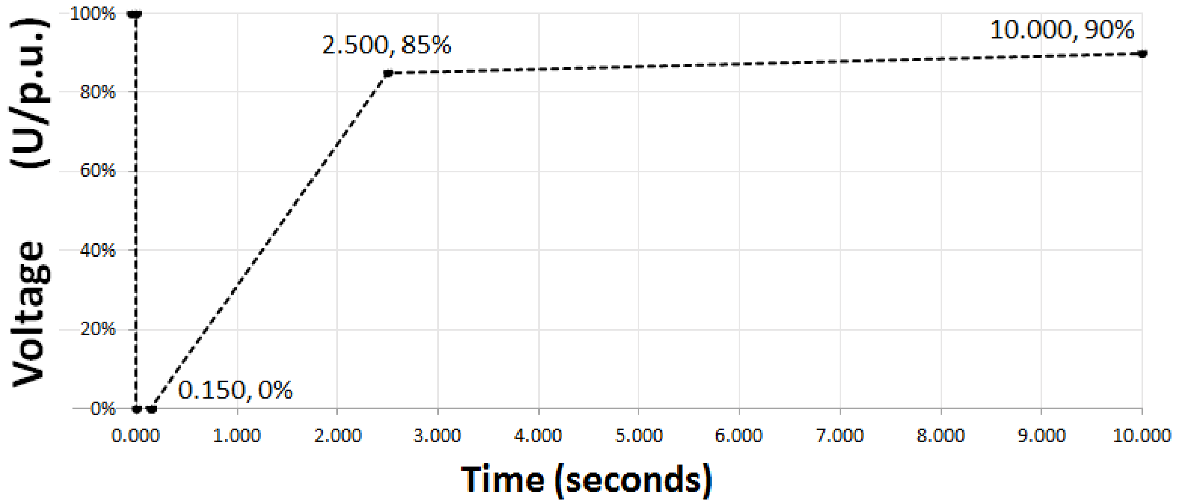


Figure CC.7.5.12: Voltage-against-time profile at the Connection Point for symmetric amd asymmetric fault conditions

Upon request by the **Interconnector Operator**, the **TSO** shall specify the pre-fault and post-fault conditions for the fault-ride-through capability. This includes;

(i) the calculation of the pre-fault minimum short circuit capacity at each **Connection Point** expressed in MVA;

(ii) pre-fault active and **Reactive Power** operating point of the **Interconnector Converter Station** at the **Connection Point** and **Voltage** at the **Connection Point**; and

(iii) calculation of the post-fault minimum short circuit capacity at each **Connection Point** expressed in MVA.

With regards to network characteristics at the remote end, the **Interconnector Converter Station** owner at the remote end shall provide the relevant data to a DC connected **Controllable PPM** owner in accordance with the provisions of PPM1.4.2.(f).

CC.7.5.12.2 **Interconnector Converter Stations** may disconnect from the **Transmission System** if the protection scheme for internal faults requires to do so. The protection scheme for internal faults shall be designed not to jeopardise fault-ride-through performance.

CC.7.5.12.3 The **TSO** may specify **Voltages** (U_{block}) at the **Connection Point**, on a site-specific basis, whereby the **Interconnector** is allowed to block, and remain connected to the **Network** with no active and **Reactive Power** contribution for a time frame that shall be as short as technically feasible and which shall be agreed between the **TSO** and the **Interconnector** owner.

CC.7.5.12.4 During **Voltage Dips**, the reactive current response shall be supplied within the rating of **Interconnector Converter Station**, with a **Rise Time** no greater than 100ms and a **Settling Time** no greater than 300ms.

CC.7.5.12.5 During and after faults, priority shall always be given to **Active Power** and not **Reactive Power.**

CC.7.5.12.6 The **Interconnector** shall reach its **Active Power** set-point as quickly as the technology allows and in any event within 500 ms of the **Transmission System Voltage** recovering to 90% of nominal **Voltage**, for **Fault Disturbances** cleared within 500 ms. For longer duration **Fault Disturbances**, the **Interconnector** shall provide at least 90% of its **Active Power** set-point within 1 second of the **Transmission System Voltage** recovering to 90% of the nominal **Voltage.**

CC.7.5.12.7 **Interconnectors** shall be capable of fast recovery from transient faults within the **Interconnector's** system.

CC.7.5.12.8 The **Interconnector** shall withstand transient faults on HVAC lines in the **Transmission System** it is connected to, and shall not cause any of the equipment in the **Interconnector** to disconnect from the Transmission System due to autoreclosure of lines in the network.

CC.7.5.12.9 The **Interconnector Owner** shall provide information to the **TSO** on the resilience of the **Interconnector** to **Transmission System** disturbances.

CC.7.5.12.10 The **Interconnector** shall be equipped with a facility to provide fault recording and monitoring of dynamic system behaviour for each of its **Interconnector Converter Stations**. This facility shall record the following parameters:

— AC and DC **Voltage**;

— AC and DC current;

— **Active Power**;

— **Reactive Power**; and

— **Frequency**.

The **TSO** will specify the quality of supply parameters for fault recording and monitoring of dynamic system behaviour. The particulars of the fault recording equipment including analogue and digital channels, the settings, including trigger

criteria, the sampling rates and the communications protocols for recorded data shall be agreed between the **Interconnector** and the **TSO**. The dynamic system behaviour monitoring shall include an oscillation trigger specified by the **TSO**, with the purpose of detecting poorly damped power oscillations. The facilities for quality of supply and dynamic system behaviour monitoring shall include arrangements for the **Interconnector** and the **TSO** to access the information electronically.

CC.8 TRANSMISSION SYSTEM PERFORMANCE

CC.8.1 The **TSO** shall in accordance with **Prudent Utility Practice** plan, design and operate the **Transmission System** so as to endeavour to maintain the performance targets at the **Connection Point** as set out in this CC.8.

CC.8.2 **Transmission System Frequency**

CC.8.2.1 The **Transmission System Frequency** is nominally 50 Hz:

(a) Normal operating range: 49.8 to 50.2 Hz.

(b) During **Transmission System** disturbances: 48.0 to 52.0 Hz.

(c) During exceptional **Transmission System** disturbances: 47.0 to 52.0 Hz.

CC.8.3 **Transmission System Voltages**

CC.8.3.1 The **Transmission System Voltages** are nominally 400kV, 220kV and 110kV. Normal operating ranges are:

(a) 400kV system: 370kV to 410kV;

(b) 220kV system: 210kV to 240kV;

(c) 110kV system: 105kV to 120kV.

CC.8.3.2 During **Transmission System** disturbances or following transmission faults:

(a) 400kV system: 350kV to 420kV;

(b) 220kV system: 200kV to 245kV;

(c) 110kV system: 99kV to 123kV.

Some **Transmission System** disturbances (e.g. earth faults, lightning strikes) will result in short-term **Voltage** deviations outside the above ranges.

CC.8.4 The negative phase-sequence component of the phase **Voltage** of the **Transmission System Voltages** will generally not exceed 1% under normal operating conditions.

CC.8.5 The **Transmission System** is an effectively earthed neutral system with an earth fault factor less than 1.4.

CC.8.6 The **Transmission System** is designed and operated to maintain the **Initial Symmetrical Short-Circuit Current** below the following:

(a) 50kA on the 400kV system;
(b) 40kA on the 220kV system;
(c) 25 kA on the 110 kV system generally;
(d) 31.5 kA at designated locations on the 110kV system.

The **TSO** shall notify any **User** with a connection to the **Transmission System** at a location to which item (d) above applies that the location is so designated.

The **TSO** shall publish annually a list of locations designated in accordance with item (d) above.

CC.9 METERING

CC.9.1 **Metering Equipment** shall be installed at **User Sites** in accordance with the provisions of the **Connection Agreement** and to the standards defined in the **Metering Code**.

CC.10 USER PROTECTION AND POWER QUALITY

CC.10 shall apply to the **DSO, Generators, Interconnectors** and **Demand Customers**.

CC.10.1 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 **Transmission 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:

(a) 120 milliseconds for the 110 kV system;
(b) 100 milliseconds for the 220 kV system; and
(c) 80 milliseconds for the 400 kV system.

These clearance times are from primary protection systems only. Without limiting this obligation, a **User** shall as a minimum prior to connection of the **User's System** to the **Transmission System** install and maintain, in accordance with **Good Industry Practice**, the protection equipment specified in CC.10.8 and CC.10.9.

CC.10.2 For the avoidance of doubt, the adequacy of protection equipment installed by the **User** for protecting the **User's Plant** and **Apparatus** against **Transmission System** disturbances is for the **User** to determine. It should also be noted that the **TSO's** requirements are primarily intended to protect the **Transmission System** facilities, although they afford a level of protection to **Users** they are not primarily designed to protect **User's** facilities.

CC.10.3 For the purpose of CC.10.1 the minimum protection requirements for a **User** facility connecting to the **Transmission System** will vary according to type, size, **Earthing** and method of connection. **User** protection required by the **TSO** should always be in service when associated plant is in service.

CC.10.4 It should be noted that high speed automatic reclosing (HSAR) is a feature of **Transmission System** operation. This feature is characterised by the sudden re-energisation of the power supply after a dead time of approximately 600 milliseconds. All tripping and high speed reclosing on the 110 kV **System** is three pole. Tripping and high speed reclosing on the 220 kV and 400 kV Systems is a combination of single pole and three pole.

CC.10.5 It is recommended that **Users** take precautions against disturbances on the **Transmission System** including without limitation protection against:

(a) load unbalance (negative sequence) protection;

(b) over/under-voltage;

(c) over/under-frequency;

(d) a combination of (b) and (c) that may result in overfluxing; and

(e) high speed automatic reclosing (HSAR), where applicable.

Users may consult with the **TSO** with respect to protection adequacy.

CC.10.6 In order to ensure secure operation of the **Transmission System** and correct co-ordination and discrimination between faults on the **Transmission System** and the **Distribution System** and **User Systems**, settings for **User's** protection systems that may have an **Operational Effect,** shall be notified to the **TSO** and it will be necessary for the **TSO** to, and the **TSO** may, prohibit the settings of some **User** protection systems within certain ranges. Protection systems 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.

CC.10.7 The **TSO** shall provide to 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 CC.7.2.5.6.

CC.10.8 Where it is feasible to do so, the **TSO** shall provide circuit breaker fail protection on **Grid Connection Point** circuit breakers installed in new transmission stations.

CC.10.9 **Generators**

CC.10.9.1 **Generators** shall 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 **Transmission System**) on **Generation Units.** The **TSO** 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.

CC.10.9.2 The **TSO** may require an individual **Generator,** or group of **Generators**, to install additional protection and/or control schemes, where the **TSO** can reasonably show that it is prudent or necessary to do so. These schemes may include but are not limited to the following:

(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.

CC.10.9.3 Distance protection shall be provided by the **TSO** on the **Grid Connection Point** circuit breaker of **Generator Transformers**.

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CC.10.9.4 The schemes and settings of the different control devices of the **Generation Units** that are necessary for **Transmission System** stability and for taking emergency action shall be coordinated and agreed between the **TSO** and the **Generator**. Any changes to the schemes and settings, of the different control devices of the **Generation Units** shall be coordinated and agreed between the **TSO** and the **Generator.**

CC.10.9.5

(a) The **TSO** shall specify the schemes and settings necessary to protect the **Transmission System**, taking into account the characteristics of the **Generation Units**. The protection schemes needed for the **Generation Units** and the

Transmission System as well as the settings relevant to the **Generation Units** shall be coordinated and agreed between the **TSO** and the **Generator**. The protection schemes and settings for internal electrical faults must not jeopardise the performance of a **Generation Unit**.

(b) Electrical protection of the **Generation Units** shall take precedence over operational controls, taking into account the security of the system and the health and safety of staff and of the public, as well as mitigating any damage to the **Generation Units**.

(c) Changes to the protection schemes needed for the **Generation Unit** and the **Transmission System** and to the settings relevant to the **Generation Unit** shall be agreed between the **TSO** and the **Generation Unit**.

CC.10.9.6 The **Generator** shall organise its protection and control devices in accordance with the following priority ranking (from highest to lowest):

(i) **Transmission System** and **Generation Unit** protection;

(ii) Synthetic inertia (if applicable);

(iii) **Frequency Control**;

(iv) Power restriction; and

(v) Power gradient constraint.

CC.10.9.7 **Generators** shall be capable of exchanging information with the **TSO** in real time or periodically with time stamping, as specified by the **TSO**. The **TSO** shall specify the content of information exchanges including a precise list of data to be provided by the **Generator**.

CC.10.9.8 **Generators** shall be capable of remaining connected to the **Network** during single-phase or three-phase auto-reclosures on meshed **Network** lines. The details of that capability shall be subject to coordination and agreements on protection schemes and settings as referred to in CC.10.9.5.

CC.10.10 **DSO**

CC.10.10.1 The **DSO** shall provide differential-protection on **Grid Connected Transformers.**

CC.10.10.2 The **TSO** may require the **DSO** to install additional protection schemes, where the **TSO** can reasonably show that it is prudent or necessary to do so, such schemes may include but are not limited to the following:

(a) directional overcurrent protection or distance protection on **User's** transformer(s);

(b) direct intertripping between the **Grid Connection Point** circuit breaker and the **User Connection Point** circuit breaker;

(c) neutral voltage displacement protection on **HV** side of **User's** transformer(s);

(d) loss of mains protection;

(e) under/over voltage protection;

(f) under/over frequency protection;

(g) unit (differential) type protection on **Distribution System** lines or cables;

(h) distance protection on the **User Connection Point** circuit breaker on **Distribution** lines or cables;

(i) bus zone protection on 110 kV **Distribution System** busbars; and

(j) teleprotection channels (for use with distance protection) between the **Grid Connection Point** circuit breaker and **User Connection Point** circuit breaker.

CC.10.10.3 Distance protection or over-current protection shall be provided by the **TSO** on **Grid Connection Point** circuit breaker(s) unless where otherwise agreed by the **TSO** and **DSO.**

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CC.10.10.4 The **TSO** shall specify the devices and settings necessary to protect the **Transmission System**, taking into account the characteristics of the **Distribution System**, on a site-specific basis. The protection schemes needed for the **Distribution System** and the **Transmission System,** as well as the settings relevant to the **Distribution System,** shall be coordinated and agreed between the **TSO** and the **DSO**.

Electrical protection of the **Distribution System** shall take precedence over operational controls, taking into account the security of the system and the health and safety of staff and of the public, as well as mitigating any damage to the **Distribution System**.

CC.10.10.5 The **TSO** and the **Distribution System** owner shall agree on changes to the protection schemes relevant for the **Distribution System**, and on the arrangements for the protection schemes of the **Distribution System**.

CC.10.10.6 The **TSO** and the **DSO** shall agree on the schemes and settings of the different control devices of the **Distribution System** relevant for system security on a site-specific basis. The **TSO** and the **DSO** shall agree on any changes to the schemes and settings of the control devices. This agreement shall include the following elements:

- isolated (network) operation;
- damping of oscillations;
- disturbances to the **Transmission System**;
- automatic switching to emergency supply and restoration to normal topology; and
- automatic circuit-breaker re-closure (on 1-phase faults).

CC.10.10.7 The **DSO** shall set the protection and control devices of its **Distribution System** in compliance with the following priority ranking, organised in decreasing order of importance:

(i) **Transmission System** protection
(ii) **Distribution System** protection
(iii) Frequency control (**Active Power** adjustment)
(iv) Power restriction

CC.10.11 **Demand Customers**

CC.10.11.1 **Demand Customers** shall provide differential-protection on **Grid Connected Transformers.**

CC.10.11.2 The **TSO** may require **Demand Customers** to install additional protection schemes, where the **TSO** can reasonably show that it is prudent or necessary to do so, which may include the following:

(a) directional overcurrent protection or distance protection on **Grid Connected Transformer(s)** where the **User System** contains **Embedded Generation**;
(b) neutral voltage displacement protection on **HV** side of **Grid Connected Transformer(s)**;
(c) loss of mains protection where the **User System** contains **Embedded Generation**;
(d) under/over voltage protection where the **User System** contains **Embedded Generation**; and
(e) under/over frequency protection where the **User System** contains **Embedded Generation**.

CC.10.11.3 Distance protection or over-current protection shall be provided by the **TSO** on the **Grid Connection Point** circuit breaker(s).

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CC.10.11.4 The **TSO** shall specify the devices and settings necessary to protect the **Transmission System**, taking into account the characteristics of the **Demand Facility**, on a site-specific basis. The protection schemes needed for the **Demand Facility** and the **Transmission System,** as well as the settings relevant to the **Demand Facility,** shall be coordinated and agreed between the **TSO** and the **Demand Facility** owner.

Electrical protection of the **Demand Facility** shall take precedence over operational controls, taking into account the security of the system and the health and safety of staff and of the public, as well as mitigating any damage to the **Demand Facility**.

CC.10.11.5 The **TSO** and the **Demand Facility** owner shall agree on changes to the protection schemes relevant for the **Demand Facility**, and on the arrangements for the protection schemes of the **Demand Facility**.

CC.10.11.6 The **TSO** and the **Demand Facility** owner shall agree on the schemes and settings of the different control devices of the **Demand Facility** relevant for system security on a site-specific basis. The **TSO** and the **Demand Facility** owner shall agree on any changes to the schemes and settings of the control devices. This agreement shall include but may not be limited to the following elements:

- isolated (network) operation;
- damping of oscillations;
- disturbances to the **Transmission System**;
- automatic switching to emergency supply and restoration to normal topology; and
- automatic circuit-breaker re-closure (on 1-phase faults).

CC.10.11.7 The **Demand Facility** owner shall set the protection and control devices of its **Demand Facility** in compliance with the following priority ranking, organised in decreasing order of importance:

(i) **Transmission System** protection
(ii) **Demand Facility** protection
(iii) **Frequency** control (active power adjustment)
(iv) Power restriction

CC.10.12 **Interconnectors**

CC.10.12.1 **Interconnectors** shall provide:

(a) differential protection on the **Interconnector Transformer**. The connections between the **Grid Connection Point** circuit breaker and the **HV** terminals of the **Interconnector Transformer** shall be included in the protected zone of this differential protection, or in the event that other plant such as filter banks or reactors are connected to these connections they shall be protected by a suitable buszone or differential protection scheme.

(b) primary and backup protection for any plant (e.g. filter banks, reactors, damping resistors) which may be connected between the **Grid Connection Point** circuit breaker and the **Interconnector Transformer**

(c) backup protection (to the **Transmission System**) on **Interconnectors.** The **TSO** acting reasonably shall require one or more of the following to be installed: **Interconnector** overcurrent protection, **Voltage** controlled **Interconnector** overcurrent protection or **Interconnector** distance protection;

(d) over/ under **Frequency** protection; and over/under-voltage protection.

CC.10.12.2 The **TSO** may require an individual **Interconnector Operator,** to install additional protection and/or control schemes, where the **TSO** can reasonably show that it is prudent or necessary to do so. These schemes may include but are not limited to the following:

(a) **Power System Stabiliser;**

(b) Ability to accept set points and commands (e.g. to ramp up or ramp down or reverse **MW** and or **Mvar** flows)

(c) Automatic remedial actions such as stopping the ramping and blocking FSM, LFSM-O, LFSM-U and **Frequency** control.

CC.10.12.3 Distance protection shall be provided by the **TSO** on the **Grid Connection Point** circuit breaker of **Interconnector Transformers**.

CC.10.12.4 For the electrical protection schemes and settings:

(a) The **TSO** shall specify the schemes and settings necessary to protect the **Transmission System**, taking into account the characteristics of the **Interconnector Converter Stations**. The protection schemes needed for the **Interconnector Converter Stations** and the **Transmission System** as well as the settings relevant to the **Interconnector Converter Stations** shall be coordinated and agreed between the **TSO** and the **Interconnector**. The protection schemes and settings for internal electrical faults must not jeopardise the performance of an **Interconnector Converter Station**.

(b) Electrical protection of the **Interconnector Converter Stations** shall take precedence over operational controls, taking into account the security of the system and the health and safety of staff and of the public, as well as mitigating any damage to the **Interconnector Converter Stations**.

(c) Changes to the protection schemes needed for the **Interconnector Converter Station** and the **Transmission System** and to the settings relevant to the **Interconnector Converter Station** shall be agreed between the **TSO** and the **Interconnector** prior to implementation.

(d) Undervoltage protection shall be set by the **Interconnector** to the widest possible technical capability of the **Interconnector Converter Station**. The **TSO** may specify narrower settings pursuant to clauses (a), (b) and (c) above.

CC.10.12.5 The **TSO** and the **Interconnector** shall coordinate and agree on the schemes and settings of the different control modes of the **Interconnector Converter Station** including the settings of the specific parameters on a site-specific basis.

Any change to the schemes or settings of parameters of the different control modes and protection of the **Interconnector**, including the procedure, shall be coordinated and agreed between the **TSO** and the **Interconnector**.

The parameters of the different control modes and the protection settings of the **Interconnector Converter Station** shall be able to be changed if required by the **TSO**. The control modes and associated setpoints shall be capable of being changed remotely as specified by the **TSO**.

CC.10.12.6 The **Interconnector** shall set the protection and control devices of its **Interconnector Converter Station** in compliance with the following priority ranking, organised in decreasing order of importance unless otherwise specified by the **TSO**:

(i) Transmission System and Interconnector system protection
(ii) **Active Power** control for emergency assistance
(iii) Synthetic inertia, if applicable
(iv) Automatic remedial actions as specified in CC.10.12.2. (c)
(v) Limited **Frequency** Sensitive Mode
(vi) **Frequency Sensitive Mode** and **Frequency** control
(vii) power gradient constraint.

CC.10.12.7 If specified by the TSO, each **Interconnector Converter Station** of an **Interconnector** shall be equipped with an automatic controller capable of receiving instructions from the relevant system operator. This automatic controller shall be capable of operating the **Interconnector Converter Stations** in a coordinated way. The relevant system operator shall specify the automatic controller hierarchy per **Interconnector Converter Station**.

The automatic controller shall include control schemes capable of automatic remedial action such as stopping the ramping and blocking **Frequency Sensitive Mode**, Limited **Frequency** Sensitive Mode – Over- **Frequency**, Limited **Frequency**

Sensitive Mode – Under- **Frequency** and **Frequency** control. The triggering and blocking criteria shall be specified by **TSO** and subject to notification to the **CRU**. The automatic controller of the **Interconnector** shall be capable of providing operational and alarm signal as indicated in CC. 12.2.

The automatic controller shall be capable of sending and receiving the following signals and commands to and from the relevant system operator:

(a) Start-up command;

(b) **Active power** setpoints;

(c) **Frequency Sensitive M**ode settings;

(d) Reactive power, **Voltage** or similar setpoints;

(e) **Reactive power** control modes;

(f) Power oscillation damping control;

(g) Emergency blocking;

(h) Ramp blocking;

(i) **Active power** flow direction; and

(j) Fast **active power** reversal command.

CC.10.12.8 The parameters and settings of the main control functions of an Interconnector shall be implemented within such a control hierarchy that makes their modification possible if necessary. Those main control functions are at least:

(a) **Frequency Sensitive Mode**, Limited **Frequency** Sensitive Mode – Over-**Frequency**, Limited **Frequency** Sensitive Mode – Under- **Frequency**;

(b) **Frequency** control;

(c) **Reactive power** control mode;

(d) Power oscillation damping capability; and

(e) Subsynchronous torsional interaction damping capability.

CC.10.13 **Power Quality**

CC.10.13.1

(a) Harmonic **Voltage** Distortion

Users shall ensure that their connection to the **Transmission System** does not result in an increase in the level of harmonic distortion of the supply **Voltage** on the **Transmission System**, at the **Connection Point**, exceeding that allocated to them. These incremental limits will be determined by the **TSO** for each **User's** connection, to ensure compliance with IEC/TR 61000-3-6 and by default, CENELEC Standard EN 50160, on the **Transmission System**.

The necessary data will be exchanged between both parties and the exchange of data shall not be unreasonably withheld. This data may consist of but is not limited to; **Impedance Loci** at the **Connection Point**, background distortion levels and **Allocated Harmonic Distortion Limits (AHDL)**.

(b) **Voltage** Fluctuations

Users shall ensure that their connection to the **Transmission System** does not result in the level of fluctuation of the supply **Voltage** on the **Transmission System** at the **Connection Point** exceeding limits set out below**.** Any necessary data will be exchanged between both parties and the exchange of data shall not be unreasonably withheld.

(i) **Voltage Flicker**

Users shall take responsibility for limiting **Voltage Flicker** caused by their **Plant** to remain within the maximum permissible **Voltage Flicker** limits at the **Connection Point** as allocated to them by the **TSO** or, as a minimum, those defined in Table 5 of IEC/TR 61000-3-7.

(ii) Rapid **Voltage** Change

Type of rapid Voltage change	$\frac{\Delta U}{U_N}$ **Limit (%)**	**Timeframe**
Temporary Voltage Depression	5	Must recover to nominal **Voltage** in 3 seconds
Step Change	3	One cycle

Users shall ensure that the disturbance levels introduced by their **Plant** and/or **Apparatus** do not promote rapid **Voltage** changes exceeding those specified in the above table or alternative limit allocated to them by the **TSO** during normal system operation.

The **User** can be connected to the **Transmission System** provided that the required studies have been completed by the **User** to show compliance with the limits outlined in CC.10.13.1 (a) and CC.10.13.1 (b) and have been reviewed by the **TSO.** Following consultation with the **TSO**, a conditional connection may be allowed to **Users** where modelling of the connection shows a breach of the limits to be marginal or only occurring during contingencies as defined by the **TSO**. This may allow the **User** to verify that the installation is compliant by monitoring, or to implement a mitigation solution.

The **User's Allocated Harmonic Distortion Limits** and any special conditions pertaining to power quality will be referenced in the **Connection Agreement**. These are subject to verification of compliance by the **TSO** and through an on-going monitoring programme as described in OC10.2.2 (c).

In the event that a **User** causes any such limits in CC.10.13.1 (a) and CC.10.13.1 (b) to be breached, the **TSO** shall be entitled to require the **User** to take such steps as the **TSO** reasonably considers to be necessary in order to prevent such breach from continuing and the **User** shall comply with the **TSO's** instructions without delay.

CC.10.13.2 The aggregate power factor for a **Demand Customer** is calculated in accordance with the following formula:

$$APF = \frac{\text{Sum P}}{((\text{Sum P})^2 + (\text{Sum Q})^2)^{0.5}}$$

where:

APF is the Aggregate Power Factor for the **Demand Customer**

Sum P is the Energy exchanged with the **Demand Customer** at the **Connection Point** for any half-hour period; and

Sum Q is the Reactive Energy exchanged with the **Demand Customer** at the **Connection Point** for the same half-hour period.

CC.10.13.3 A **Demand Customer** shall ensure that at any load above 50% of **Maximum Import Capacity** the aggregate power factor as determined at the **Connection Point** in any half-hour period shall be within the range 0.90 lagging to unity.

CC.11 COMMUNICATION FACILITIES

CC.11.1 The communication facilities required to be provided by **Users** are addressed in the **Operating Codes.**

CC.12 SIGNALS TO BE PROVIDED BY USERS

CC.12.1 Each **User** shall provide such signals and indications in relation to the **User's Plant** and **Apparatus** as are required by the **TSO** (acting reasonably) in accordance with the **Connection Agreement**.

CC.12.2 Signals and indications required to be provided by **Users** will include but shall not be limited to the following:

(a) **LV** switchgear positions pertinent to the status of each **Grid Connected Transformer** through a set of two potential free auxiliary contacts (one contact normally open and one contact normally closed when 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), (h), (i) and (j) 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 derived MW output on each fuel, from **Generation Units** that can continuously fire on more than one fuel simultaneously;

(h) Where it is agreed between the **TSO** and the **Generator** that signals are not available on the **HV** terminals, +/- **MW** and +/- **Mvar** shall be provided at the **Grid Connected Transformer** low **Voltage** terminals; and

(i) Remaining **Secondary Fuel** capability (where applicable) in MWh equivalent when running at **Registered Capacity**;

(j) With regard to real-time monitoring of **Frequency Sensitive Mode**, as described in OC.1, the **Generator** shall be equipped to transfer in real time and in a secured manner, at least the following signals:

— status signal of **Frequency Sensitive Mode** (on/off);

— actual parameter settings for **Active Power** frequency response; and

— **Governor Droop** and **Frequency Response Deadband**.

The **TSO** shall specify additional signals to be provided by the **Generator** by monitoring and recording devices in order to verify the performance of the active power frequency response provision of participating **Generation Units**.

(k) and (l) are applicable to **Demand Customers** only:

(k) **MW** and +/- **Mvar** at the **HV** terminals of the **Grid Connected Transformer**; and

(l) **Grid Connected Transformer** tap position.

(m), (n), (o), (p), (q), (r), (s) and (t) are applicable to **Demand Side Unit Operators** who represent a **Demand Side Unit:**

(m) **Demand Side Unit MW Response** from **Generation** operating in **Continuous Parallel Mode** or **Shaving Mode**;

(n) **Demand Side Unit MW Response** from avoided **Demand** consumption and **Generation** operating in **Lopping Mode**, **Standby Mode** or **Automatic Mains Failure Mode**;

(o) Remaining **Demand Side Unit MW Availability**;

(p) **Demand Side Unit MW Response** from each **Individual Demand Site** with a **Demand Side Unit MW Capacity** of greater than or equal to 5 **MW**;

(q) **MW Output** from **Generation Units** with a **Capacity** greater than or equal to

5 **MW**;

(r) **Mvar Output** from **Generation Units** with a **Capacity** greater than or equal to 5 **MW** at **Individual Demand Sites** with a **Maximum Export Capacity** specified in the **Connection Agreement** or **DSO Connection Agreement** as applicable, as required by the TSO;

(s) Aggregate **MW Output** from **Generation Units** with a combined **Capacity** of greater than or equal to 5 **MW** on an **Individual Demand Site**, as required by the TSO; and

(t) **Demand Side Unit MW Response** from each **Individual Demand Site** that comprises the **Demand Side Unit**, as required by the TSO.

(u), (v), (w), (x) and (y) are applicable to **Interconnectors** only:

(u) +/-**MW** and +/-**Mvar** at the high **Voltage** terminals of the **Interconnector Transformer**;

(v) **kV** at **Interconnector Transformer** high **Voltage** terminals;

(w) **Interconnector Transformer** tap position;

(x) **Interconnector** status; and

(y) **Frequency**

(z) Start-up signals;

(aa) AC and DC **Volta**ge measurements;

(bb) AC and DC current measurements;

(cc) **Active** and **Reactive Power** measurements on the AC side;

(dd) DC power measurements;

(ee) HVDC converter unit level operation in a multi-pole type HVDC converter;

(ff) elements and topology status;

(gg) **Frequency Sensitive Mode**, Limited **Frequency** Sensitive Mode – Over-**Frequency** and Limited **Frequency** Sensitive Mode – Under- **Frequency Active Power** ranges;

(hh) emergency blocking;

(ii) ramp blocking; and

(jj) fast **Active Power** reversal.

CC.12.3 Where signals or indications required to be provided by the **User** under CC.12.2 become unavailable or do not comply with applicable standards due to failure of the **Users'** 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.

CC.12.4 Signals to be provided by **Users** shall be presented in such form as is nominated by the **TSO**.

CC.12.5 Where, the **TSO**, acting reasonably, determines that because of a **Modification** to the **Transmission System** or otherwise to meet a **Transmission System** requirement, additional signals and/or indications in relation to a **User's Plant** and **Apparatus** are required, the **TSO** shall notify that requirement to the **User**. On receipt of such a notification the **User** shall promptly, and in accordance with **Good Industry Practice**, ensure that such signals and/or indications are made available at the relevant marshalling rack.

CC.12.6 **Demand Side Unit Operators** and **Generator Aggregators** 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 and shall include:

(a) signals from **Demand Side Unit Operators** shall be relayed to the **TSO Telecommunication Interface Cabinet** which reflect the **Demand Side Unit MW Response** to an accuracy of within 1 **MW** of the actual **Demand Side Unit MW Response** within 15 seconds of change occurring to the **Demand Side Unit MW Response**; and

(b) a single failure of an item of the **Demand Side Unit Operator's** equipment will not result in:

(i) loss of control of more than one **Individual Demand Site**;

(ii) loss of **Demand Side Unit MW Response** of more than one **Individual Demand Site**; or

(iii) the **Demand Side Unit MW Response** from **Generation** or **Demand Side Unit MW Response** from avoided **Demand** consumption signals being incorrect by more than the **Demand Side Unit MW Capacity** of the

Individual Demand Site with the highest **Demand Side Unit MW Capacity** comprising the **Demand Side Unit**.

CC.13 POWER SUPPLIES

CC.13.1 Each **User** shall provide:

(a) 400 V ac / 230 V ac power supplies as required by the **TSO** for **Transmission Station** facilities, the capacity and detail of which shall be as specified by the **TSO** and provided for in the **User's Connection Agreement**;

(b) a standby supply for all ac power supplies for **Transmission Station** facilities by a diesel generator, unless alternative means are agreed with the **TSO**, 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.

CC.14 RESPONSIBILITY FOR SAFETY

CC.14.1 For each **User Site** and in consultation with the **User**, the **TSO** shall detail in the **Operation Instructions** the demarcation of responsibility for safety of persons carrying out work or testing at the **User's Connection Site** and on circuits which cross the **User's Site** at any point.

CC.14.2 More detailed information on procedures and responsibilities involved in safety procedures is set out in OC.11.

CC.15 COMMISSIONING AND NOTIFICATION

CC.15.1 The **TSO** 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 CC.15 are in addition to the requirements under the **Connection Agreement**.

CC.15.2 **Users** are required to carry out such tests (which are defined to be **Grid Code Tests**) as are required in order to confirm that the **User's Plant** and **Apparatus** meets all the requirements of the **Grid Code** which must be met prior to the **Operational Date**. The **TSO** may, under the **Connection Agreement**, notify to the **User** such **Grid Code Tests** as it requires the **User** to carry out. The **TSO** may not necessarily test for CC.7.3.1.1, (b), (c), (d)(i) 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.

CC.15.3 Where **Commissioning** is likely to involve a requirement for **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 the date previously confirmed, then provided the **User** gives the **TSO** reasonable notice of the re-scheduled tests, he shall not be deemed to have failed to give the notices 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.

CC.15.4 The information provided under CC.15.3 is for indicative purposes only, and the **User** shall subsequently make a formal request to the **TSO** for a **Commissioning Test** requiring **Dispatch** in accordance with the following provisions of this CC.15, and shall not carry out such a **Commissioning Test** except as **Dispatched** in accordance with this CC.15.

CC.15.5 **Users** shall make a request in writing to the **TSO** for every **Commissioning Test** requiring **Dispatch**, in accordance with CC.15.4. Such request to include the following information:

CC.15.5.1 details of the proposed **Commissioning Test**;

CC.15.5.2 **Dispatches,** where necessary, required by **Users** 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** into sections as appropriate;

(b) indicate and discuss which sections of the **Commissioning Test** can be completed in stages and which cannot;

(c) indicate possible variations of the **Commissioning Test** for the sections which can be completed in stages.

CC.15.5.3 the preferred time or times for the **Commissioning Test**;

CC.15.5.4 the milestones for individual sections of the **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 completion of each section.

CC.15.6 **Generators** and **Interconnectors** will be subject to SDC1 and SDC2 a minimum of seven (7) days prior to the **Operational Date** and the **Generation Unit** or **Interconnector** will be available for **Dispatch** from the **Operational Date**.

CC.15.7 Following the **Connection Date** but not later than 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 compliance with the **Grid Code** or the **Connection Agreement.**

CC.15.8 The values as confirmed or verified under CC.15 shall be included in the **User's Registered Operating Characteristics** and **Registered Data**.

CC.15.9 The **Generator** shall demonstrate to the **TSO** that it has complied with **Generation Unit** requirements by successfully completing the Operational Notification Procedure for connection of each **Generation Unit**.

CC.15.10 **Operational Notification Procedure**

The Operational Notification Procedure for connection of each **Generation Unit** requires the completion of three sequential processes, consisting of:

- Energisation Operational Notification (EON);
- Interim Operational Notification (ION); and
- Final Operational Notification (FON).

CC.15.10.1 Energisation Operational Notification

The **TSO** will issue an EON to the **Generator** for a **Generation Unit**, subject to completion of the EON checklist. This checklist will require agreement on the protection and control settings relevant to the **Connection Point**.

Upon receipt of the EON, a **Generator** may energise its internal network and auxiliaries for the associated **Generation Unit** by using the grid connection that is specified for the **Connection Point**.

CC.15.10.2 Interim Operational Notification

The **TSO** will issue an ION to the **Generator** for a **Generation Unit**, subject to completion of the ION checklist.

Upon receipt of the ION, a **Generator** 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 and shall not be longer than 24 months. An extension to this period of time may be granted via a derogation undertaken according to GC.9.3, if the **Generator** can demonstrate sufficient progress towards full compliance and outstanding issues are clearly identified.

CC.15.10.3 Final Operational Notification

CC.15.10.3.1 The **TSO** will issue a FON to the **Generator** for a **Generation Unit**, subject to completion of the FON checklist.

Upon receipt of the FON, a **Generator** may operate the associated **Generation Unit** and generate power by using the grid connection that is specified for the **Connection Point**.

CC.15.10.3.2 If the **TSO** identifies a reason not to issue a FON, the **Generator** may seek a derogation via the process described in GC.9.3.

Where a request for a derogation is rejected, the **TSO** shall have the right to refuse to allow the operation of the **Generation Unit** until the **Generator** and the **TSO** resolve the incompatibility and the **TSO** considers that the **Generation Unit** is compliant with **Grid Code**.

If the **TSO** and the **Generator** 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**.

CC.15.11 A **Generator** issued with a FON shall inform the **TSO** immediately in the following circumstances:

(a) the facility is temporarily subject to either significant modification or loss of capability affecting its performance; or

(b) equipment failure leading to non-compliance with some relevant requirements.

CC.15.12 Limited Operational Notification

CC.15.12.1 A **Generator** shall apply to the relevant system operator for a Limited Operational Notification (LON), if the **Generator** reasonably expects the circumstances described in CC.15.11 to persist for more than three months.

CC.15.12.2 The **TSO** will then issue a LON containing the following information:

(a) the unresolved issues justifying the granting of the LON;

(b) the responsibilities and timescales for the expected solution; and

(c) a maximum period of validity which shall not exceed 12 months. The initial period granted may be shorter with the possibility of an extension if evidence is submitted to the satisfaction of the **TSO** demonstrating that substantial progress has been made towards achieving full compliance.

CC.15.12.3 The FON shall be suspended during the period of validity of the LON with regard to the items for which the LON has been issued.

CC.15.12.4 A further extension of the period of validity of the LON may be granted upon a request for a derogation, via the process described in GC.9.3, made to the **TSO** before the expiry of that period.

CC.15.12.5 The **TSO** shall have the right to refuse to allow the operation of the **Generation Unit**, once the LON is no longer valid. In such cases, the FON shall automatically become invalid.

CC.15.12.6 If the **TSO** does not grant an extension of the period of validity of the LON in accordance with CC.15.12.4 or if it refuses to allow the operation of the **Generation Unit** once the LON is no longer valid in accordance with CC.15.12.5, the **Generator** may refer the issue for decision to the **CRU** within six months after the notification of the decision of the **TSO**.

⌂

CC.15.13 The **Demand Facility Owner, Closed Distribution System Operator** and **DSO** shall demonstrate to the **TSO** that it has complied with **DCC Unit** requirements by successfully completing the operational notification procedure for connection of each **Demand Facility, Distribution Facility** and **Distribution System.**

CC.15.14 **Operational Notification Procedure**

The operational notification procedure for connection of each **Demand Facility, Distribution Facility** and **Distribution System** requires the completion of three sequential processes, consisting of:

- energisation operational notification (EON);
- interim operational notification (ION); and
- final operational notification (FON).

CC.15.14.1 Energisation Operational Notification

The **TSO** will issue an EON to the **Demand Facility Owner, Closed Distribution System Operator** and **DSO** for a **Demand Facility, Distribution Facility** and **Distribution System**, subject to completion of the EON checklist. This checklist will require agreement on the protection and control settings relevant to the **Connection Point**.

Upon receipt of the EON, a **Demand Facility Owner, Closed Distribution System Operator** and **DSO** may energise its internal network and auxiliaries for the associated **Demand Facility, Distribution Facility** or **Distribution System** by using the grid connection that is specified for the **Connection Point**.

CC.15.14.2 Interim Operational Notification

The **TSO** will issue an ION to the **Demand Facility Owner**, **Closed Distribution System Operator** and **DSO** for a **Demand Facility**, **Distribution Facility** and **Distribution System** subject to completion of the ION checklist.

⌂

Upon receipt of the ION, a **Demand Facility Owner, Closed Distribution System Operator** and **DSO** may operate the associated **Demand Facility**, **Distribution Facility** or **Distribution System**, by using the grid connection that is specified for the **Connection Point** for a limited time period. The limited period of time shall be agreed with the TSO and shall not be longer than 24 months. An extension to this period of time may be granted via a derogation undertaken according to GC.9.4, if the **Demand Facility Owner**, **Closed Distribution System Operator** or **DSO** can demonstrate sufficient progress towards full compliance and outstanding issues are clearly identified.

CC.15.14.3 Final Operational Notification

CC.15.14.3.1 The **TSO** will issue a FON to the **Demand Facility Owner**, **Closed Distribution System Operator** or **DSO** for a **Demand Facility, Distribution Facility** or **Distribution System**, subject to completion of the FON checklist.

Upon receipt of the FON, a **Demand Facility Owner, Closed Distribution System Operator** or **DSO** may operate the associated **Demand Facility**, **Distribution Facility** or **Distribution System** and generate power by using the grid connection that is specified for the **Connection Point**.

CC.15.14.3.2 If the **TSO** identifies a reason not to issue a FON, the **Demand Facility Owner, Closed Distribution System Operator** or **DSO** may seek a derogation via the process described in GC.9.4.

Where a request for a derogation is rejected, the **TSO** shall have the right to refuse to allow the operation of the **Demand Facility, Distribution Facility** or **Distribution System** until the **Demand Facility Owner, Closed Distribution System Operator** or **DSO** and the **TSO** resolve the incompatibility and the **TSO** considers that the **Demand Facility, Distribution Facility** or **Distribution System** is compliant with **Grid Code**.

If the **TSO** and the **Demand Facility Owner, Closed Distribution System Operator** or **DSO** do not resolve the incompatibility within a reasonable time frame, but in 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**.

CC.15.15 Limited Operational Notification

CC.15.15.1 A Demand Facility Owner, Closed Distribution System Operator or DSO issued with a FON shall inform the TSO within 24 hours of the incident, in the following circumstances:

- the facility is temporarily subject to either significant modification or loss of capability affecting its performance; or
- equipment failure leading to non-compliance with some relevant requirements.

A longer time to inform the **TSO** can be agreed with the **Demand Facility Owner**, **Closed Distribution System Operator** or **DSO** depending on the nature of the changes.

CC.15.15.2 A **Demand Facility Owner, Closed Distribution System Operator** or **DSO** shall apply to the relevant system operator for a limited operational notification (LON), if the **Demand Facility Owner, Closed Distribution System Operator** or **DSO** reasonably expects the circumstances described in CC.15.15.1 to persist for more than three months.

CC.15.15.3 The **TSO** will then issue a LON containing the following information:

- the unresolved issues justifying the granting of the LON;
- the responsibilities and timescales for the expected solution; and
- a maximum period of validity which shall not exceed 12 months. The initial period granted may be shorter with the possibility of an extension if evidence is submitted to the satisfaction of the **TSO** demonstrating that substantial progress has been made towards achieving full compliance.

CC.15.15.4 The FON shall be suspended during the period of validity of the LON with regard to the items for which the LON has been issued.

CC.15.15.5 A further extension of the period of validity of the LON may be granted upon a request for a derogation, via the process described in GC.9.4, made to the **TSO** before the expiry of that period.

CC.15.15.6 The **TSO** shall have the right to refuse to allow the operation of the **Demand Facility, Closed Distribution System** or **Distribution System**, once the LON is no longer valid. In such cases, the FON shall automatically become invalid.

CC.15.15.7 If the **TSO** does not grant an extension of the period of validity of the LON in accordance with CC.15.15.5 or if it refuses to allow the operation of the **Demand Facility, Distribution Facility** or **Distribution System** once the LON is no longer valid in accordance with CC.15.15.6, the **Demand Facility Owner, Closed Distribution System Operator** or **DSO** may refer the issue for decision to the **CRU** within six months after the notification of the decision of the **TSO**.

OC Operating Conditions

OC.1 Demand Forecasts

OC.1.1 Introduction

OC.1.1.1 OC.1 is concerned with **Demand** forecasting for operational purposes. In order to match **Generation** with **Demand** for electricity it is necessary to undertake **Demand** forecasting. It is also necessary to undertake **Demand** forecasting of **Reactive Power**.

OC.1.1.2 In the **Operational Planning Phase**, **Demand** forecasting shall be conducted by the **TSO** taking account of **Demand** forecasts furnished by **Users** who shall provide the **TSO** with **Demand** forecasts and other information in the form set out in this OC.1.

OC.1.1.3 In the **Programming Phase** and **Control Phase,** the **TSO** will conduct its own **Demand** forecasting taking into account information to be furnished by **Users** and the other factors referred to in OC.1.6.1.

OC.1.1.4 In OC.1.4, which relates to data required from **Users** in the **Operational Planning Phase**, **Demand** means demand of MW and Mvar of electricity relating to each **Grid Supply Point** plus that to be met by **Embedded Generation Plant**. **Reactive Power Demand** includes the series **Reactive Power** losses of the **User's System** but excludes any network susceptance and any **Reactive Power** compensation on the **User's System**. The **TSO** will obtain the lumped network susceptance and details of reactive compensation from the requirements to submit data under the **Planning Code**.

OC.1.1.5 OC.1 deals with the provision of data on **Demand Control** in the **Operational Planning Phase**, the **Programming Phase**, the **Control Phase** and the **Post Control Phase**.

OC.1.1.6 In this OC.1, Year 0 means the current year at any time, Year 1 means the next year at any time, Year 2 means the year after Year 1, etc.

OC.1.1.7 The reference in this OC.1 to a "day" shall mean the period covered by the **Trading Day**, even though that may not be a calendar day.

OC.1.1.8 References in OC.1 to data being supplied on a half hourly basis refer to it being supplied for each period of 30 minutes ending on the hour and half hour in each hour.

OC.1.2 Objectives

The objectives of OC.1 are to:

OC.1.2.1 Ensure the provision of data to the **TSO** by **Users** in the **Operational Planning Phase**, **Programming Phase**, **Control Phase** and **Post Control Phase;** and

OC.1.2.2 Describe the factors to be taken into account by the **TSO** when **Demand** forecasting in the **Programming Phase** and **Control Phase.**

OC.1.3 Scope

OC1 applies to the **TSO** and to all **Users**, which term in this OC.1 means:

(a) **Generators**;

(b) The **Distribution System Operator**;

(c) **Suppliers**; and

(d) **Demand Customers**.

OC.1.4 Data Required by the TSO in the Operational Planning Phase

OC.1.4.1 Each **User** shall provide the **TSO** with the data requested in the relevant parts of OC.1.4 below (except **Demand** solely related to **Power Station Auxiliary Plant** when fed in accordance with pre-agreed feeding arrangements).

OC.1.4.2 For year 1 the following shall be supplied to the **TSO In Writing** by week 22 in year 0:

(a) The **DSO** and **Demand Customers** shall supply typical profiles of the anticipated **Demand** (averaged over any half hour on any **Grid Supply Point**) on half hourly and **Grid Supply Point** basis for defined categories of day type as determined by the **TSO**;

(b) The **DSO** and **Demand Customers** shall supply MW profiles of the amount and duration of anticipated **Demand Control** which may result in a **Demand** change of 10MW or more (averaged over any half hour on **any Grid Supply Point**) on half hourly and **Grid Supply Point** basis;

(c) The **DSO** shall supply typical MW profiles for the operation, or Availability as appropriate, of **Embedded Generation** where the total **Registered Capacity** of **Generation Units** on a single **Site** exceeds 5MW for defined categories of day type as determined by the **TSO**. The method for submitting MW schedules and/or Availability shall be agreed between the **TSO** and the **DSO**, such agreement not to be unreasonably withheld;

(d) Notwithstanding OC.1.4.2(c), the DSO shall supply typical MW profiles for the operation, or Availability as appropriate, of **Embedded Generation** where the total **Registered Capacity** of **Generation Units** on a single **Site** exceeds 2MW, for defined categories of day type as determined by the **TSO**, if the **TSO** considers the **Site** to be critical for **Transmission System** operation. The method for submitting MW schedules and/or Availability shall be agreed between the **TSO** and the **DSO**, such agreement not to be unreasonably withheld.

OC.1.4.3 The **DSO** and **Demand Customers** shall inform the **TSO** of any changes to the information supplied under OC.1.4.2 as soon as this information is available. This information will be provided **In Writing**, or as otherwise agreed between the **DSO** or **Demand Customers** and the **TSO**, such agreement not to be unreasonably withheld.

(a) In particular, the **DSO** and **Demand Customers** shall provide to the **TSO In Writing** information pertaining to new connections greater than 2MW immediately this information is available. This information must include: anticipated connection date, location of connection, size of connection category of connection (e.g. residential, industrial etc.) and the typical profiles of the anticipated **Demand** on half hourly basis for defined categories of day type as determined by the **TSO**;

(b) In particular, the **DSO** and **Demand Customers** shall provide to the **TSO In Writing** information pertaining to disconnection of existing **Demand** immediately this information is available. This information must include: anticipated disconnection date, location of connection, size of connection, and the revised typical profiles of the anticipated **Demand** on a half hourly basis at the **Grid Supply Point** for defined categories of day type as determined by the **TSO**;

OC.1.4.4 On the 5th last **Business Day** of every month the **DSO** and **Demand Customers** shall verify **In Writing** that the most recently submitted MW **Demand** profiles for the following two months are in accordance with their current best estimate of these values.

OC.1.5 Post Control Phase

The following is required by the **TSO In Writing** (or by such electronic data transmission facilities as have been agreed with the **TSO**) by 14.00 hours each day in respect of **Active Power** data and **Reactive Power** data:

a) MW profiles for the previous **Trading Day** of the amount and duration of **Demand** reduction achieved from the use of **Demand Control** of 10MW or more (averaged over any half hour on any **Grid Supply Point**), on a half hourly and **Grid Supply Point** basis, from the **DSO**;

b) MW profiles of the amount and duration of Demand reduction achieved from the use of **Customer Demand Management** of 10MW or more on a half hourly basis during the previous **Trading Day**, from **Suppliers** and **Demand Customers**;

c) Details of half hour **Active Power** output and **Reactive Power** produced or absorbed by **Embedded Generation**, with a single Site with **Registered Capacity** in excess of 2MW, during the previous **Trading Day**, from the **DSO**;

d) (Where requested by the **TSO**), details of half hour **Active Power** output and **Reactive Power** produced or absorbed by **Generation Plant** during the previous **Trading Day**, from **Generators**.

OC.1.6 The TSO Demand Forecast

OC.1.6.1 The following factors will be taken into account by the **TSO** when conducting **Demand** forecasting in the **Programming Phase** and **Control Phase**:

(a) Historic **Demand** data;
(b) Weather forecasts and the current and historic weather conditions;
(c) The incidence of major events or activities which are known to the **TSO** in advance;
(d) **Transmission System** losses;
(e) **Embedded Generation**;
(f) **Demand Control** of 10MW or more (averaged over any half hour at any **Grid Supply Point**) proposed to be exercised by the **DSO** and of which the **TSO** has

been informed,

(g) **Customer Demand Management** of 10MW or more (averaged over any half hour) proposed to be exercised by **Suppliers** and of which the **TSO** has been informed,

(h) Other information supplied by **Users**, and

(i) Growth rates.

OC.1.6.2 Taking into account the factors specified in OC.1.6.1 the **TSO** uses **Demand** forecast methodology to produce forecasts of **Demand**.

OC.1.6.3 The methodology will be based upon factors (a), (b), (c) and (d) above to produce, by statistical means, unbiased forecasts of **Demand** including that to be met by **Embedded Generation**. **Demand** will be calculated from these forecasts but will also take into account factors (e), (f), (g), (h) and (i) above.

OC.2 Operational Planning

OC.2.1 Introduction

Secure operation of an electricity system requires that maintenance of production facilities (**Generation Units**, **Interconnectors**, **Aggregated Generating Units** and **Demand Side Units**) should be carried out in a timely and orderly fashion. This is essential in order to enable the **TSO** to fulfil its obligations relating to operation of the **Transmission System**, and to enable **Generators**, **Interconnector Operators, Generator Aggregators** or **Demand Side Unit Operators** to plan their **Outages** in an orderly way with due regard to **Plant** requirements and resource limitations. The mechanisms by which this is achieved are formalised in this Operational Planning Code (Generation).

OC.2.2 Objective

The primary objective of OC.2 is to promote the development and implementation of a co-ordinated **Generation Outage Programme**, consistent with security of supply and requirements for the secure and economic operation of the **Transmission**

System and the **Other Transmission System**, and with the needs of **Generators**, **Interconnector Operators, Generator Aggregators** or **Demand Side Unit Operators** in respect of **Plant** maintenance requirements and resource limitations.

In order to achieve this objective, OC.2 defines:

(a) the procedure for formal notification of **Outages** by **Generators**, **Interconnector Operators, Generator Aggregators** and **Demand Side Unit Operators** to the **TSO**;

(b) the procedures by which the **Indicative**, **Provisional** and **Committed Outage Programmes** are reviewed by the **TSO**, in consultation with **Generators**, **Interconnector Operators, Generator Aggregators** or **Demand Side Unit Operators**;

(c) the co-ordination of **Outage** planning and the interchange of **Outage** schedules with the **Other TSO**; and

(d) the procedure for formal notification by **Generators**, **Generator Aggregators** or **Demand Side Unit Operators** of:

  (i) a decision to cancel a major **Outage** of a **Generating Unit**;

  (ii) the findings during or following a major **Outage** of a **Generating Unit**;

  (iii) an unexpected and unplanned failure of a **Generating Unit**.

OC.2 shall apply to all proposed **Outages** that may affect the ability of a **Generation Unit, Interconnector, Aggregated Generating Unit** and **Demand Side Unit** to achieve, in accordance with its **Registered Operating Characteristics**, either its full **Registered Capacity**, appropriate to each **Registered Fuel**, **Interconnector Registered Capacity** or its **Demand Side Unit MW Capacity** as the case maybe.

OC.2.7 also requires **Generators, Interconnector Operators, Generator Aggregators** and **Demand Side Unit Operators** to inform the **TSO** of other proposed maintenance of a **Generation Unit**, **Interconnector**, **Aggregated Generating Unit, Demand Side Unit** or any associated **Plant** or **Apparatus**, where such maintenance will affect the availability of **Ancillary Services** in respect of that **Generation Unit**.

OC.2.3 Scope

Operational Planning applies to the **TSO** and to the following, each of which is a **User** under this OC.2:

(a) **Generators** which for the purposes of OC.2 includes all **Generators** with **Registered Capacity** greater than 5 MW or which are subject to **Central Dispatch**;

(b) **Interconnector Operators;**

(c) **Generator Aggregators;**

(d) **Demand Side Unit Operators**; and

(e) The **Distribution System Operator (DSO)**.

OC.2.4 Outage Scheduling

OC.2.4.1 Throughout OC.2 the current year shall be defined as year 0, the following year as year 1, and so on. The **Outage** planning process in respect of a **Generation Unit, Interconnector**, **Aggregated Generating Unit** and **Demand Side Unit** shall commence not later than one (1) year prior to the **Scheduled Operational Date** or from the date of the relevant agreements, whichever is the later.

OC.2.4.2 In rolling over the **Generation Outage Programme** from one year to the next, for every year except the first year of the planning process:

(a) submissions by the **Generator**, **Interconnector Operator**, **Generator Aggregator** and/or **Demand Side Unit Operator** for year 2 should reflect the current **Provisional Outage Programme** for year 3; and

(b) submissions by the **Generator**, **Interconnector Operator**, **Generator Aggregator** and/or **Demand Side Unit Operator** for year 1 should reflect the current **Provisional Outage Programme** for year 2.

except, in any such case, to the extent that the **Generator**, **Interconnector Operator**, **Generator Aggregator** or **Demand Side Unit Operator** is reasonably responding to changed circumstances. This does not require **Generators, Interconnector Operators**, **Generator Aggregators** or **Demand Side Unit Operators** to explain changes unless required to do so by the **TSO**. The aggregate of all **Generators' Outage Programmes** is the **Generation Outage Programme** that will comprise the **COP** and **POP**.

OC.2.4.3 By the end of March in year 0, **Generators, Generator Aggregators** and **Demand Side Unit Operators** shall submit to the **TSO**, for each **Generation Unit**, **Aggregated Generating Unit** or **Demand Side Unit**, details of **Outages** and estimates of the **Forced Outage Probabilities** for inclusion in:

(a) the **Committed Outage Programme (COP)** for year 1. Other than in the first year after the planning process has commenced, this will be based on the previous year's **Provisional Outage Programme** for year 2, which period through the passage of time has now become year 1, and any changes may only reflect the **Generator's**, **Interconnector Operator's**, **Generator Aggregator's**, and **Demand Side Unit Operator's** reasonable response to changed circumstances;

(b) the **Provisional Outage Programme (POP)** for years 2 and 3.

In the case of **Aggregated Generating Units**, and **Demand Side Units** which consist of **Aggregated Demand Sites**, the **Generator Aggregator** or **Demand Side Unit Operator** shall provide the aggregated **Outages**, and upon request from the **TSO** the **Generator Aggregator** or **Demand Side Unit Operator** shall provide the **Outage** for each individual site, in a reasonable time period.

Generators, **Interconnector Operators**, **Generator Aggregators** and **Demand Side Unit Operators** shall specify with regard to each of their **Generation Units**, **Interconnector**, **Aggregated Generating Units** or **Demand Side Units**, the start date and time and the duration of each **Outage**.

OC.2.4.4 In scheduling **Outages**, and in relation to all other matters under OC.2, the **Generator**, **Interconnector Operator**, **Generator Aggregator or Demand Side Unit Operator** must act reasonably and in good faith. Without limitation to such obligation, each **Generator**, **Interconnector Operator**, **Generator Aggregator** and **Demand Side Unit Operator** should act in accordance with **Good Industry Practice** in planning their **Outages** and, in particular, so as to avoid a situation arising in which a **Generator**, **Interconnector Operator**, **Generator Aggregator** or **Demand Side Unit Operator** is obliged to schedule an **Outage** at short notice by reason of obligations imposed upon the **Generator**, **Interconnector Operator**, **Generator Aggregator** or **Demand Side Unit Operator** by statute as a consequence of the **Generator**, **Interconnector Operator**, **Generator Aggregator or Demand Side Unit Operator** not having planned in accordance with **Good Industry Practice**, for example, by not having planned sufficiently in advance its **Outages** for any statutory time limit.

OC.2.4.5 When submitting proposed **Outages** for inclusion in the **COP**, **POP** and **IOP**, **Generators**, **Interconnector Operators**, **Generator Aggregators** and **Demand Side Unit Operators** shall, unless they reasonably substantiate that an **Outage** is inflexible, specify:

(a) an alternative preferred window, or alternative preferred windows, of opportunity within each year for any **Outage**;

(b) the minimum **Outage** duration which would be acceptable, if less than the scheduled **Outage** duration;

(c) situations where the paralleling of **Outages** of two or more of its **Generation Units**, **Interconnectors**, **Aggregated Generating Units**, **Demand Side Units** or **Aggregated Demand Side Units** may be required, desirable, undesirable or not possible;

(d) a priority order associated with the various **Outages** scheduled by the **Generator**, **Interconnectors**, **Generator Aggregators** and **Demand Side Unit Operator**;

(e) any **Outages** where it is particularly desirable that they should take place within the year scheduled; or

(f) any **Outage** where its timing is dependent on **Generation Unit** run hours, equivalent run hours or starts.

OC.2.4.6 **Generators**, **Interconnector Operators**, **Generator Aggregators, Demand Side Unit Operators** are required to signal adequately in advance major **Outages** which could impact on capacity adequacy or on the **TSO's** transmission outage maintenance and development. In rolling over the **Generation Outage Programme** from one year to the next each **Generator, Generator Aggregator** and **Demand Side Unit Operator** shall not be constrained in making any submission by any previous **Provisional Outage Programme**.

OC.2.4.7 Between March and June of year 0, the **TSO** shall carry out a security analysis of years 1 to 7 in light of proposed **Outages** and other relevant matters including:

(a) **Outages** of other **Generation Units**, **Aggregated Generating Units** and **Demand Side Units;**

(b) **Outages** of **Generation Units**, **Aggregated Generating Units** and **Demand Side Units** on the **Other Transmission System;**

(c) **Interconnectors** and **Inter-jurisdictional Tie Line;** and

(d) **Transmission** outages, **Load** growth and fuel security.

In the event that a proposed **Generator's**, **Interconnector Operator's** and **Generator Aggregator's, Demand Side Unit Operator's Outage** has a detrimental effect on **Capacity Adequacy** or system security either in the **Transmission System** or in the **Other Transmission System**, the relevant **TSO** will highlight the shortfall to all **Generators, Interconnector Operators, Generator Aggregators, Demand Side Unit Operators** and **Suppliers.**

OC.2.4.8 Any concerns which the **TSO** may have with the **Generation Outage Programme** must be notified to all **Generators**, **Interconnector Operators**, **Generator Aggregators** and **Demand Side Unit Operators** by the end of June in year 0.

OC.2.4.9 Between the end of June in year 0 and the end of September in year 0 any concerns raised by the **TSO** shall be notified to **Generators**, **Interconnector Operators**, **Generator Aggregators** and **Demand Side Unit Operators**. The **TSO** will enter into discussions with **Generators**, **Interconnector Operators**, **Generator Aggregators** and **Demand Side Unit Operators** to find a resolution. If by the end of September in year 0 no resolution has been agreed and in the opinion of the **TSO** there is a capacity shortfall in year 1, the **TSOs** will jointly issue a **System Capacity Shortfall Warning**.

OC.2.4.10 The **TSO** shall issue to each **Generator**, **Interconnector Operator**, **Generator Aggregator** and **Demand Side Unit Operator** a **Generation Outage Programme** for that **Generator, Interconnector, Generator Aggregator, Demand Side Unit Operator** for years 1 to 3 by the last **Business Day** of September in year 0, including the **COP** for year 1.

OC.2.4.11 Information relating to the **COP** and **POP** shall be exchanged on a regular basis with the **Other TSO**.

OC.2.5 Not Used

OC.2.6 Changes to the Committed Outage Programme within the Implementation Year (Year 0)

OC.2.6.1 A request for a change to an **Outage** included in the **Committed Outage Programme** or an additional **Outage** may be initiated either by the **TSO** or by a **Generator**, **Interconnector Operator**, **Generator Aggregator** or **Demand Side Unit Operator** at any time.

OC.2.6.2 **Request initiated by the TSO**

OC.2.6.2.1 The **TSO** may at any time request from a **Generator, Interconnector Operator, Generator Aggregator** or **Demand Side Unit Operator** a change in the timing or duration of any **Outage** of one of the **Generator's Generation Units, Interconnectors, Demand Side Unit Operator's Demand Side Units** or an **Individual Demand Site** which constitutes the **Demand Side Unit** in the **Committed Outage Programme**.

OC.2.6.2.2 A **Generator, Interconnector Operator, Generator Aggregator** or **Demand Side Unit Operator** may respond either by declining the request, or by agreeing to the request (in which case the **COP** shall be deemed to be amended accordingly). **Generators, Interconnector Operators, Generator Aggregators** and **Demand Side Unit Operators** shall make every reasonable effort to co-operate with changes requested by the **TSO**.

OC.2.6.2.3 If a **Generator, Interconnector Operator, Generator Aggregator** or **Demand Side Unit Operator** responds by agreeing to the request subject to specific conditions, the **TSO** may respond by either confirming agreement to those conditions, in which case the conditions specified by the **Generator, Interconnector Operator, Generator Aggregator** or **Demand Side Unit Operator** shall be deemed to have been accepted, or by declining agreement. Where the **TSO** agrees to the conditions the **COP** shall be deemed to be amended accordingly. Where the **TSO** declines to agree to the conditions, then the **TSO** may negotiate with the **Generator, Interconnector Operator, Generator Aggregator** or **Demand Side Unit Operator** as to revised or alternative conditions, which would be acceptable.

OC.2.6.3 **Outage Change Initiated by a Generator, Interconnector Operator, Generator Aggregator or Demand Side Unit Operator**

OC.2.6.3.1 **Generators, Interconnector Operators, Generator Aggregators** or **Demand Side Unit Operators** may at any time request the **TSO** for a change in the timing or duration of any **Outage** of one of the **Generator's Generation Units, Interconnectors** or **Demand Side Unit Operator's Demand Side Units** or an **Individual Demand Site** which constitutes the **Demand Side Unit** in the **Committed Outage Programme**.

OC.2.6.3.2 Where a change to the **COP** is proposed by a **Generator**, **Interconnector Operator, Generator Aggregator** or **Demand Side Unit Operator**, the **TSO** shall evaluate whether the change is likely to have a detrimental effect on **Capacity Adequacy** or on the secure operation of the **Transmission System.** This shall be done within a reasonable time frame, taking into consideration the extent of the change and the timing of the **Outage.**

OC.2.6.3.3 Where the request is not likely to have a detrimental effect on **Capacity Adequacy** or the secure operation of the **Transmission System** then the **TSO** shall amend the **COP** accordingly. The **Generator**, **Interconnector Operator, Generator Aggregator** or **Demand Side Unit Operator** shall be advised by the **TSO** that the change has been accepted.

OC.2.6.3.4 Where the **Outage** change is likely to have a detrimental effect on **Capacity Adequacy** or requirements for the secure operation of the **Transmission System** then the **TSO** shall not amend the **COP**. The **TSO** shall contact the **Generator, Generator Aggregator** or **Demand Side Unit Operator** and inform the **Generator, Interconnector Operator's, Generator Aggregator** or **Demand Side Unit Operator** that the change to the **COP** has not been accepted, the **TSO** shall at the **Generator's, Interconnector Operator, Generator Aggregator's** or **Demand Side Unit Operator's** request enter into discussions with the **Generator, Interconnector Operator, Generator Aggregator** or **Demand Side Unit Operator** to facilitate an alternative modification which may meet the requirements of the **Generator, Interconnector Operator, Generator Aggregator** or **Demand Side Unit Operator** while not having an unacceptable effect on **Capacity Adequacy** or requirements for secure operation of the **Transmission System.** In the event that the **Generator, Interconnector Operator, Generator Aggregator** or **Demand Side Unit Operator** wishes to avail of an alternative modification, it shall submit a change request in accordance with OC.2.6.3.1.

OC.2.6.3.5 Where the **Generator, Interconnector Operator, Generator Aggregator** or **Demand Side Unit Operator** has been notified that the change to the **COP** has not been accepted, but in the view of the **Generator, Interconnector Operator, Generator Aggregator** or **Demand Side Unit Operator** it must force the **Generation Unit, Interconnector** or **Demand Side Unit** to be unavailable due to technical or safety issues, then the **Generator, Interconnector Operator, Generator Aggregator**, **Demand Side Unit Operator** shall inform the **TSO** immediately in accordance with the requirements to submit an **Availability Notice**.

OC.2.7 Other Information to be Noted

OC.2.7.1 **Generators** and **Interconnector Operators** will inform the **TSO** of any proposed maintenance, in addition to **Outages**, which will, or is likely to, affect the capability of the **Generation Unit** or **Interconnector** to provide **Ancillary Services**, as soon as is reasonably possible.

OC.2.7.2 The **TSO** may, where security of supply or the secure operation of the **Transmission System** or the **Other Transmission System** would be at risk, request alterations to maintenance notified under Section OC.2.7.1. The **TSO** shall make reasonable endeavours to give as much notice as possible for such requests for alterations. Where the **TSO** makes such a request, the **Generator, Interconnector Operator, Generator Aggregator** or **Demand Side Unit Operator** shall use reasonable endeavours to comply with the request in arriving at the **User's** final programme for such maintenance.

OC.2.7.3 The **DSO** shall co-operate with the **TSO** and **Embedded Generators** and **Demand Side Unit Operators** in all phases of **Outage** planning to promote **Capacity Adequacy** and ensure system security.

OC.2.7.4 **Generators** must immediately notify the **TSO** on making the decision to cancel a major **Outage** of a **Generation Unit**.

OC.2.7.4.1 Following the decision by a **Generator** to cancel a major **Outage** of a **Generation Unit** the **Generator** must report to the **TSO**, on an on-going basis, practical, useful, and proportionate information to allow the **TSO** to make the necessary assessments and propose mitigation measures in relation to security of supply**.**

OC.2.7.4.1.1 The reports should cover the following:

(a) an explanation for the cancellation of a major **Outage**;

(b) annual notification of major changes to the operational intentions of the **Generator** and/or characteristics of the **Generation Unit** as a result of the OC2.7.4.1.1 decision not to proceed with the major **Outage**;

(c) assessments covering the risks of sudden and catastrophic failure.

OC.2.7.5 A **Generator** must immediately notify the **TSO** in the event of sudden and catastrophic failure of a **Generation Unit**.

OC.2.7.5.1 The **Generator** must report to the **TSO** the impact of the failure of the **Generation Unit** and the future operation of the **Generation Unit**.

OC.2.7.5.2 The **TSO** must notify the **Regulatory Authority** if the assessments covering the sudden and catastrophic failure of a **Generation Unit** highlight the emergence of potential risks to the security of supply and the operation of the **System.**

OC.3 Not Used

OC.4 System Services

OC.4.1 Introduction

System Services refers to the services essential to the proper functioning of the **Power System** which electricity utilities collectively provide for their customers in addition to the provision of electrical power, the supply of electric energy, and the transmission and distribution of this energy, and which thus determine **Power Quality**:

(a) **Frequency Control**;

(b) **Voltage Control**;

(c) **Network Control**;

(d) **Operating Margin; and**

(e) Black Start.

In order to ensure secure operation, the **TSO** shall have control over all **System Services**; i.e. the **TSO** shall specify what **System Services** are to be provided when and by whom.

OC.4.2 Scope

OC.4.2.1 OC.4 applies to the **TSO** and to the following, each of which is a **User** under this OC.4:

(a) **Grid Connected Generators** with **Registered Capacity** greater than 2MW;
(b) **Demand Customers**
(c) The **Distribution System Operator (DSO)**; and
(d) **Interconnector Operators**.

OC.4.3 Frequency Control

OC.4.3.1 **Introduction**

OC.4.3.1.1 In order to maintain the security and integrity of the **Transmission System** it is necessary that the **TSO** operates the **Transmission System** and **Dispatches** in such a manner as to provide adequate **Frequency Control** so as to achieve operation within applicable **Frequency** limits at all times.

OC.4.3.2 **Objective**

OC.4.3.2.1 The objectives of OC.4.3 are:

(a) to set out the procedures required to ensure that adequate **Frequency Control** capability is provided on the **Transmission System** to enable operational **Frequency Control** by the **TSO** so as to achieve the applicable limits; and

(b) to set out the procedures required to enable the **TSO** to control the **Transmission System Frequency** and (insofar as possible) to maintain **Frequency** within the limits set out in CC.8.2.1.

OC.4.3.3 **Description of Frequency Control**

OC.4.3.3.1 **Frequency Control** occurs in two time scales, namely:

(a) **Primary Frequency Control**; and

(b) **Secondary Frequency Control**.

OC.4.3.3.2 **Primary Frequency Control**

OC.4.3.3.2.1 **Primary Frequency Control** takes place in the period of up to 30 seconds after a change in **Frequency** and is achieved by automatic corrective responses to **Frequency** deviations occurring on the **Transmission System**. This automatic correction arises from:

(a) natural frequency demand relief of motor load;

(b) automatic MW output adjustment of **Generation Units** initiated by **Governor Droop** or other responses including peaking of **Combustion Turbine Units**, condensate stop or frequency triggered response of pumped storage units;

(c) automatic load shedding (see OC.5: **Demand Control**).

OC.4.3.3.2.2 Automatic **Primary Frequency Control** actions in response to normal **Frequency** fluctuations, within the levels specified in CC.8.2.1(a), on the **Transmission System** can be termed as "**Frequency Regulation**". Inadequate **Frequency Regulation** can result in:

(a) unscheduled operation because **Generation Units** are moving away from their **Dispatched MW** levels due to **Frequency** drift;

(b) poor **External Interconnection** tie-line control; and

(c) failure to meet the applicable **Frequency** limits.

OC.4.3.3.2.3 **Frequency** deviations, outside the levels specified in CC.8.2.1(a) such as those that may occur on the loss of **Generation Unit(s)**, **Interconnectors** or other MW input into, the **Transmission System** or the **Distribution System** are corrected through the use of **Operating Reserve**.

OC.4.3.3.3 **Secondary Frequency Control**

OC.4.3.3.3.1 **Secondary Frequency Control** takes place in the time scale from 5 seconds up to 10 minutes after the change in **Frequency**. It is provided by a combination of automatic and manual actions.

OC.4.3.3.3.2 Improved **Secondary Frequency Control** can be achieved by use of a **Secondary Frequency Regulation System** which acts directly on the **MW Outputs** of participating **Generation Units** and on the **Active Power** transfer to or from **External Systems** by **Interconnectors**. This automatic action facilitates more frequent MW output adjustments than is practicable by means of **Dispatch Instructions** and manual setpoint adjustment, thus allowing more frequent and rapid **Frequency** correction.

OC.4.3.4 **Frequency Response Systems**

OC.4.3.4.1 **Requirements of Generation Unit Governor Systems**

OC.4.3.4.1.1 In order that adequate **Frequency Regulation** is maintained on the **Transmission System** at all times, **Generators** are required to comply with the provisions of OC.4.3.4.1.

OC.4.3.4.1.2 Other than as permitted in accordance with OC4.3.4.1.3:

(a) **Generation Units** when **Synchronised** to the **Transmission System** shall operate at all times under the control of a **Governor Control System,** unless otherwise specified by the **TSO**, with characteristics within the appropriate ranges as specified in **Connection Conditions**;

(b) no time delays other than those necessarily inherent in the design of the **Governor Control System** shall be introduced;

OC.4.3.4.1.3 The **Generator** may only restrict governor action in such a manner as to contravene the terms of OC.4.3.4.1.2 where:

(a) the action is essential for the safety of personnel and/or to avoid damage to **Plant**, in which case the **Generator** shall inform the **TSO** of the restriction without delay; or

(b) in order to (acting in accordance with **Good Industry Practice**) secure the reliability of the **Generation Unit**; or

(c) the restriction is agreed between the **TSO** and the **Generator** in advance; or

(d) the restriction is in accordance with a **Dispatch Instruction** given by the **TSO**.

OC.4.3.4.1.4 In the event that the **TSO** in accordance with OC.4.3.4.1.3 either agrees to a restriction on governor action or instructs such a restriction, the **TSO** shall record the nature of the restriction, the reasons, and the time of occurrence and duration of the restriction.

OC.4.3.4.1.5 **Frequency Sensitive Mode**

A **Frequency Deadband** of no greater than +/- 15mHz may be applied to the operation of the **Governor Control System**. The design, implementation and operation of the **Frequency Deadband** shall be agreed with the **TSO** prior to the **Commissioning**.

OC.4.3.4.1.6 Action required by **Generators** in response to low **Frequency**:

(a) If **System Frequency** falls to below 49.80 Hz each **Generator** will be required to check that each of its **CDGUs** is achieving the required level of response including that required from the **Governor Control System**, where applicable in order to contribute to containing and correcting the low **System Frequency**.
(b) Where the required level of response is not being achieved appropriate action should be taken by the **Generator** without delay and without receipt of instruction from the **TSO** to achieve the required levels of response, provided the **Generator's** local security and safety conditions permit.

OC.4.3.4.1.7 Action required by **Generators** in response to **High Frequency Events**:

If **System Frequency** rises to or above 50.2 Hz, each **Generator** will be required to ensure that its **CDGUs** have responded in order to contribute to containing and correcting the high **System Frequency** by automatically or manually reducing **MW Output** without delay and without receipt of instruction from the **TSO** to achieve the required levels of response, provided the **Generator's** local security and safety conditions permit.

OC.4.3.4.1.8 **Limited Frequency Sensitive Mode – Over-frequency**

The following shall apply for **Generators** operating in Limited Frequency Sensitive Mode – Over Frequency:

(a) **Generation Units** shall be capable of providing **Active Power Frequency Response** when the **Transmission System Frequency** rises to or above 50.2 Hz.
(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 **Generator** without delay and without receipt of instruction from the **TSO** to achieve the required levels of response, provided the **Generator's** local security and safety conditions permit.

○

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

(d) **Generation Units** 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.

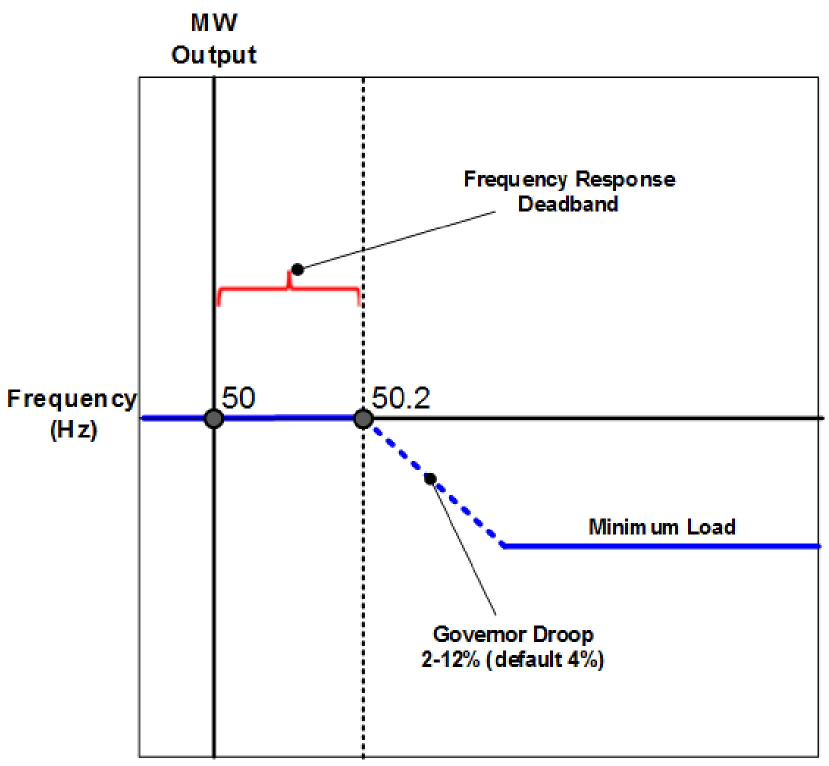

Figure OC.4.3.4.1.8: Limited Frequency Sensitive Mode – Over-frequency

OC.4.3.4.1.9 **Limited Frequency Sensitive Mode – Under-frequency**

The following shall apply for **Generators** operating in Limited Frequency Sensitive Mode – Under-frequency:

(a) **Generation Units** shall be capable of providing **Active Power Frequency Response** when the **Transmission System Frequency** falls to or below 49.5 Hz.

(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%.

(c) Where the required level of response is not being achieved appropriate action should be taken by the **Generator** without delay and without receipt of instruction from the **TSO** to achieve the required levels of response, provided the

Generator's local security and safety conditions permit.

(d) **Generators** shall take into account the;

(i) ambient conditions when the response is triggered;

(ii) operating conditions of each **Generation Unit**; and

(iii) availability of the **Primary Fuel**.

(e) **Generators** shall be capable of providing a power increase up to

Registered Capacity. Stable operation shall be ensured.

(f) **Generators** capable of acting as a load, including **Pumped Storage Plants**, shall be capable of disconnecting their load. This requirement does not extend to auxiliary supplies.

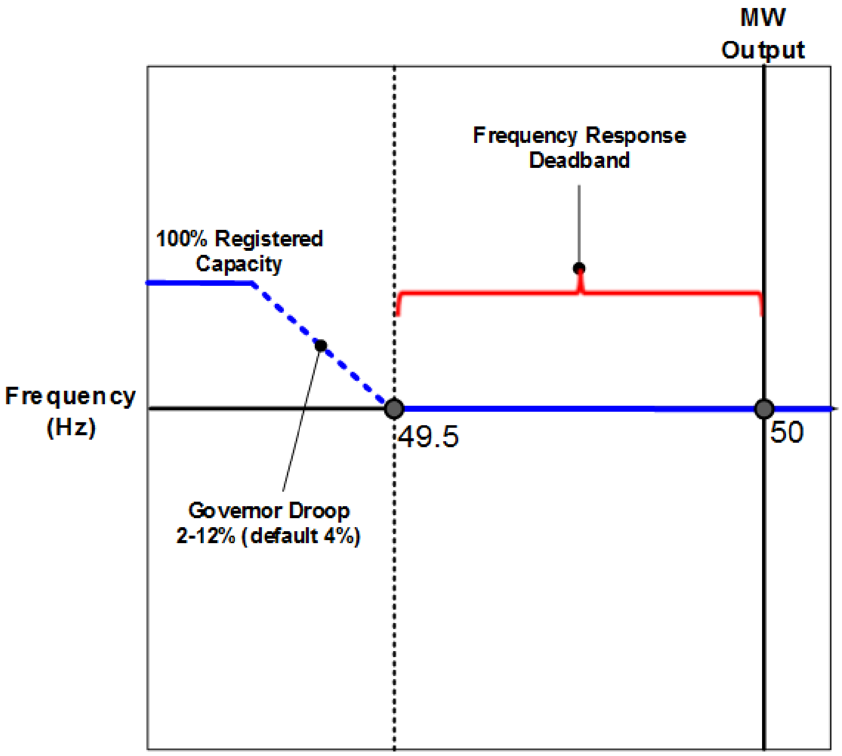

Figure OC.4.3.4.1.9: Limited Frequency Sensitive Mode – Under-frequency

OC.4.3.4.1.10 **Frequency Sensitive Mode**

The following shall apply for Generators operating in Frequency Sensitive Mode operation:

(a) A **Frequency Deadband** of no greater than +/- 15mHz may be applied to the operation of the **Governor Control System**. The design, implementation and operation of the **Frequency Deadband** shall be agreed with the **TSO** prior to the **Commissioning**.

(b) **Generation Units** shall be capable of setting **Governor Droop** between 2% and 12%. The default **Governor Droop** setting shall be 4%.

(c) **Generation Units** shall be capable of providing **Active Power Frequency Response** in accordance with the parameters specified in Table OC.4.3.4.1.10(a).

Table OC.4.3.4.1.10(a): Parameters for **Active Power Frequency Response**

Parameter	Value
Frequency Response Insensitivity (Δf)	15mHz
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.

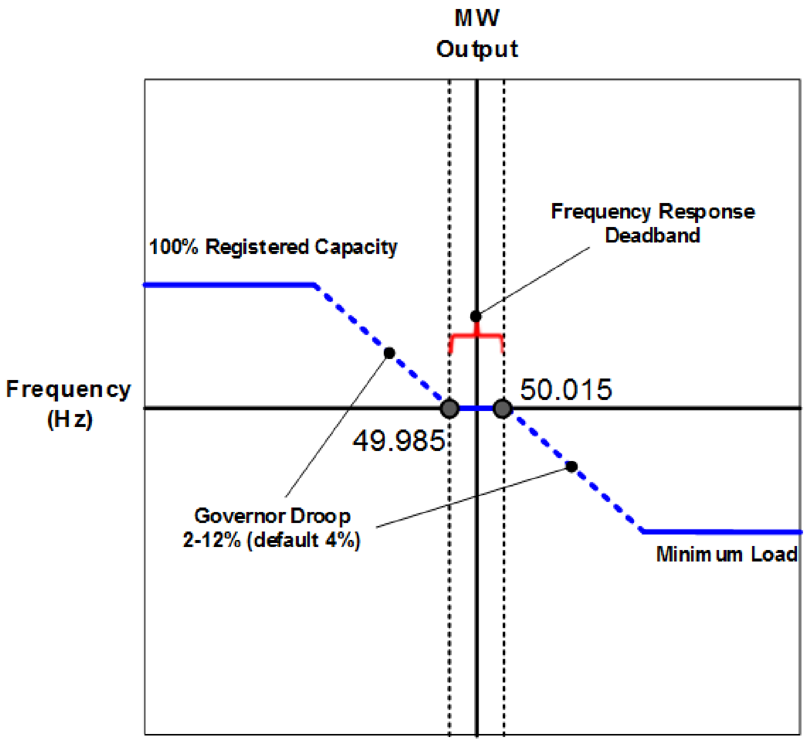

Figure OC.4.3.4.1.10: Frequency Sensitive Mode

OC.4.3.4.1.11 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**. **Generators** may be instructed to be in both Limited Frequency Sensitive Mode – Under-frequency and Limited Frequency Sensitive Mode – Over-frequency at the same time. **Generators** 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.

OC.4.3.4.2 **Requirement of Interconnector Frequency Response Systems**

OC.4.3.4.2.1 In order that adequate **Frequency Control** is maintained on the **Transmission System** at all times, **Interconnectors** are required to comply with the provisions of OC.4.3.4.2.

OC.4.3.4.2.2 Other than as permitted in accordance with OC.4.3.4.2.3:

(a) **Interconnectors** when **Energised** shall operate at all times in **Frequency Control** mode**,** unless otherwise specified by the **TSO**, with characteristics within the appropriate ranges as specified in **Connection Conditions**;

(b) The **Interconnector Frequency Droop** shall normally be 4% and shall be settable between 2% and 7%;

(c) No intentional time delays other than those agreed with the **TSO** shall be introduced into the frequency response system;

(d) The **Frequency Deadband** shall normally be zero. Any non-zero deadband must be agreed in advance with the **TSO** and shall not exceed +/-15mHz.

(e) **Interconnectors** shall not act to control the frequency in an **External System** unless agreed in advance with the **TSO** and the **External System Operator.**

Frequency Sensitive Mode

The following shall apply for **Interconnectors** for **Frequency Sensitive Mode** operation:

(a) **Interconnector** shall be capable of responding to **Frequency** deviations on the **Transmission System** by adjusting its **Active Power** transmission within the minimum and maximum transmission capacity in each direction in accordance with the parameters given below.

(b) A **Frequency Deadband** of no greater than +/- 15mHz.

(c) A **Frequency Response Insensitivity** of 15mHz.

(d) An upward regulation (importing) droop between 0.1% and 12% with a default value set at 4%.

(e) A downward regulation droop (exporting) droop between 0.1% and 12% with a default value set at 4%.

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

(g) Adjustment of **Active Power** response to a **Frequency** step change shall be delivered as soon as technically feasible and will be at or above the solid line in the following digram in accordance with the parameters shown in Table CC.4.3.4.2.2.

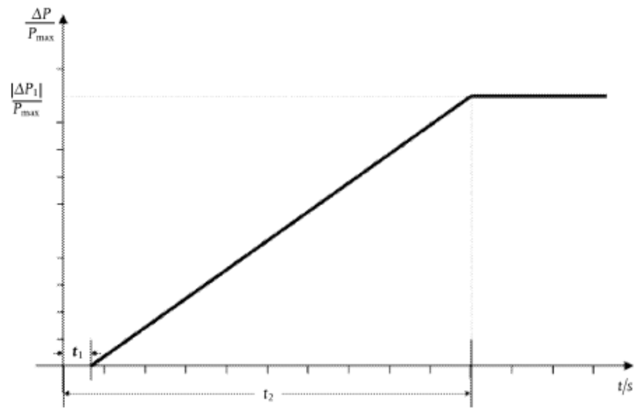

Table OC.4.3.4.2.2 Parameters for full activation of **Active Power Frequency** response resulting from **Frequency** step change

Parameter	**Setting**
Active Power as percentage of Maximum Capacity ($\Delta P_1/P_{max}$)	X%
Maximum admissible initial delay t_1	0.5 seconds
Maximum admissible time for full activation t_2, unless longer activation times are agreed with the TSO	10 seconds

An **Interconnector** linking various synchronous areas shall be capable of adjusting the full **Active Power Frequency** response when operating in **Frequency Sensitive Mode** at any time and for a continuous time period. In addition, the **Active Power** control of the Interconnector shall not have any adverse impact on the **Active Power Frequency** response.

Limited Frequency Sensitive Mode – Over-frequency

The following shall apply for **Interconnectors** operating in Limited **Frequency** Sensitive Mode – Over- **Frequency**:

(a) **Interconnector** shall be capable of adjusting **Active Power Frequency** response, during both import and export, when the **Transmission System Frequency** rises to or above 50.2 Hz.

(b) The **Active Power** response shall be capabale of operating with a droop between 0.1% and 12% with default set at 4%.

(c) **Interconnector** shall be capable of adjusting its **Active Power** down to its minimum active power transmission capacity. Stable operation shall be ensured. When Limited **Frequency** Sensitive Mode – Over- **Frequency** is active, hierarchy of control facilities shall be organised in accordance with CC.10.12.6.

(d) **Interconnector** shall be capable of adjusting **Active Power Frequency** response as fast as inherently technically feasible.

|||	**Limited Frequency Sensitive Mode – Under-frequency** The following shall apply for **Interconnectors** operating in Limited **Frequency** Sensitive Mode – Under- **Frequency**: (a) **Interconnector** shall be capable of adjusting **Active Power Frequency** response, during both import and export, when the **Transmission System Frequency** falls to or below 49.5 Hz. (b) The **Active Power** response shall be capabale of operating with a droop between 0.1% and 12% with default set at 4%. (c) **Interconnector** shall be capable of adjusting its **Active Power** up to its maximum **Active Power** transmission capacity. Stable operation shall be ensured. When Limited **Frequency** Sensitive Mode – Under- **Frequency** is active, hierarchy of (d) control facilities shall be organised in accordance with CC.10.12.6. (e) **Interconnector** shall be capable of adjusting **Active Power Frequency** response as fast as inherently technically feasible.

OC.4.3.4.2.3 The **Interconnector Operator** may only restrict the action of the **Frequency Control** mode in such as a manner as to contravene the terms of OC.4.3.4.2.2 where:

(a) The action is essential for the safety of personnel and/or to avoid damage to **Plant**, in which case the **Interconnector Operator** shall inform the **TSO** of the restriction without undue delay; or

(b) in order to (acting in accordance with **Good Industry Practice**) secure the reliability of the **Interconnector,** in which case the **Interconnector Operator** shall inform the **TSO** of the restriction without undue delay; or

(c) the restriction is agreed between the **TSO** and the **Interconnector Operator** in advance; or

(d) the restriction is in accordance with a **Dispatch Instruction** given by the **TSO**.

OC.4.3.4.2.4 In the event that the **TSO** in accordance with OC.4.3.4.2.3 either agrees to a restriction on the control action or instructs such a restriction, the **TSO** shall record the nature of the restriction, the reasons, and the time of occurrence and duration of the restriction.

OC.4.3.4.2.5 Action required by **Interconnector Operators** in response to low **Frequency**:

(a) If **System Frequency** falls to below 49.80 Hz each **Interconnector Operator** will be required to ensure that it has responded in order to contribute to containing and correcting the low **System Frequency** by automatic or manually increasing the **Active Power** transfer from an **External System** or decreasing the **Active Power** transfer from the **Transmission System** without delay and without receipt of instruction from the **TSO** to achieve the required levels of response, provided the **Interconnector's** local security and safety conditions permit;

(b) Any such action shall be in accordance with the **Interconnector Operating Protocol** agreed between the **Interconnector Operator**, the **TSO** and the **External System Operator**.

OC.4.3.4.2.6 Action required by **Interconnector Operators** in response to high **Frequency**:

(a) If **System Frequency** rises above 50.2 Hz each **Interconnector Operator** will be required to ensure that it has responded in order to contribute to containing and correction of the high **System Frequency** by automatic or manually decreasing the **Active Power** transfer from an **External System** or increasing the **Active Power** transfer from the **Transmission System** without delay and without receipt of instruction from the **TSO** to achieve the required levels of response, provided the **Interconnector's** local security and safety conditions permit.

(b) Any such action shall be in accordance with the **Interconnector Operating Protocol** agreed between the **Interconnector Operator**, the **TSO** and the **External System Operator**.

OC.4.3.4.2.7 Action required by **Interconnector Operators** in response to **External System Frequency Events:**

Automatic MW setpoint changes of **Interconnectors** triggered by **Frequency Events** on the **External System** shall be agreed between the **Interconnector Operator,** the **TSO**, and the **External System Operator** in accordance with the **Interconnector Operating Protocol.**

OC.4.3.4.2.8 The **TSO** having due regard to system security may instruct the **Interconnector Operator** to disable the **Frequency Control** mode of an **Interconnector** at any time, and this instruction must be carried out without delay.

OC.4.3.5 **Dispatch Instructions**

When the **TSO** determines it is necessary, by having monitored the **System Frequency**, it may, as part of the procedure set out in SDC2, issue a **Dispatch Instruction** (including **Target Frequency** where applicable) in order to seek to regulate **Frequency** to meet the requirements for **Frequency Control**. The **TSO** will give, where applicable, 15 minutes notice to each relevant **User** of variation in **Target Frequency**.

OC.4.3.6 Automatic Generator Control (AGC)

OC.4.3.6.1 The secondary **Frequency** regulation system operational on the **Transmission System** is known as the "**Automatic Generator Control**" (**AGC**).

OC.4.3.6.2 **Generation Units** and **Interconnectors** with a **Registered Capacity** of 60MW or greater are, under **Connection Conditions**, required to be connected to **AGC**, the **AGC Control Range** being a **Registered Operating Characteristic**.

OC.4.3.6.3 Other than as provided for in OC.4.3.6.4 and OC.4.3.6.5 all **Generation Units** and **Interconnectors** fitted with **AGC** shall operate under the control of **AGC** when within their **AGC Control Range**.

OC.4.3.6.4 In the event that the **Generator** or **Interconnector Operator** (acting in accordance with **Good Industry Practice**) considers that it is necessary to secure the reliability of a **Generation Unit** or **Interconnector**, or for the safety of personnel and/or **Plant**, to prevent a **Generation Unit** or **Interconnector** from operating under **AGC** and commences to control the MW output manually, then the **Generator** or **Interconnector Operator** shall inform the **TSO** of this without delay. **Generators** and **Interconnector Operators** shall also inform the **TSO** of the reasons for not operating the **Generating Unit** or **Interconnector** under **AGC**, and the course of action being taken to rectify the problem forthwith. When the problem has been rectified, the **Generator** or **Interconnector Operator** shall contact the **TSO** to arrange for the **Generation Unit** or **Interconnector** to return to operation under the control of **AGC**.

OC.4.3.6.5 The **TSO** may issue a **Dispatch Instruction** to a **Generator** or **Interconnector Operator** to prevent a **Generation Unit** or **Interconnector** (fitted with **AGC**) from operating under **AGC**, in accordance with **SDC2**.

OC.4.3.6.6 **Generation Units** or **Interconnectors** not operating under **AGC** for reasons set out in OC.4.3.6.4 and OC.4.3.6.5 shall nevertheless continue to follow **MW Dispatch Instructions** as required by SDC2.

OC.4.4 Voltage Control

OC.4.4.1 Introduction

OC.4.4.1.1 In order to maintain security and integrity of the **Transmission System**, to avoid damage to the **Transmission System** and to **User Plant**, and to maintain **Voltages** at **User Connection Points** within the limits specified in the **Connection Conditions**, it is necessary for the **TSO** to control **Transmission System Voltages**.

OC.4.4.1.2 **Voltage** control of power systems requires that a Mvar demand is met and that sufficient dynamic **Voltage** control capability is available on the **Transmission System** to cover changes in the Mvar demand such as result from **Demand** variations, to facilitate controlled **Voltage** adjustment and to limit the duration and extent of **Voltage** fluctuations under fault conditions. In order to do this, static and dynamic reactive reserve capability is required. To control **Transmission System Voltages**, the **TSO** will utilise a variety of methods of dynamic and static control.

OC.4.4.1.3 **Voltage** control strategies used by the **TSO** include:

a) transformer tap-changing, cable switching, reactor and capacitor switching, and other control methods which involve utilisation of **Transmission System Plant** only;
b) tap-changing on **Generator Transformers**;
c) **Demand** power factor correction;
d) utilisation of **Generation Unit Reactive Power** capability, both by means of **AVR** control and also **Mvar Dispatch Instructions** issued by the **TSO** to **Generators**;
e) utilisation of **Interconnector Reactive Power** capability by means of suitably acting **AVR** control and/or **Mvar Dispatch Instructions** issued by the **TSO** to **Interconnector Operators.**

OC.4.4.2 Objectives

OC.4.4.2.1 The objective of OC.4.4 is to set out the control strategies used by the **TSO**, in conjunction with **Users** where appropriate, in controlling **Transmission System Voltages**.

OC.4.4.2.2 OC.4.4 sets out the procedures required (in conjunction with those in SDC2 to enable the **TSO** to:

(a) maintain voltage stability of the **Transmission System;**

(b) maintain **Transmission System Voltages** at **User Connection Points** within operational limits as specified in the **Connection Conditions**.

OC.4.4.2.3 OC.4.4 sets out the procedures for the utilisation of **User Plant** or facilities by the **TSO** for the purposes of **Transmission System Voltage** control, where appropriate.

OC.4.4.2.4 Some procedures for implementation of **Voltage** control strategies (e.g. **Generation Unit** Mvar **Dispatch, Interconnector Mvar Dispatch**) are addressed under the provisions of SDC2 and therefore this OC.4.4 shall be read in conjunction with these provisions.

OC.4.4.3 Description of Voltage Control

OC.4.4.3.1 **Voltage Control** is achieved by ensuring sufficient availability of dynamic and static reactive power from contributions listed in OC.4.4.3.2. The factors, which are obviously most readily subject to control by the **TSO**, are the Mvar produced/absorbed by **Generation Units, Interconnectors** and installed dedicated **Voltage Control** facilities.

OC.4.4.3.2 The **TSO** shall endeavour to maintain sufficient availability of dynamic and static reactive power in order to operate **Transmission System Voltages** at **Connection Points** within the levels specified in CC.8.3, at all times. Factors, which will influence the required Mvar capacity, include the following:

OC.4.4.3.2.1 The charging capacitance of the **Transmission System**.

OC.4.4.3.2.2 **Customer** Mvar **Demand**.

OC.4.4.3.2.3 **Transmission System** Mvar losses.

OC.4.4.3.2.4 **Generation Unit** Mvar production or absorption.

OC.4.4.3.2.5 **Interconnector** Mvar production or absorption.

OC.4.4.3.2.6 **Voltage Control** facilities, such as capacitor banks and reactors.

OC.4.4.3.3 The effects of **Transmission System** capacitance can be controlled and to some extent utilised by controlled variation of the **Transmission System Voltage**. Thus at times of high Mvar **Demand** (normally times of high MW **Demand**), the **Transmission System Voltage** may be operated towards the upper portion of the allowable control range, and at times of low Mvar **Demand** (normally times of low MW **Demand**), the **Transmission System Voltage** may be operated towards the lower portion of the allowable control range. This daily variation is typically required for operation of the **Transmission System**.

OC.4.4.3.4 Due to the electrical characteristics of a **Transmission System**, the **Voltage** (for **Plant** operated at the same nominal **Voltage**) will not be the same at all points on the **Transmission System**.

OC.4.4.4 Voltage Control Policy

OC.4.4.4.1 The **TSO** shall control system voltage in order to minimise system losses and cost of use of **Ancillary Services**. The **TSO** shall determine and modify as appropriate general procedures for its use in controlling **Voltage** on the **Transmission System**. The procedures shall be formulated having due regard to relevant economics of **Transmission System** operation and **Power System** reliability. In particular, the **Voltage Control** shall take cognisance of daily, weekly and seasonal factors and the **TSO** shall determine:

(a) suitable target **Voltages** in order to limit/control the effect of transmission capacitance;

(b) best utilisation of dedicated **Voltage Control** facilities; and

(c) Mvar dynamic reserve requirements.

OC.4.4.5 Methods Utilised in Exercising Voltage Control

OC.4.4.5.1 **Transmission System Voltages** shall be continuously monitored by the **TSO**. Appropriate **Voltage** operating points shall be determined by the **TSO**, taking account of OC.4.4.4 and in particular of **System** conditions pertaining at the time of operation.

OC.4.4.5.2 The **TSO** shall adjust **System Voltages**, using control facilities that are available so as to achieve the Mvar capacity necessary in order to operate **Transmission System Voltages** at **Connection Points** within the levels specified in CC.8.3 and retain a dynamic Mvar capability to deal with changing **System** conditions which result from changes in **Demand** or changes in transmission or generation configuration, whether as a result of control actions or faults. This may necessitate the modification of **Generation Unit MW** output or **Interconnector(s) Active Power** transfer from an **External System** or **Active Power** transfer to the **Transmission System**.

OC.4.4.5.3 The excitation system of each **Generation Unit** shall normally be operated under the control of a continuously acting **AVR**, which shall be set so as to maintain a constant terminal voltage. The **Generator** may not disable or restrict the operation of the **AVR** except in accordance with OC.4.4.5.5, in which event the **Generator** shall notify the **TSO** without delay.

OC.4.4.5.4 Each **Interconnector** shall control the voltage at the **Grid Connection Point** by means of a suitable continuously acting **AVR.** The voltage control mode shall be as agreed under the **Interconnector Operating Protocol.** The **Interconnector Operator** may not disable or restrict the operating of the **AVR** except in accordance with OC.4.4.5.5, in which event the **Interconnector Operator** shall notify the **TSO** without undue delay.

OC.4.4.5.5 The **Generator** or **Interconnector Operator** may only disable or restrict **AVR** action where:

(a) the action is essential for the safety of personnel and/or **Plant**; or

(b) in order to (acting in accordance with **Good Industry Practice**), secure the reliability of the **Generation Unit or Interconnector**; or

(c) the restriction is agreed between the **TSO** and the **Generator** or **Interconnector Operator** in advance.

OC.4.4.5.6 In the event of a **Generation Unit** not operating under **AVR**, the **TSO** may impose restrictions on the operation of the **Generation Unit** in accordance with **Prudent Utility Practice**, to the extent necessary to provide for safe and secure operation of the **Transmission System** and operation within prescribed standards, including where necessary instructing the **Generator** to **De-Energise** the **Generation Unit**. Where the **TSO** takes such action, the **TSO** shall consult with the **Generator** as soon as practicable in order to determine a safe operating regime, which causes minimum restriction on the operation of the **Generation Unit**.

OC.4.4.5.7 In the event of an **Interconnector** not operating under **AVR**, the **TSO** may impose restrictions on the operation of the **Interconnector** in accordance with **Prudent Utility Practice**, to the extent necessary to provide for safe and secure operation of the **Transmission System** and operation within prescribed standards, including where necessary instructing the **Interconnector Owner** to **De-Energise** the **Interconnector**.

OC.4.4.5.8 The **TSO** shall, by means of **Dispatch Instructions** (as provided in SDC2), instruct **Generators** and **Interconnectors** to adjust the **Reactive Power** output of **Generation Units** and **Interconnectors**, and the relevant provisions of SDC2 shall apply.

OC.4.4.5.9 Other facilities which shall be utilised by the **TSO**, where appropriate, in order to exercise **Voltage Control** shall include:

(a) switching in or out of dedicated **Voltage Control** facilities, such as capacitor banks and reactors;

(b) tap-changing on 400/220kV and 220/110kV **Transmission System** transformers;

(c) switching out of transmission **HV** cables (and occasionally transmission lines) in order to reduce the capacitive contribution of the **Transmission System**.

OC.4.4.5.10 The extent to which **Voltage Control** mechanisms can be utilised may be limited by **System** conditions and other limitations of **Plant** and **Apparatus**.

OC.4.4.5.11 On some occasions it shall be necessary to reschedule **Generation Units** or **Interconnectors** away from their desired output in order to achieve **Transmission System Voltages** at **Connection Points** within the levels specified in CC.8.2.

OC.4.4.6 Emergency or Exceptional Voltage Control

OC.4.4.6.1 Additional **Voltage Control** mechanisms may be utilised in the event of **System Emergency Conditions**. These shall include the following:

OC.4.4.6.1.1 **Generators** may be requested to operate **Generation Units** at Mvar production or absorption levels outside their currently declared **Technical Parameters**. This will be done by agreement between the **Generator** and the **TSO** and **Generators** will not be penalised for non-compliance with this clause.

OC.4.4.6.1.2 Changes in **System Voltage** can be achieved by instructing, as a form of **Dispatch Instruction** under OC.4.4, **Generators** to carry out a **Simultaneous Tap Change.** In the event that the **TSO** considers it necessary to carry out a **Simultaneous Tap Change**, **Generators** shall comply with the **TSO's** instructions.

OC.4.4.6.1.3 **Demand** shedding may be used to prevent **Voltage** from contravening low **Voltage** limits (as further provided in OC.5) at **Connection Points**.

OC.4.4.6.1.4 **Interconnector Operators** may be requested to operate **Interconnectors** at Mvar production or absorption levels outside their currently declared

Technical Parameters. This will be done by agreement between the **Interconnector Operator** and the **TSO** and **Interconnector Operators** will not be penalised for non-compliance with this clause.

OC.4.5 Network Control

OC.4.5.1 Introduction

OC.4.5.1.1 In implementing the **Transmission Outage Programme**, in routine operation of the **Transmission System** and in responding to emergency and fault situations on the **Transmission System**, the **TSO** needs to carry out network switching and **Control Actions** which may from time to time affect the operations of **Users** or security of supply to **Users**.

OC.4.5.1.2 The purpose of this OC.4.5 is to set out the actions which may be taken by the **TSO** in controlling the **Transmission System**, to set out the procedures whereby the **TSO** shall inform **Users**, where practicable, as to network **Control Actions** which will or may be likely to significantly affect a **User's** operations and to identify where the **TSO** shall, insofar as reasonably practicable, consult with **Users** and take into consideration **Users'** reasonable requirements.

OC.4.5.2 Objective

OC.4.5.2.1 The first objective of OC.4.5 is to identify the **Control Actions** that may be taken by the **TSO**, in order that the **TSO** may carry out maintenance and operation of the **Transmission System** and respond to **Transmission System** faults and emergencies.

OC.4.5.2.2 The second objective of OC4.5 is to establish procedures whereby the **TSO** will:

(a) where practicable, inform **Users** who will be or are likely to be significantly affected by network **Control Actions** of relevant details of intended **Control Actions** and the effect of those **Control Actions**;

(b) consult with **Users** as appropriate in order to find out and take into consideration reasonable objections raised by **Users** so affected.

OC.4.5.3 Network Control Actions

OC.4.5.3.1 The **TSO** needs to carry out operational network switching for a number of purposes, which will include:

(a) **Outages** of transmission **Plant** and **Apparatus** for the purposes of maintenance, new works, **System Tests**, protection testing and work by **Users**;

(b) **Outages** of transmission **Plant** due to suspected or potential faults and emergency repairs;

(c) **Voltage Control**;

(d) limiting power flows on the **Transmission System** to levels consistent with the capabilities of the transmission **Plant** and system security.

OC.4.5.3.2 Additionally, network switching may occur automatically and without advance warning due to operation of protection equipment in isolating or clearing faults on transmission **Plant** or on **User's Plant** which is connected to the **Transmission System.**

OC.4.5.3.3 Automatic switching sequences may also be established to limit power flows or **Voltage** or **Frequency** deviations in the event of faults elsewhere on the **System**.

OC.4.5.4 Notification to Users of Network Control

OC.4.5.4.1 All network **Control Actions** carried out on the **Transmission System** have the potential in a given set of circumstances to affect **Users**. To attempt to inform **Users** of every **Control Action** is not practicable and in most cases the information will not be of value to the **User** as the **User** will not invoke any specific action as a result of receipt of the information.

OC.4.5.4.2 Where it is identified and agreed, in accordance with the terms of the **Connection Agreements** and/ or Operating Agreements, between the **TSO** and a **User** that a specific **Control Action** (usually an action affecting the **Transmission System** configuration) has an **Operational Effect** on a **User** and that there is merit in notifying the **User** in advance of the **Control Action**, then the **TSO** will notify the **User** of the **Control Action** (if planned and where time permits), in accordance with any standing agreement that may be agreed with the **User**.

OC.4.5.4.3 Typical examples of actions notified in accordance with OC.4.5.4.2 may include:

(a) notification to the **DSO** of a significant reduction in supply security to a **Grid Supply Point**, where the **DSO** may arrange standby feeding arrangements at lower **Voltages**;

(b) notification to a **Demand Customer** of a significant reduction in supply security to a **Grid Supply Point** (such as the **Outage** of one of two transmission connections) where the **Demand Customer** may arrange standby supply or run in-house **Generation**.

OC.4.5.4.4 Where it is necessary to carry out urgent switching or other network **Control Actions** resulting from a **System** condition or fault, then it may not be possible for the **TSO** to inform **Users** in advance of the switching or other **Control Actions**. The **TSO** shall endeavour to inform **Users** where time permits, but this shall not delay timely implementation of **Control Actions** as required. Where the **TSO** is unable to inform **Users** prior to the **Control Actions**, then the provisions of OC.4.5.5 shall apply.

OC.4.5.5 Control Under Fault or Emergency Conditions

OC.4.5.5.1 In the event of a **System** fault or protection operation or other automatic operation, it will not be possible to invoke standing procedures in accordance with OC.4.5.4 prior to the occurrence of the **Control Action.**

OC.4.5.5.2 In the circumstances referred to in OC.4.5.5.1 or in the event that the **TSO** needs to implement **Control Actions** urgently and without informing **Users**, then unless the situation is of a temporary nature and has been rectified to normal, the **TSO** shall inform **Users** of the occurrence of the actions.

OC.4.5.5.3 The **TSO** shall also inform **Users** as to the likely duration of the condition and shall update this prognosis as appropriate. The **TSO** shall additionally inform **Users** when the condition has ended.

OC.4.5.5.4 **Emergency** Assistance to and from **External Systems** will be detailed in the **Interconnector Operating Protocol** agreed between the **Interconnector Operator**, the **TSO** and the **External System Operator**, and shall include the following actions:

(a) An **External System Operator** may request that the **TSO** take any available action to increase the **Active Power** transferred into its **External System**, or reduce the **Active Power** transferred into the **Transmission System**. Such request must be met by the **TSO** providing this does not require a reduction of Demand on the **Transmission System**, or lead to a reduction in security on the **Transmission System**.

(b) An **External System Operator** may request that the **TSO** take any available action to increase the **Active Power** transferred into its **External System**, or reduce the **Active Power** transferred into the **Transmission System**. Such request must be met by the **TSO** providing this does not require a reduction of Demand on the **Transmission System**, or lead to a reduction in security on the **Transmission System**.

OC.4.5.6 De-Energisation of Users by the TSO

OC.4.5.6.1 **De-Energisation** of a **User's Plant** and **Apparatus** may be effected at any time and from time to time if and to the extent that the **TSO** reasonably considers it necessary in order to provide for safe and secure operation of the **Transmission System** within prescribed standards, including in circumstances which otherwise cause or in the **TSO's** view are likely to cause one or more of the following:

(a) risk to the safety of personnel;

(b) risk to the stability of the **Transmission System**;

(c) risk to the **Transmission System** or any **User's Plant** or **Apparatus**;

(d) **Transmission System** elements to become loaded beyond their emergency limits;

(e) **Voltage** excursions on the **Transmission System** outside the ranges specified in CC.8.3;

(f) any behaviour causing sustained operation outside the normal **Transmission System** operating **Frequency** range;

(g) any material breach of a **Connection Condition**; and

(h) any action or inaction which places the **TSO** in breach of any legal or statutory or regulatory obligation.

OC.4.6 Operating Margin

OC.4.6.1 Introduction

OC.4.6.1.1 In order to cater for **Demand** forecast variations and to cover against a sudden loss of generation from the **Transmission System**, it is necessary that an **Operating Margin** is maintained through the **Operational Control Phase**.

OC.4.6.1.2 The **Operating Margin** is the amount of reserve (provided by additional **Generation** or **Demand** reduction measures) available above that required to meet the expected **System Demand**. **Prudent Utility Practice** requires that a continuum of **Operating Margin** is provided to adequately limit, and then correct, the potential **Frequency** deviation which may occur due to a **Generation**/**Demand** imbalance.

OC.4.6.1.3 OC.4.6 describes different types of reserve, as provided in a number of reserve time scales, which the **TSO** expect to utilise in the provision of the **Operating Margin**.

OC.4.6.1.4 Minimum connection and operating requirements for **Generators** and **Interconnectors** are outlined in the **Connection Conditions**.

OC.4.6.1.5 Procedures for the **Monitoring** and **Testing** of **Operating Reserve** are outlined under OC.10.

OC.4.6.2 Objective

OC.4.6.2.1 The objective of OC.4.6 is to describe the various time scales for which reserves are required, to describe the policy which will govern the dispatch of the reserves, and to describe the procedures for monitoring the performance of **Generation Units,** participating **Interconnectors** and other reserve providers.

OC.4.6.3 Constituents of Operating Margin

OC.4.6.3.1 The **Operating Margin** consists of **Operating Reserve** (which is further broken down into 4 time-scales), **Replacement Reserve**, **Substitute Reserve** and **Contingency Reserve**.

OC.4.6.3.2 **Operating Reserve**

OC.4.6.3.2.1 **Operating Reserve** is additional MW output provided from **Generation** plant, reduction of **Active Power** transfer to an **External System** or increase of **Active Power** transfer to the **Transmission System** by **Interconnectors,** or reduction in **Customer Demand**, which must be realisable in real time operation to contain and correct any potential **Transmission System Frequency** deviation to an acceptable level.

OC.4.6.3.2.2 **Operating Reserve** definitions relate to the time elapsed from the occurrence of an event which has initiated a **Frequency** disturbance. The definition of the time at which the event is deemed to have occurred and other associated definitions are addressed in OC.4.6.4.

OC.4.6.3.3 **Primary Operating Reserve (POR)**

OC.4.6.3.3.1 **Primary Operating Reserve (POR)** is the additional MW output (and/or reduction in **Demand**) required at the **Frequency** nadir (minimum), compared to the pre-incident output (or **Demand**), which is fully available and sustainable between 5 seconds and 15 seconds after the **Event** and where the nadir occurs between 5 and 15 seconds after the **Event.**

OC.4.6.3.3.2 If the actual **Frequency** nadir occurs less than 5 seconds or more than 15 seconds after the **Event**, then for the purpose of **POR** monitoring (in accordance with OC.10.4.4) the nadir is deemed to be the lowest Frequency which did occur between 5 and 15 seconds after the **Event.**

OC.4.6.3.4 **Secondary Operating Reserve (SOR)**

OC.4.6.3.4.1 **Secondary Operating Reserve (SOR)** is the additional MW output (and/or reduction in **Demand**) required compared to the pre-incident output (or **Demand**), which is fully available and sustainable over the period from 15 to 90 seconds following an **Event.**

OC.4.6.3.5 **Tertiary Operating Reserve**

OC.4.6.3.5.1 **Tertiary Operating Reserve band 1 (TOR1)** is the additional MW output (and/or reduction in **Demand**) required compared to the pre-incident output (or **Demand**) which is fully available and sustainable over the period from 90 seconds to 5 minutes following an **Event.**

OC.4.6.3.5.2 **Tertiary Operating Reserve band 2 (TOR2)** is the additional MW output (and/or reduction in **Demand**) required compared to the pre-incident output (or **Demand**) which is fully available and sustainable over the period from 5 minutes to 20 minutes following an **Event.**

OC.4.6.3.6 **Replacement Reserve** is the additional MW output (and/or reduction in **Demand**) required compared to the pre-incident output (or **Demand**) which is fully available and sustainable over the period from 20 minutes to 4 hours following an **Event.**

OC.4.6.3.7 **Substitute Reserve** is the additional MW output (and/or reduction in **Demand**) required compared to the pre-incident output (or **Demand**) which is fully available and sustainable over the period from 4 hours to 24 hours following an **Event**.

OC.4.6.3.8 **Contingency Reserve** is the margin of Availability over forecast **Demand**, which is required in the period from 24 hours ahead down to real time, to cover against uncertainties in availability of generation capacity and also against weather forecast and **Demand** forecast errors. **Contingency Reserve** is provided by generation plant which is not required to be **Synchronised**, but which must be held available to **Synchronise** within a limited time scale.

OC.4.6.4 Definitions Associated with an Operating Reserve Incident

OC.4.6.4.1 Following the occurrence of a significant **Frequency** disturbance, the **TSO** shall monitor, in accordance with OC.10.4, and analyse the adequacy of the provision of **Operating Reserve**. For the purposes of this performance analysis, the following criteria have been defined.

OC.4.6.4.2 A significant **Frequency** disturbance event is deemed to have occurred if the **Frequency** falls below 49.70 Hz.

OC.4.6.4.3 The time of occurrence of the event is defined as the last time at which the **Frequency** fell through the level of 49.80 Hz, prior to the occurrence of the **Frequency** nadir.

OC.4.6.4.4 The pre-incident **Frequency** value is the average **Transmission System Frequency** between 60 and 30 seconds prior to the **Event.**

OC.4.6.4.5 The pre-incident value of MW output of a **Generation Unit**, MW **Demand** of a **Customer**, is the appropriate MW value averaged over the period between 60 and 30 seconds prior to the **Event.**

OC.4.6.5 Operating Margin Policy

OC.4.6.5.1 **Contingency Reserve**

OC.4.6.5.1.1 The **TSO** shall determine the amount of **Contingency Reserve** required for each time scale up to 24 hours ahead, taking due consideration of relevant factors, including but not limited to the following:

(a) historically **Availability Factor** and reliability performance of individual **Generation Units;**

(b) notified risk to the reliability of individual **Generation Units**; and

(c) **Demand** forecasting uncertainties; and

(d) status and availability of **Interconnectors.**

OC.4.6.5.2 **Operating Reserve**

OC.4.6.5.2.1 The **TSO** shall determine the amount of **Primary Operating Reserve**, **Secondary Operating Reserve, Tertiary Operating Reserve** and **Replacement Reserve** to be carried at any time to ensure system security. This will not be constrained by the **Trading and Settlement Rules.** Due consideration will be taken of relevant factors, including but not limited to the following:

(a) the relevant **TSO** operating policy in existence at that time;

(b) the extent to which **Customer** disconnections allowed under the relevant standard have already occurred within the then relevant period;

(c) the elapsed time since the last **Customer** disconnection incident;

(d) particular events of national or widespread significance, which may justify provision of additional **Operating Reserve**;

(e) the cost of providing **Operating Reserve** at any point in time;

(f) the magnitude and number of the largest generation infeeds to the **Transmission System** at that time, including infeeds over **External Interconnections** and also over single transmission feeders within the **Transmission System** and also the amount of **Generation** that could be lost following a single **Contingency**;

(g) ambient weather conditions, insofar as they may affect (directly or indirectly) **Generation Unit** and/or **Transmission System** reliability;

(h) the predicted **Frequency** drop on loss of the largest infeed as may be determined through simulation using a dynamic model of the **Power System**;

(i) constraints imposed by agreements in place with **Externally Interconnected Parties**;

(j) uncertainty in future **Generation** output.

OC.4.6.5.3 The **TSO** shall keep records of significant alterations to the **Operating Reserve** policy so determined under OC.4.6.6.2.

OC.4.6.6 Responsibilities of the TSO in Respect of Operating Reserve

OC.4.6.6.1 The **TSO** shall in accordance with **Prudent Utility Practice** make reasonable endeavours to **Dispatch** generation and otherwise operate the system in compliance with the **TSO's** determinations as to **Operating Margin** policies made from time to time.

OC.4.6.6.2 The **TSO's** sole responsibility, having met its obligations under the preceding provisions of OC.4.6, shall be to, acting in accordance with **Prudent Utility Practice**, **Dispatch** such **Generation Units** as are available required to meet:

(a) **System Demand**; and

(b) the level of **Operating Reserve** required by the **TSO's** then **Operating Reserve** policies.

OC.4.7 Black Start

OC.4.7.1 Introduction

OC.4.7.1.1 In order to recover the **Transmission System** from a **Partial Shutdown** or **Total Shutdown**, it is necessary to have certain **Power Stations** ("**Black Start Stations**") available which have the ability for at least one of its **Generation Units** to **Start-Up** from **Shutdown** and to energise a part of the **Total System**, or be **Synchronised** to the **System**, upon instruction from the **TSO**, without an external electrical power supply as detailed in the **Interconnector Operating Protocol** agreed between the **Interconnector Operator**, the **TSO** and the **External System Operator**.

OC.4.7.2 Objective

OC.4.7.2.1 The objectives of OC.4.7 is to set out the requirements of **Black Start Stations** to enable recovery of the **Transmission System** from a **Partial Shutdown** or **Total Shutdown**:

OC.4.7.3 Requirements of Black Start Stations

OC.4.7.3.1 In order that adequate security is maintained on the **Transmission System** at all times, **Black Start Stations** are required to comply with the provisions of OC.4.7.3.

OC.4.7.3.2 Other than as permitted in accordance with OC.4.7.3.3:

During a **Black Start** situation, instructions in relation to **Black Start Stations** will be in the format required for instructions to **Units** in **SDC1** and **SDC2**, and will recognise any differing **Black Start** operational capabilities (however termed) set out in the relevant **Ancillary Services Agreement** in preference to the declared operational capability as registered pursuant to **SDC1** (or as amended from time to time in accordance with **SDC1** and **SDC2**). For the purposes of these instructions the **Black Start** will be an emergency circumstance. For **Power Stations** or **Interconnectors** which are not **Black Start Stations**, **Dispatch** instructions will recognise each **Unit's** declared operational capability as registered pursuant to **SDC1** (or as amended from time to time in accordance with **SDC1** and **SDC2**).

OC.4.7.3.3 If during the **Demand** restoration process any **Generation Unit** or **Interconnector** that is part of a **Black Start Station** cannot, because of the **Demand** being experienced, keep within its safe operating parameters, the **Generator** or **Interconnector Operator** shall inform the **TSO.** The **TSO** will, where possible, either instruct **Demand** to be altered or will re-configure the **Transmission System** or will instruct a **User** to re-configure its **System** in order to alleviate the problem being experienced by the **Generator** or **Interconnector Operator**. However, the **TSO** accepts that any decision to keep a **Unit** operating, if outside its safe operating parameters, is one for the **Generator** or **Interconnector Operator** concerned alone and accepts that the **Generator** or **Interconnector Operator** may change generation on that **Unit** if it believes it is necessary for safety reasons (whether relating to personnel or **Plant** and/or **Apparatus**). If such a change is made without prior notice, then the **Generator or Interconnector Operator** shall inform the **TSO** as soon as reasonably practical.

OC.5 Demand Control

OC.5.1 Introduction

OC.5.1.1 OC5 is concerned with the provisions to be made by the **DSO** and, by the **TSO** in relation to **Demand Customers**, to permit the reduction of **Demand** in the event of available **Generating Plant** and transfers from **External Interconnections** being insufficient to meet **Demand**, or in the event of breakdown or operating problems such as in respect of **System Frequency**, **Voltage** levels or **Thermal Overloads** on any part of the **Transmission System**. The **Demand Control** arrangements may also apply where there are insufficient **Generating Plant** or transfers to meet **Demand** in all or any part of the **Other Transmission System** and/or in the event of problems on the **Other Transmission System** in circumstances where the **TSO** is able to assist the **Other TSO** and where doing so would not have a detrimental effect on the security of the **Transmission System**.

OC.5.1.2 OC5 deals with the following:

(a) **Customer Demand** reduction instructed by the **TSO;**

(b) **Customer Demand** reconnection instructed by the **TSO**;

(c) Automatic low **Frequency Demand Disconnection**;

(d) Automatic low **Voltage Demand Disconnection**; and

(e) **Automatic Frequency Restoration**.

The term "**Demand Control**" is used to describe any or all of these methods of achieving **Demand** reduction, or in the case of (b) and (e), a **Demand** increase.

OC.5.1.3 The procedures set out in OC.5 includes a system of **Alerts**, issued to **Users**, to give advance notice of **Demand Control** that may be required by the **TSO** under this **OC5**.

OC.5.1.4 Data relating to **Demand Control** shall include details relating to MW.

OC.5.1.5 **Demand Control** shall not, so far as is possible, be exercised in respect of **Priority Customers**. OC.5, therefore, applies subject to this exclusion.

OC.5.1.6 **Demand Control** shall be exercised equitably in respect of **Customers** connected to the **Distribution System** and **Demand Customers**.

OC.5.1.7 **Explanation**

OC.5.1.7.1 **Demand Control** is exercised through operation of the **Distribution System** or of the **Transmission System** (in the case of **Demand Customers**). **Demand Control** in relates to the physical organisation of the total **System**, and not to any contractual arrangements that may exist. Where **Demand Control** is needed in a particular area, the **TSO** would not know which **Supplier** to contact and (even if it were to) the resulting **Demand Control** implemented, because of the diversity of contracts, may not produce the required result.

OC.5.1.7.2 Therefore, in most instances of **Demand Control**, **Demand Control** will be exercisable by the **DSO**. **Suppliers** should note, however, that, although implementation of **Demand Control** in respect of their **Customers** may not be exercisable by them, their **Customers** may be affected by **Demand Control**.

OC.5.2 Objective

OC.5.2.1 The overall objective of OC.5 is to require the provision of facilities by **DSO** and **Demand Customers** to enable the **TSO** to achieve the reduction in **Demand** that will either avoid or relieve operating problems on the **Transmission System**, and subject to the circumstances set out in OC.5.1.1, the **Other Transmission System**, in whole or in part, and thereby to enable the **TSO** to instruct **Demand Control** in a manner that does not unduly discriminate against, or unduly prefer, any one or any group of **Users**. It is also to ensure that the **TSO** is notified of any **Demand Control** utilised by **Users** other than following an instruction from the **TSO**.

OC.5.3 Scope

OC.5 applies to the **TSO** and to all **Users**, which term in this OC.5 means:

(a) The **Distribution System Operator;**

(b) **Suppliers**; and

(c) **Demand Customers**.

OC.5.4 Procedure for the Implementation of Demand Control on the Instructions of the TSO

OC.5.4.1 Where a shortage of generation capacity or other reason for the exercising of **Demand Control** is foreseen, the **TSO** will alert the **DSO** by means of a **Demand Control Alert**.

OC.5.4.2 Where reasonable notice of the need for **Demand Control** is available, the **TSO** will initiate the **Rota Load Shedding Plan** and **Demand Control** will be implemented in accordance with the **Rota Load Shedding Plan**. The **TSO** and the **DSO** will each be responsible for maintaining procedures and will co-operate with each other so as to provide for the implementation of **Demand Control** in accordance with the **Rota Load Shedding Plan**.

OC.5.4.3 Where the requirement for **Demand Control** arises at short notice, it may be necessary for practical reasons to implement **Demand Control** other than in accordance with the **Rota Load Shedding Plan**. The **TSO** and the **DSO** will each maintain procedures (and will co-operate in forming such procedures) to provide that **Demand Control** can be exercised rapidly when required, in accordance with the **TSO's** instructions.

OC.5.4.4 In the event of **Demand Control** being exercised other than in accordance with the **Rota Load Shedding Plan** (due to reasons of short notice or otherwise), and if the **Demand Control** is expected to be sustained, then the **TSO** will arrange for the **Rota Load Shedding Plan** to be implemented as soon as practicable. The **TSO** may instruct certain modifications in the application of **the Rota Load Shedding Plan** to provide for those **Customers** which have been subject to shedding in the initial phase prior to the initiation of **Planned Rota Load Shedding**.

OC.5.4.5 The **Rota Load Shedding Plan** provides for disconnection and reconnection of defined blocks of demand on instruction from the **TSO**, In this way the **TSO** can instruct the necessary level of disconnection (and reconnection) required by the circumstances at the time. The **DSO** shall comply with instructions issued by the **TSO** in accordance with the **Rota Load Shedding Plan**, and in particular will not reconnect **Demand** other than in accordance with the **TSO's** instructions.

OC.5.4.6 The **Rota Load Shedding Plan** shall also provide for the issue of information to **Customers** through the media of the expected duration of **Demand Control**, and which blocks of **Customers** are at most risk of disconnection at which times.

OC.5.4.7 Both the **TSO** and the **DSO** will maintain records of the disconnection and reconnection of customers exercised under the **Rota Load Shedding Plan**, (and, for the avoidance of doubt, of any **Demand Control** exercised in accordance with OC.5.4.3).

OC.5.5 Automatic Low Frequency Demand Disconnection

OC.5.5.1 The **DSO** shall make arrangements that will enable automatic low **Frequency Disconnection** of a percentage of its total peak **Customer Demand** (based on **Annual SLR Conditions**) as specified by the **TSO**, in order to seek to limit the consequences of a major loss of **Generation** or an event on the total system which leaves part of the total system with a **Generation** deficit, provided that, so far as possible, **Demand** of **Generation Units** which is required to enable the **Generation Units** to start-up shall not be subject to automatic low **Frequency Disconnection**. The **TSO** retains the right to specify the **Frequency** settings on percentages of **Demand** subject to automatic low **Frequency Disconnection**.

OC.5.5.2 The **Demand** of the **DSO** which is subject to automatic low **Frequency Disconnection** will be split into discrete MW blocks. The number, location, size and the associated low **Frequency** settings of these blocks, will be as specified by the **TSO** by week 39 in every three calendars year following discussion with the **DSO** and will be reviewed every three years by the **TSO**. The distribution of the blocks will be such as to give reasonably uniform **Disconnection** within the **Distribution System** across all **Grid Supply Points**.

OC.5.5.3 **Demand Customers** shall provide automatic low **Frequency Disconnection**, which will be split into discrete blocks. The number and size of blocks and the associated low **Frequency** settings will be as specified by the **TSO** by week 39 every three calendar years following discussion with the **Demand Customers**. In the case of a **User**, it is not necessary for it to provide automatic low **Frequency Disconnection** under OC.5.5 if it is providing low **Frequency Disconnection** at a higher level of **Frequency** as an **Ancillary Service**.

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OC.5.5.4 **Demand Facilities**, **Closed Distribution Systems** and **Distribution Systems** shall be capable of automatic low **Frequency Disconnection** between 47 – 50 Hz.

OC.5.5.5 The proportion of demand subject to automatic low **Frequency Disconnection** shall be agreed with the **TSO**. For **Demand Facilites**, up to 100% of the **Demand** may be made subject to automatic low **Frequency Disconnection at the TSO's direction**.

OC.5.5.6 The automatic low **Frequency Disconnection** scheme for a **Demand Facility**, **Closed Distribution System** or the **Distribution System** shall be capable of disconnecting **Demand** in stages for a range of operational frequencies. The specifics performance requirements of the scheme shall be specified and agreed with the **TSO**.

OC.5.5.7 The automatic low **Frequency Disconnection** scheme shall allow for operation from a nominal AC input to be specified by the TSO, and shall meet the following functional capabilities:

(i) **Frequency** range: at least between 47-50 Hz, adjustable in steps of 0.05 Hz;

(ii) Operating time: no more than 150 ms after triggering the **Frequency** setpoint;

(iii) Voltage lock-out: blocking of the functional capability shall be possible when the voltage is within a range of 30 to 90 % of reference 1 p.u. voltage; and

(iv) Provide the direction of active power flow at the point of disconnection.

The AC voltage supply used in providing these automatic low **Frequency Disconnection** functional capabilities, shall be measured from the at the **Connection Point**.

OC.5.6 Automatic Frequency Restoration

OC.5.6.1 The **DSO** will make arrangements that will enable automatic **Frequency** restoration of **Demand** that is subject to automatic low **Frequency Demand Disconnection**. The **TSO** retain the right to specify the **Frequency** settings on blocks of **Demand** subject to automatic **Frequency** restoration.

OC.5.6.2 Once an automatic low **Frequency Demand Disconnection** has taken place, the **DSO** shall not reconnect **Customers** until instructed by the **TSO**, or otherwise in accordance with agreed procedures.

OC.5.6.3 Where conditions are such that, following automatic low **Frequency Demand Disconnection**, it is not possible to restore a large proportion of the total **Demand** so **Disconnected** within a reasonable period of time, the **TSO** may instruct the **DSO** to implement additional **Demand Disconnection** manually, and restore an equivalent amount of the **Demand** that had been **Disconnected** automatically. The purpose of such action is to ensure that a subsequent fall in **Frequency** will again be contained by the operation of automatic low **Frequency Demand Disconnection**. If the requirement for **Demand Control** is expected to continue for a sustained period of time, then the **TSO** will initiate the implementation of the **Rota Load Shedding Plan** in accordance with OC.5.4.

OC.5.6.4 Once the **Frequency** has recovered, the **DSO** will abide by the instructions of the **TSO** with regard to reconnection, and/or shall implement agreed procedures for **Demand** reconnection, without undue delay.

OC.5.7 Automatic Low Voltage Demand Disconnection

OC.5.7.1 The **TSO** may from time to time determine that there is a requirement for automatic low **Voltage Disconnection** of **Customer Demand**, in order to limit the consequences of the loss of a **Generation Unit(s)**, or an event on the total **System**, which otherwise would result in part of the total **System** with **Voltages** outside the levels specified in CC.8.3.

OC.5.7.2 The **TSO** may exercise the required **Automatic Low Voltage Demand Disconnection** (**ALVDD**) at the level of the **Transmission System**. However, depending on the extent of **ALVDD** required, and in order not to disconnect more **Customer Demand** than reasonably required in response to a specific incident or set or circumstances, it may be preferable that **ALVDD** is carried out at the level of the **Distribution System**.

OC.5.7.3 On request by the **TSO**, the **DSO** will co-operate with the **TSO** as to the design and implementation of **ALVDD** at locations on the **Distribution System**, where the requirement is indicated in accordance with OC.5.7.2. The **TSO** will retain full control over the enabling/disabling of the **ALVDD**, and the **Voltage** settings at which **ALVDD** will be initiated in each circumstance. In general, the settings will be specified by the **TSO** by week 39 in every three calendars year following discussion with the **DSO**, but the specification of settings may be altered by the **TSO** at other times to address specific circumstances pertaining at the time. The **DSO** shall respond to any change in specification by altering the settings without undue delay.

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OC.5.7.4 The **TSO** will specify the functional capabilities for low voltage demand disconnection, where the **TSO** identifies the need, in co-ordination with **Distribution Facilities** and **Demand Facilities** on a site specific basis, and will include as a minimum:

(i) monitoring voltage by measuring all three phases; and

(ii) blocking of the relays operation based on direction of either **Active Power** or **Reactive Power** flow.

OC.5.7.5 Low voltage demand disconnection shall be implemented automatically or manually.

OC.5.7.6 The **TSO** may specify the requirement for on-load tap changer blocking. **Closed Distribution System** and **Distribution System Operators** will be advised as necessary, on a case-by-case basis, taking into consideration the site-specific requirements.

OC.6 Small Scale Generator Conditions

OC.6.1 Introduction

OC.6.1.1 Secure operation of an electricity system requires that maintenance of production facilities (**Generation Units**) should be carried out in a timely and orderly fashion. This is essential in order to enable the **TSO** to fulfil its obligations relating to operation of the **Transmission System**, and to enable **Generators** to plan their **Outages** in an orderly way with due regard to **Plant** requirements and resource limitations.

OC.6.1.2 OC6 formalises the mechanism for scheduling outages of **Users** specified in OC.6.3.

OC.6.1.3 In implementing the **Transmission Outage Programme**, in routine operation of the **Transmission System** and in responding to emergency and fault situations on the **Transmission System**, the **TSO** needs to carry out network switching and **Control Actions** which may from time to time affect the operations of **Users** or security of supply to **Users**.

OC.6.1.4 OC6 sets out the actions which may be taken by the **TSO** in controlling the **Transmission System**, to set out the procedures whereby the **TSO** shall inform **Users**, where practicable, as to network **Control Actions** which will or may be likely to significantly affect a **User's** operations and to identify where the **TSO** shall, insofar as reasonably practicable, consult with **Users** and take into consideration **Users'** reasonable requirements.

OC.6.1.5 In addition to OC.6, the Users specified in OC.6.3 are required to comply with:

- Planning Conditions
- General Conditions
- Connection Conditions (Excluding CC.7.3.1.1(k) to (v) inclusive, CC.7.3.5, CC.7.3.7, CC.7.3.8, CC.12.2 (e) to (g) inclusive)
- OC.7
- OC.10 (excluding sections OC.10.5.6; OC.10.7.1; OC.10.7.2; OC.10.7.3; OC.10.7.4; OC.10.7.6), and
- OC.11

OC.6.2 Objective

OC.6.2.1 OC.6 ensures the development and implementation of a **Generation Outage Programme**, consistent with security of supply and requirements for the secure and economic operation of the **Transmission System**, and with the needs of **Small Scale Generators** in respect of **Plant** maintenance requirements and resource limitations.

OC.6.2.2 In order to achieve this objective, OC.6 defines the procedure for formal notification of **Outages** by **Generators** to the **TSO**.

OC.6.2.3 OC.6 entifies the **Control Actions** that may be taken by the **TSO**, in order that the **TSO** may carry out maintenance and operation of the **Transmission System** and respond to **Transmission System** faults and emergencies.

OC.6.2.4 OC.6 establishes procedures whereby the **TSO** will:

(a) where practicable, inform **Users,** who will be or are likely to be significantly affected by network **Control Actions,** of relevant details of intended **Control Actions** and the effect of those **Control Actions**;

(b) consult with **Users,** as appropriate, in order to find out and take into consideration reasonable objections raised by **Users** so affected.

OC.6.3 Scope

OC.6 applies to the **TSO**, and to the following **Users**:

(a) **Generators** with **Registered Capacity** of 2MW or less (on a single **Site**);

(b) **Generators** with **Registered Capacity** less than 5MW (on a single **Site**) and greater than 2MW (on a single **Site**) where the **TSO** consider that the **Generator** is in a location that does not make its operation particularly critical to the operation of the transmission system.

OC.6.4 Outage Scheduling

OC.6.4.1 Throughout OC.5.7.3 the current year shall be defined as year 0, the following year as year 1, and so on.

OC.6.4.2 By the end of March in year 0, **Small Scale Generators** shall submit to the **TSO**, for each **Generation Site**, plant **Capacity Available** for each week for year 1 for inclusion in the **Committed Outage Programme (COP)** for year 1 and estimated weekly **Load Factors** for year 1. **Generators** shall specify the start date and time and the duration of each **Outage**. This information shall be supplied on a **Unit** basis if so requested by the **TSO**.

OC.6.4.3 In scheduling **Outages**, and in relation to all other matters under OC.5.7.3, the **Generator** must act reasonably and in good faith. Without limitation to such obligation, each **Generator** should act in accordance with **Good Industry Practice** in planning their **Outages** and, in particular, so as to avoid a situation arising in which a **Generator** is obliged to schedule an **Outage** by reason of obligations imposed upon the **Generator** by statute as a consequence of the **Generator** not having planned in accordance with **Good Industry Practice**, for example, by not having planned sufficiently in advance its **Outages** for any statutory time limit.

OC.6.4.4 Any concerns which the **TSO** may have with the **Generation Outage Programme** must be notified to all **Generators** by the end of June in year 0.

OC.6.4.5 Between the end of June in year 0 and the end of September in year 0 any concerns raised by the **TSO** shall be notified to **Generators**. The **TSO** will facilitate discussions by **Generators** to find a resolution.

OC.6.5 Changes to the Committed Outage Programme within the Implementation Year

A request for a change to an **Outage** included in the **Committed Outage Programme** or an additional **Outage** may be initiated either by the **TSO** or by a **Generator** at any time.

OC.6.5.1 **Request Initiated by the TSO**

OC.6.5.1.1 The **TSO** may at any time request from a **Generator** a change in the timing or duration of any **Outage** of one of the **Generator's Generation Units** in the **Committed Outage Programme**.

OC.6.5.1.2 A **Generator** may respond by either declining the request, or by agreeing to the request (in which case the **COP** shall be deemed to be amended accordingly). **Generators** shall make every reasonable effort to co-operate with changes requested by the **TSO**.

OC.6.5.1.3 If a **Generator** responds by agreeing to the request subject to specific conditions, the **TSO** may respond by either confirming agreement to those conditions, in which case the conditions specified by the **Generator** shall be deemed to have been accepted, or by declining agreement. Where the **TSO** agrees to the conditions the **COP** shall be deemed to be amended accordingly. Where the **TSO** declines to agree to the conditions, then the **TSO** may negotiate with the **Generator** as to revised or alternative conditions, which would be acceptable.

OC.6.5.2 **Outage change Initiated by a Generator**

OC.6.5.2.1 **Generators** may at any time request the **TSO** for a change in the timing or duration of any **Outage** of one of the **Generator's Generation Units** in the **Committed Outage Programme**.

OC.6.5.2.2 Where a change to the **COP** is proposed by a **Generator**, the **TSO** shall evaluate whether the change is likely to have a detrimental effect on the secure operation of the **Transmission System**. This shall be done within a reasonable time frame, taking into consideration the extent of the change and the timing of the **Outage**. The **Generato**r shall be advised by the **TSO** whether or not the change has been accepted.

OC.6.5.2.3 Where, in accordance with OC6.5, the request is not likely to have a detrimental effect on the secure operation of the **Transmission System** then the **TSO** shall amend the **COP** accordingly.

OC.6.5.2.4 Where, in accordance with OC.6.5, the **Outage** change is likely to have a detrimental effect on requirements for the secure operation of the **Transmission System** then the **TSO** shall not amend the **COP**. The **TSO** shall contact the **Generator** requesting the change to establish that it is still required.

OC.6.6 Other Information to be Notified

OC.6.6.1 **Generators** will inform the **TSO** of any proposed maintenance, in addition to **Outages**, which will, or is likely to, affect the capability of the **Generation Unit** to provide **Ancillary Services**.

OC.6.6.2 The **TSO** may, where security of supply or the secure operation of **the Transmission System** would be at risk, request alterations to maintenance notified under Section OC.6.6.1. The **TSO** shall make reasonable endeavours to give as much notice as possible for such requests for alterations. Where the **TSO** makes such a request, the **Generator** shall use reasonable endeavours to comply with the request in arriving at the **Generator's** final programme for such maintenance.

OC.6.7 Network Control

OC.6.7.1 **Network Control Actions**

OC.6.7.1.1 The **TSO** needs to carry out operational network switching for a number of purposes, which will include:

(a) **Outages** of transmission **Plant** and **Apparatus** for the purposes of maintenance, new works, **System Tests**, protection testing and work by **Users**;

(b) **Outages** of transmission **Plant** due to suspected or potential faults and emergency repairs;

(c) **Voltage Control**;

(d) limiting power flows on the **Transmission System** to levels consistent with the capabilities of the transmission **Plant** and system security;

(e) High Speed reclosing is a feature of the network.

OC.6.7.1.2 Additionally, network switching may occur automatically and without advance warning due to operation of protection equipment in isolating or clearing faults on transmission **Plant** or on **User's Plant** which is connected to the **Transmission System.**

OC.6.7.1.3 Automatic switching sequences may also be established to limit power flows or **Voltage** or **Frequency** deviations in the event of faults elsewhere on the **System**.

OC.6.7.2 Notification to Users of Network Control

OC.6.7.2.1 All network **Control Actions** carried out on the **Transmission System** have the potential in a given set of circumstances to affect **Users**. To attempt to inform **Users** of every **Control Action** is not practicable and in most cases the information will not be of value to the **User** as the **User** will not invoke any specific action as a result of receipt of the information.

OC.6.7.2.2 Where it is identified and agreed, in accordance with the terms of the Connection Agreements and/ or Operating Agreements, between the **TSO** and a **User** that a specific **Control Action** (usually an action affecting the **Transmission System** configuration) has an **Operational Effect** on a **User** and that there is merit in notifying the **User** in advance of the **Control Action**, then the **TSO** will notify the **User** of the **Control Action** (if planned and where time permits), in accordance with any standing agreement that may be agreed with the **User**.

OC.6.7.2.3 Where it is necessary to carry out urgent switching or other network **Control Actions** resulting from a **System** condition or fault, then it may not be possible for the **TSO** to inform **Users** in advance of the switching or other **Control Actions**. The **TSO** shall endeavour to inform **Users** where time permits, but this shall not delay timely implementation of **Control Actions** as required. Where the **TSO** is unable to inform **Users** prior to the **Control Actions**, then the provisions of OC.6.7.3 shall apply.

OC.6.7.3 Control Under Fault or Emergency Conditions

OC.6.7.3.1 In the event of a **System** fault or protection operation or other automatic operation, it will not be possible to invoke standing procedures in accordance with OC.6.7.2 prior to the occurrence of the **Control Action.**

OC.6.7.3.2 In the circumstances referred to in OC.6.7.3.1 or in the event that the **TSO** needs to implement **Control Actions** urgently and without informing **Users**, then unless the situation is of a temporary nature and has been rectified to normal, the **TSO** shall inform **Users** of the occurrence of the actions.

OC.6.7.3.3 The **TSO** shall also inform **Users** as to the likely duration of the condition and shall update this prognosis as appropriate. The **TSO** shall additionally inform **Users** when the condition has ended.

OC.6.7.4 De-Energisation of Users by the TSO

OC.6.7.4.1 **De-Energisation** of a **User's Plant** and **Apparatus** may be effected at any time and from time to time if and to the extent that the **TSO** reasonably considers it necessary in order to provide for safe and secure operation of the **Transmission System** within prescribed standards, including in circumstances which otherwise cause or in the **TSO's** view are likely to cause one or more of the following:

(a) risk to the safety of personnel;

(b) risk to the stability of the **Transmission System**;

(c) risk to the **Transmission System** or any **User's Plant** or **Apparatus**;

(d) **Transmission System** elements to become loaded beyond their emergency limits;

(e) **Voltage** excursions on the **Transmission System** outside the ranges specified in CC.8.3;

(f) any behaviour causing sustained operation outside the normal **Transmission System** operating **Frequency** range;

(g) any material breach of a **Connection Condition**; and

(h) any action or inaction which places the **TSO** in breach of any legal or statutory or regulatory obligation.

OC.6.7.4.2 Instructions to **De-energise** a **User** connected to the distribution system under the terms of OC.6.7.4.1 may be issued by the **TSO** to the **DSO** who shall act on the instruction without undue delay.

OC.7 Information Exchange

OC.7.1 Notification of Events and Operations

OC.7.1.1 Introduction

OC.7.1.1.1 OC.7.1 sets out the requirements for the exchange of information in relation to **Operations** and/or **Events** on the **Power System** which have had (or may have had) or will have (or may have) an **Operational Effect**, and thereby have become:

(a) **Significant System Incidents** on the **Transmission System** in the case of an **Operation** and/or **Event** occurring on a **User System**; and

(b) **Significant System Incidents** on a **User System** in the case of an **Operation** and/or **Event** occurring on the **Transmission System**.

(c) significant system incidents on the **Other Transmission System** in the case of an **Operation** and/or **Event** occurring on the **Transmission System**.

OC.7.1.1.2 The requirement to notify in OC.7.1 relates generally to notification of what is expected to happen or what has happened. However, as OC.7.1 provides, when an **Event** or **Operation** has occurred on the **Transmission System** which itself has been caused by (or exacerbated by) an **Operation** or **Event** on a **User System**, the **TSO** in reporting the **Event** or **Operation** on the **Transmission System** to another **User** or **External System Operator** as the case may be, can pass on what it has been told by the **User** under OC.7.1 in relation to the **Operation** or **Event** on the first **User System**.

OC.7.1.1.3 Much of the information that the **TSO** will require to analyse **Significant System Incidents** may be available by means of:

(a) the **TSO's SCADA** system(s) and other data collection systems; and

(b) information provided to the **TSO** by **Users** under other codes of the **Grid Code**.

OC.7.1.1.4 In order to ensure that the **TSO** receives as rapidly as practicable the information it needs to operate the **Transmission System**, and to ensure that no information is missed, this OC.7.1 sets out a comprehensive set of requirements. It also provides for information to be submitted to **Users**, in order to assist **Users**. Where an obligation exists elsewhere to provide data to the **TSO** the **User** is not required also to provide data under OC.7.1.

OC.7.1.2 *Objective*

The objective of OC.7.1 is to provide for the exchange of information so that the implications of an **Operation** and/or **Event** can be considered, possible risks arising from it can be assessed and appropriate action taken by the relevant party in order to assist in maintaining the integrity of the **Power System**.

OC.7.1.3 *Scope*

OC.7.1.3.1 OC.7.1 applies to the **TSO** and to **Users**, which term in OC7.1 means:

(a) **Generators**;

(b) **Interconnector Operators;**

(c) **Dispatchable PPMs**;

(d) **Distribution System Operator**;

(e) **Demand Customers**; and

(f) **Demand Side Unit Operators.**

OC.7.1.3.2 It is required that as part of the fulfilment of obligations under this OC.7.1, both the **TSO** and **Users** will take into account information they have received from third parties in determining whether an **Operation** or an **Event** is to occur, or has~~,~~ occurred.

OC.7.1.4 *Requirement to Notify*

OC.7.1.4.1 While in no way limiting the general requirements to notify set out in this OC.7.1, the **TSO** and **Users** shall agree to review from time to time which **Operations** and **Events** are required to be notified.

OC.7.1.5 *Notification of an Operation*

OC.7.1.5.1 The **TSO** will notify the **User**, (save in circumstances as provided for under OC.7.1.5.2), of **Operations** on the **Transmission System**, which will have (or may have), in the reasonable opinion of the **TSO**, an **Operational Effect** on the **User**. Except as agreed with the **TSO**, the **User** may not pass on the information contained in a notification to it from the **TSO** under this OC.7.1 to any other person.

OC.7.1.5.2 In circumstances where it is not possible to invoke standing procedures prior to the occurrence of an **Operation** or in the event that the **TSO** needs to implement **Operations** urgently and without informing the **User** then, unless the situation is of a temporary nature, i.e. less than 15 minutes, and has been rectified to normal, the **TSO** shall inform the **User** of the occurrence of the **Operations**, without undue delay. The **TSO** shall also inform the **User** as to the likely duration of the condition and shall update this prognosis as appropriate. The **TSO** shall additionally inform the **User** as soon as reasonably possible when the condition has ended.

OC.7.1.5.3 The **User** will notify the **TSO** of **Operation**s on the **User**'s **System** which will have (or may have) an **Operational Effect** on the **Transmission System**. The **TSO** may use this information in notifying any other **User(s)** on whose **System(s)** the operation will have, or may have, in the reasonable opinion of the **TSO**, an **Operational Effect**, in accordance with this OC.7.1.

OC.7.1.6 *Form of Notification of an Operation*

OC.7.1.6.1 A notification (and any response to any questions asked under OC.7.1.6.3), of an **Operation** 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 assess the implications and risks arising.

OC.7.1.6.2 A notification will include the name (and job title) of the individual reporting the **Operation** on behalf of the **TSO** or the **User**, as the case may be.

OC.7.1.6.3 The recipient of the notification may ask questions to clarify the notification and the giver of the notification will, insofar as he is able, answer any questions raised.

OC.7.1.7 *Recording of an Operation*

The notification shall be given **In Writing** whenever possible before carrying out an **Operation**. If there is insufficient time before the **Operation** is scheduled to take place for notification to be given **In Writing**, then the notification shall be given orally and if either the **User** or the **TSO** requests, it shall be submitted **In Writing**.

OC.7.1.8 *Timing in Respect of an Operation*

A notification under Section OC.7.1.5 will be given as far in advance as possible and in any event shall be given in sufficient time as will reasonably allow the recipient to consider and assess the implications and risks arising.

OC.7.1.9 *Notification of Events*

OC.7.1.9.1 The **TSO** will notify the **User** of **Events** which in the reasonable opinion of the **TSO** are **Significant System Incidents** having an **Operational Effect** on the **User**. Except as agreed with the **TSO**, the **User** may not pass on the information contained in a notification to it from the **TSO** to any other person.

OC.7.1.9.2 The **User** will notify the **TSO** of **Events** which may be **Significant System Incidents** affecting the **Transmission System**. The **TSO** may use this information in notifying any other **Users** on whose **System(s)** the **Significant System Event** will have, or may have, in the reasonable opinion of the **TSO**, an **Operational Effect.**

OC.7.1.9.3 The **TSO** will notify the **Other TSO** of **Events** which in the reasonable opinion of the **TSO** are **Significant System Incidents** having an Operational Effect on the **Other TSO**. Except as agreed with the **TSO**, the **Other TSO** may not pass on the information contained in a notification to it from the **TSO** to any other person.

OC.7.1.10 *Form of Notification of an Event*

OC.7.1.10.1 A notification (and any response to any questions asked under Section OC.7.1.10.3) of an **Event**, will describe the **Event**, pursuant to Section OC.7.1.9 although it need not state the cause of the **Event**, and, subject to that, will be of sufficient detail to enable the recipient of the notification reasonably to consider and assess the implications and risks arising.

OC.7.1.10.2 A notification will include the name (and job title) of the individual reporting the **Event** on behalf of the **TSO** or the **User**, as the case may be.

OC.7.1.10.3 The recipient of the notification may ask questions to clarify the notification and the giver of the notification will, insofar as he is able (although he need not state the cause of the **Event**) answer any questions raised.

OC.7.1.11 Provision of Further Information

When an **Event** has been reported to the **TSO** by a **Generator** or **Interconnector Operator** under OC.7.1 and it is necessary in order for the **Generator** or **Interconnector Operator** to assess the implications of the **Event** on their system more accurately, the **Generator** or **Interconnector Operator** may ask the **TSO** for details of the fault levels from the **Transmission System** to their **Generation Unit** or **Interconnector** at the time of the **Event**, and the **TSO** will, as soon as reasonably practicable, give the **Generator** or **Interconnector** that information provided that the **TSO** has that information.

OC.7.1.12 *Recording of an Event*

Notification of an **Event** pursuant to Section OC.7.1.9 shall be given orally in the first instance. **Significant System Incidents** must be reported **In Writing** if requested by either the **User** or the **TSO**.

OC.7.1.13 *Timing in Respect of an Event*

A notification of an **Event** under section OC7.1.9 shall be given as soon as practicable after the occurrence of the **Event**, or time that the **Event** is known of or anticipated by the giver of the notification under OC.7.1, and in any event, except in an emergency ,within fifteen minutes of such time.

OC.7.2 Operational Communication and Data Retention

OC.7.2.1 Introduction

OC.7.2.1.1 It is necessary that adequate communication facilities and procedures are established between the **TSO** and **Users** to allow the timely transfer of information, in order that the **TSO** may fulfil its obligations with regard to the operation of the **Transmission System**.

OC.7.2.2 Objective

OC.7.2.2.1 The objectives of OC.7.2 are:

(a) to establish contact locations for the **TSO** and each class of **User**;

(b) to detail the communication facilities required between the **TSO** and each class of **User**;

(c) to establish the general procedures (notwithstanding any specific procedures which may be established in other sections of this **Grid Code**) for communication of information between the **TSO** and **Users**; and

(d) to establish the general procedures (notwithstanding any specific procedures which may be established in other sections of this **Grid Code**) for the authorisation of the **TSO** personnel to act on behalf of the **TSO** and **User** personnel to act on behalf of the **User** in the communication of information between the **TSO** and **Users**.

(e) to establish the general procedures (notwithstanding any specific procedures which may be established in other sections of this **Grid Code**) for the retention of data.

OC.7.2.2.2 Pursuant to this OC.7.2 both the **TSO** and **Users** will be obliged to adopt the use of new technologies and methodologies for communication of information, where there is a recognisable benefit from doing so, and to do so would be reasonable in the circumstances.

OC.7.2.2.3 This OC.7.2 covers the general procedures for all forms of communication of operational information between the **TSO** and **Users**, other than pre-connection communication that is dealt with in the **Connection Conditions**. Data relating to **Commercial (Energy) Metering** is specifically not covered by this OC.7.2.

OC.7.2.3 Scope

OC.7.2.3.1 OC.7.2 applies to the **TSO** and to **Users**, which term in OC.7.2 means:

(a) **Generators**;

(b) **Interconnector Operators;**

(c) **Dispatchable PPM**;

(d) **Distribution System Operator**;

(e) **Demand Customers**; and

(f) **Demand Side Unit Operator.**

OC.7.2.4 Contact Locations

OC.7.2.4.1 The TSO

OC.7.2.4.1.1 Other than where specifically provided for under Section OC.7.2.4.1.2 or in other sections of the **Grid Code**, the contact location within the **TSO** for communication on matters pertaining to the real time operation of the **Transmission System** shall be the **National Control Centre** (**NCC**) or if designated under Section OC.7.2.6.2 the **Emergency Control Centre** (**ECC**).

OC.7.2.4.1.2 The **TSO** will, from time to time, notify to **Users** the relevant points of contact in the **TSO** (and their contact details) and any changes to such points of contact and/or details for the purposes of each section of this **Grid Code** (including, where appropriate, for specific purposes under each section), and the **User** shall, as required, contact the relevant notified points of contact.

OC.7.2.4.1.3 The **TSO** shall from time to time distribute to each **User** an organisational chart and list of personnel and contact numbers (consistent with the notification given under Section OC.7.2.4.1.2) in order to assist the **User** in communicating with the **TSO**.

OC.7.2.4.2 Generators

OC.7.2.4.2.1 The **Generator** contact locations and personnel referred to in this Section OC.7.2.4.2 shall be notified by the **Generator** to the **TSO** prior to connection and thereafter updated as appropriate.

OC.7.2.4.2.2 The **Generator** is required to provide a **Control Facility**. The **Generator** shall ensure acting in accordance with **Good Industry Practice** that the **Control Facility** is staffed at appropriate staffing levels at all times.

OC.7.2.4.2.3 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 **Generator** and the **TSO**, such agreement not to be unreasonably withheld) and are of suitable experience and training and are authorised to perform the following functions on behalf of the **Generator**:

(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 **Availability**, **Ancillary Service** capability, or **Operating Characteristics** of the **Generation Units** during **System Emergency Conditions**.

OC.7.2.4.2.4 At any point in time, a single person shall be designated by the **Generator** and notified to the **TSO** as the **Responsible Manager**. The **Responsible Manager** shall be responsible for dealing with the **TSO** on matters relating to the **Grid Code** other than as provided for in OC.7.2.4.2.2 and OC.7.2.4.2.3. In the event that the **Responsible Manager** is not a person on duty at the **Control Facility**, then the **Responsible Manager** must be capable of being contacted from the **Control Facility** at all times, and in the event that the **TSO** issues a request to the **Control Facility** requiring the **Responsible Manager** to contact the **NCC**, the **Responsible Manager** shall comply with the request without undue delay and in any case within 15 minutes of the request.

OC.7.2.4.2.5 The **Responsible Manager** shall be authorised by the **Generator** to perform the following functions on behalf of the **Generator**:

(a) to make estimates in accordance with **Good Industry Practice** as to the available **Availability**, **Ancillary Service** capability and **Operating Characteristics** of each **Generation Unit**;

(b) to make **Declarations** for each **Generation Unit**;

(c) to communicate with respect to issues regarding **Outages** of each **Generation Unit**.

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

OC.7.2.4.3 Demand Customers

OC.7.2.4.3.1 The **Demand Customers** contact locations and personnel referred to in this Section OC.7.2.4.3 shall be notified by the **Demand Customer** to the **TSO** prior to connection and thereafter updated as appropriate.

OC.7.2.4.3.2 The **Demand Customer** is required to provide the **TSO** with the contact information of a **Responsible Operator(s)** who shall respond to communications from the **TSO** without undue delay (except where otherwise provided for by agreement between the **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 **Demand Customer**.

OC.7.2.4.3.3 The **Responsible Operator** shall have the ability to attend the **Site** of the **Demand Customer** within 60 minutes of an instruction to do so being issued by the **TSO**.

OC.7.2.4.3.4 At any point in time, a single person shall be designated by the **Demand Customer** and notified to the **TSO** as the **Responsible Manager**. The **Responsible Manager** shall be responsible for dealing with the **TSO** on matters relating to the **Grid Code** other than as provided for in OC.7.2.4.3.2 and OC.7.2.4.3.3. In the event that the **Responsible Manager** is not a person on duty at the **Site** of the **Demand Customer** , then the **Responsible Manager** must be capable of being contacted from the **Site** of the **Demand Customer** at all times, and in the event that the **TSO** issues a request to the **Site** of the **Demand Customer** requiring the **Responsible Manager** to contact the **NCC**, the **Responsible Manager** shall comply with the request without unreasonable delay and in any case within 15 minutes of the request.

OC.7.2.4.4 DSO

OC.7.2.4.4.1 The **DSO** contact locations and personnel referred to in this Section OC.7.2.4.4 shall be notified by the **DSO** to the **TSO** prior to connection and thereafter updated as appropriate.

OC.7.2.4.4.2 The **DSO** is required to provide a **Control Facility**. The **DSO** shall ensure acting in accordance with **Good Industry Practice** that the **Control Facility** is staffed at appropriate staffing levels at all times.

OC.7.2.4.4.3 The **DSO** shall operate its **Control Facility** according to the provisions agreed with the **TSO** in any agreements between the **DSO** and the **TSO,** such agreement not to be unreasonably withheld.

OC.7.2.4.5 Dispatchable PPMs

OC.7.2.4.5.1 The **Dispatchable PPM's** contact locations and personnel referred to in this Section OC.7.2.4.5 shall be notified by the **Dispatchable PPM** to the **TSO** prior to connection and thereafter updated as appropriate.

OC.7.2.4.5.2 The **Dispatchable PPM** is required to provide a **Control Facility**. The **Dispatchable PPM** shall ensure acting in accordance with **Good Industry Practice** that the **Control Facility** is staffed at appropriate staffing levels at all times.

OC.7.2.4.5.3 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 PPM** and the **TSO**, such agreement not to be unreasonably withheld) and are of suitable experience and training and are authorised to perform the following functions on behalf of the **Dispatchable PPM**:

(a) to accept and execute **Dispatch Instructions** as per **SDC2**; and

(b) to receive and acknowledge receipt of requests, for amongst other matters, operation outside the **Declared** values of **Availability**, **Ancillary Service** capability, or operation of the **Dispatchable PPM** during **System Emergency Conditions**.

OC.7.2.4.5.4 At any point in time, a single person shall be designated by the **Dispatchable PPM** and notified to the **TSO** as the **Responsible Manager**. The **Responsible Manager** shall be responsible for dealing with the **TSO** on matters relating to the **Grid Code** other than as provided for in OC.7.2.4.2.2 and OC.7.2.4.2.3. In the event that the **Responsible Manager** is not a person on duty at the **Control Facility**, then the **Responsible Manager** must be capable of being contacted from the **Control Facility** at all times, and in the event that the **TSO** issues a request to the **Control Facility** requiring the **Responsible Manager** to contact the **NCC**, the **Responsible Manager** shall comply with the request without undue delay and in any case within 15 minutes of the request.

OC.7.2.4.5.5 The **Responsible Manager** shall be authorised by the **Dispatchable PPM** to perform the following functions on behalf of the **Dispatchable PPM**:

(a) to submit and revise an **Availability Notice** and other data under SDC1 for the **Dispatchable PPM**;

(b) to communicate with respect to issues regarding **Outages** of the **Dispatchable PPM**.

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

OC.7.2.4.6 **Interconnector Operators**

OC.7.2.4.6.1 The **Interconnector Operator** contact locations and personnel referred to in this section OC.7.2.4.6 shall be notified by the **TSO** prior to connection and thereafter updated as appropriate.

OC.7.2.4.6.2 The **Interconnector Operator** is required to provide a **Control Facility**. The **Interconnector Operator** shall ensure acting in accordance with **Good Industry Practice** that the **Control Facility** is staffed at appropriate levels at all times.

OC.7.2.4.6.3 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 **Interconnector Operator** and the **TSO**, such agreement not to be unreasonably withheld) and are of suitable experience and training and are authorised to perform the following functions on behalf on the **Interconnector Operator**:

(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 **Availability**, **Ancillary Service** capability, or **Operating Characteristics** of the **Interconnectors** during **System Emergency Conditions**.

OC.7.2.4.6.4 At any point in time, a single person shall be designated by the **Interconnector Operator** and notified to the **TSO** as the **Responsible Manager.** The **Responsible Manager** shall be responsible for dealing with the **TSO** on matters relating to the **Grid Code** other than as provided in OC.7.2.4.6.2 and OC.7.2.4.6.3. In the event that the **Responsible Manager** is not the person on duty at the **Control Facility**, then the **Responsible Manager** must be capable of being contactable from the **Control Facility** at all times, and in the event that the **TSO** issues a request to the **Control Facility** requiring the **Responsible Manager** to contact the **NCC**, the **Responsible Manager** will comply without undue delay and in any case within 15 minutes of the request.

OC.7.2.4.6.5 The **Responsible Manager** shall be authorised by the **Interconnector Operator** to perform the following functions on behalf of the **Interconnector Operator:**

(a) to make estimates in accordance with **Good Industry Practice** as to the **Availability**, **Ancillary Service** capability and **Operating Characteristics** of the **Interconnector**;

(b) to make **Declarations** for the **Interconnector;**

(c) to communicate with respect to issues regarding **Outages** of the **Interconnector.**

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

OC.7.2.4.7 Demand Side Unit Operators

OC.7.2.4.7.1 **Demand Side Unit Operators** are required to provide a **Control Facility**. The **Demand Side Unit Operator** shall ensure acting in accordance with **Good Industry Practice** that the **Control Facility** is staffed with appropriate staffing levels at all times.

OC.7.2.4.7.2 For **Demand Side Unit Operator**, 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 **Demand Side Unit Operator** 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 **Demand Side Unit Operator** 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 Side Unit MW Availability**.

OC.7.2.4.7.3 At any point in time, a single person shall be designated by the **Demand Side Unit Operator** and notified to the **TSO** as the **Responsible Manager**. The **Responsible Manager** shall be responsible for dealing with the **TSO** on matters relating to the **Grid Code**. In the event that the **Responsible Manager** is not a person on duty at the **Control Facility** of the **Demand Side Unit Operator**, then the **Responsible Manager** must be capable of being contacted from the **Control Facility** of the **Demand Side Unit Operator** at all times, and in the event that the **TSO** issues a request to the **Control Facility** of the **Demand Side Unit Operator** requiring the **Responsible Manager** to contact the **NCC**, the **Responsible Manager** shall comply with the request without unreasonable delay and in any case within 15 minutes of the request.

OC.7.2.4.7.4 The **Responsible Manager** shall be authorised by the **Demand Side Unit Operator** to perform the following functions on behalf of the **Demand Side Unit Operator**:

(a) to make estimates in accordance with **Good Industry Practice** as to the **Demand Side Unit MW Availability**;

(b) to make **Declarations** of the **Demand Side Unit MW Availability** for **Demand Side Unit Operator**; and

(c) to communicate with respect to issues regarding **Outages** of each **Individual Demand Site** within the **Demand Side Unit**.

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

OC.7.2.4.7.5 Unless otherwise agreed with the **TSO**, each **Individual Demand Site** comprising a **Demand Side Unit** shall have a **Responsible Operator** that must be capable of being contacted from the **Control Facility** of the **Demand Side Unit Operator** at all times and is capable of being at the **Individual Demand Site** within 1 hour of request to respond to any query or issue from the **Responsible Operator** at the **Control Facility** of the **Demand Side Unit Operator** or the **TSO**.

OC.7.2.5 Communication Facilities

OC.7.2.5.1 The minimum communications facilities which are to be installed and maintained between the **TSO** and the **User** are defined in this Section OC.7.2.5.

OC.7.2.5.2 All equipment to be provided by **Users** under this Section OC.7.2.5 shall comply with the applicable International Telecommunications Union (ITU) and International Electrotechnical Commission (IEC) standards for SCADA and communications equipment and shall meet such standards as notified by the **TSO**, acting reasonably, in advance of their design or procurement (whichever is later) and shall be provided at the cost of the **User**, except where otherwise specified.

OC.7.2.5.3 **Supervisory Control and Data Acquisition (SCADA)**

OC.7.2.5.3.1 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 **Users** 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 **Users** reasonably require.

OC.7.2.5.3.2 For **Demand Side Unit Operators**, **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 **Demand Side Unit Operators** 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 **Demand Side Unit Operators**, reasonably require.

OC.7.2.5.3.3 Interface cabinets shall be installed in the control room of the **Transmission Station** at the **User Site** and also on the **User's Site** or, in the case of a **Demand Side Unit Operator**, in the **User's Control Facility**. Provision and maintenance of wiring and signalling from the **User's Plant** and **Apparatus** to the **User's** interface cabinet shall be the responsibility of the **User.** The **TSO** shall provide the cables to interconnect these interface cabinets.

OC.7.2.5.4 **Computer Equipment**

OC.7.2.5.4.1 Each **User** shall comply with the **TSO** requirements and provide appropriate computer and data networking equipment to allow data exchange such as electronic mail, dispatch instructions etc between the **TSO** and the **User**. The equipment shall only be used by the **User** for operational communications with the **TSO**.

OC.7.2.5.4.2 Each **User** shall be responsible for optimising the reliability and security of the computer equipment, referred to in OC.7.2.5.4.1, including the provision, at no charge, of an uninterruptible power supply.

OC.7.2.5.5 **Telephone/Fascimile**

OC.7.2.5.5.1 Each **User** shall be responsible for the provision and maintenance (at the cost of the **User**) of telephone and facsimile equipment as required by this Section OC.7.2.5.5.

OC.7.2.5.5.2 The **TSO** may arrange for the provision of one or more telephone extensions to be connected to the **OPTEL** system. This facility shall be reserved for operational purposes only, and shall be continuously attended by a person meeting the requirements of OC.7.2.4.2.3, OC.7.2.4.3.3, or OC.7.2.4.4.3 (as appropriate) and answered without undue delay. **Users** shall be responsible for the provision at no charge of an uninterruptible power supply.

OC.7.2.5.5.3 **Users** shall provide a Public Switched Telephone Network circuit to the **Communications and Control Room**.

OC.7.2.5.5.4 **Users** shall provide no fewer than two separate Public Switched Telephone Network circuits to the **Control Facility**.

OC.7.2.5.5.5 **Users** shall provide no fewer than one telefacsimile unit, connected to a dedicated Public Switched Telephone Network circuit at the **Control Facility**.

OC.7.2.5.6 **Access and Security**

OC.7.2.5.6.1 All SCADA, metering equipment, computer and communications equipment that interfaces with the **TSO** and the information carried by it must be secure from unauthorised access. Procedures governing security and access shall be agreed with **Users** pursuant to the **Operation Instructions**, but shall allow for adequate access to the equipment and information by the **TSO** or its service providers for the purposes of maintenance, repair, testing and the taking of readings.

OC.7.2.5.7 **Time Standards**

OC.7.2.5.7.1 Time will be set by a standard determined by the **TSO**. The time standard will be broadcast to relevant telecommunications devices in order to maintain time coherence.

OC.7.2.6 Communications

OC.7.2.6.1 **Communication Between the TSO and the User**

OC.7.2.6.1.1 Other than where specifically provided for in other sections of the **Grid Code**, communication between the **TSO** and **Users** on matters pertaining to the real time operation of the **Transmission System** shall take place between the **NCC** and the **User's Control Facility**.

OC.7.2.6.1.2 If the **NCC** is to be moved to a different location the **TSO** shall ordinarily notify **Users** not more than one **Business Day** after the move, but in the event of an emergency it may instead notify **Users** as soon as practicable after the move.

OC.7.2.6.1.3 Unless otherwise specified in the **Grid Code**, all instructions given by **NCC** and communications between **NCC** and the **User's Control Facility** shall be given by means of the facilities described in OC.7.2.5.

OC.7.2.6.1.4 Any automatic recording (by whatever means) of communications given by means of telephony, electronic means, facsimile transfer or telex will be accepted by the **TSO** and **Users** as evidence of those instructions or communications.

OC.7.2.6.2 **Communication Between the TSO and External TSO**

OC.7.2.6.2.1 For **Interconnectors**, the procedure for operational liaison by the **TSO** with the **External TSO** is set out in the **Interconnector Operating Protocol.**

OC.7.2.6.2.2 Communication between the **TSO** and **External TSO** on the real time operation of the **Transmission System** regarding **Interconnectors** shall take place between the **NCC** and the **External System's Control Facility**.

OC.7.2.7 **Data and Notices**

OC.7.2.7.1 Data and notices to be submitted to the **TSO** or to **Users** under the **Grid Code** (other than data and notices which are the subject of a specific requirement of the **Grid Code** as to the manner of their delivery) shall be **In Writing** and shall be delivered by hand or sent by pre-paid post, by telex, receipted email or telefacsimile transfer.

OC.7.2.7.2 Data and notices to be submitted to the **TSO** under the **Grid Code** shall be addressed to the person, and at the address, notified by the **TSO** to **Users** for such purpose, following entry into the **Connection Agreement** or for a **Demand Side Unit** prior to issuance of the Operational Certificate, or to such other person or address, as the **TSO** may notify to **Users** from time to time.

OC.7.2.7.3 Data and notices to be submitted to **Users** under the **Grid Code** shall be addressed to the **User's** nominated representative (at the address notified by **Users** to the **TSO** following entry into the **Connection Agreement** or for a **Demand Side Unit** prior to issuance of the Operational Certificate for such purpose (and failing such notification to the principal office of the addressee)), or to such other person or address as **Users** may notify to the **TSO** from time to time.

OC.7.2.7.4 All data items, where applicable, will be referenced to nominal **Voltage** and **Frequency** unless otherwise stated.

OC.7.2.7.5 All **Operational Data** is to be supplied in accordance with the timetables set out in the **Grid Code**.

OC.7.2.8 Data Retention

OC.7.2.8.1 **Operational Data** is all data required to be supplied by either the **TSO** or **Users** under the **Grid Code** any other data expressly provided to be **Operational Data** under the **Grid Code**. **Operational Data** to be supplied by the **User** must be submitted to the department or address as the **TSO** may from time to time advise.

OC.7.2.8.2 The **TSO** and **Users** will keep all **Operational Data** confidential.

OC.7.2.8.3 The **TSO** shall maintain a complete and accurate record of all **Operational Data** supplied or maintained under the **Grid Code**. The format for the retention of records shall be as the **TSO** may reasonably determine (provided such format shall not prejudice its accessibility and comprehension by the **User** under OC.7.2.8.4). All **Operational Data** shall be so maintained for a period of not less than six (6) years commencing from the date the **Operational Data** was first supplied (or first created, if earlier).

OC.7.2.8.4 The **TSO** shall afford **Users** access to its records (and copies thereof) of **Operational Data** and/or data required to be maintained under OC.7.2.8.3 on reasonable notice.

OC.8 Operational Testing

OC.8.1 Introduction

OC.8.1.1 OC.8 deals with the responsibilities and procedures for arranging and carrying out **Operational Tests** which may have an effect on the **Systems** of the **TSO** and **Users.**

OC.8.1.2 By their nature, **Operational Tests** may impinge on either or both of:

(a) the **TSO's** responsibilities in respect of the **Transmission System**, including **Dispatch** of generation, **Interconnectors** and **Demand Side Unit MW Availability**; and

(b) the operations of **Users** and the quality and continuity of supply of electricity to **Users**.

OC.8.1.3 To minimise disruption to the operation of the **Transmission System** and to the **Systems** of other **Users**, it is necessary that tests which affect the operation of the **Transmission System** or **Users' Systems** as under OC.8.1.2, are subject to central co-ordination and control.

OC.8.1.4 To achieve the primary objective as outlined in OC.8.2.1, OC.8 sets out procedures for establishing and reporting **Operational Tests.**

OC.8.2 Objective

OC.8.2.1 The primary objective of OC8 is to establish procedures for central co-ordination and control of an **Operational Test** required by the **TSO** or a **User**, where such test will or may:

(a) affect the secure operation of the **Transmission System**; or

(b) have a significant effect on the operation of the **Transmission System**, the **Other Transmission System** or a **User's System**; or

(c) affect the economic operation of the **Transmission System** or a **User's System**; or

(d) affect the quality or continuity of supply of electricity to **Users**.

OC.8.2.2 By way of example, tests that are typical of those which may be expected to be covered by OC.8 are listed in OC.8.4 to OC.8.5. This list is not intended to be exhaustive and other tests which fall within the definition of **Operational Tests** shall also be covered by the procedures outlined in this OC.8.

OC.8.2.3 OC.8 is not intended to deal with tests which may be called routinely by the **TSO** in order to assess compliance of **Users** with their design, operating and connection requirements as specified in the **Grid Code** and in each **User's Connection Agreement, Ancillary Services Agreements** and **System Support Agreement**, or to assess that **Generators or Interconnector Operators** are in compliance with their **Registered Data** as notified by **Declarations**, where appropriate, or to determine that **Generation Units** or **Interconnectors** are in compliance with **Dispatch Instructions**. These issues are covered under OC.10 (**Monitoring**, **Testing** and **Investigation**).

OC.8.3 Scope

OC8 applies to the **TSO** and to all **Users**, which term in this OC.8 means:

(a) **Generators** which includes all **Generators** with units with **Registered Capacity** greater than 5 MW and **Generator Aggregators**;

(b) **Interconnectors**;

(c) **Demand Side Unit Operators**;

(d) The **Distribution System Operator**; and

(e) **Demand Customers**.

OC.8.4 Tests Required by the TSO

OC.8.4.1 The TSO as operator of the **Transmission System** will in accordance with **Prudent Utility Practice**, needs to carry out **Operational Tests** in order to maintain and develop operational procedures, to train staff, and to acquire information in respect of **Power System** behaviour under abnormal system conditions. The **TSO** will endeavour to limit the frequency of occurrence, scope, extent of effects and type of **Operational Tests** to those that are required by **Prudent Utility Practice.**

OC.8.4.2 **Operational Tests** required by the **TSO** from time to time shall include, but shall not be limited to the following:

(i) Tests involving the controlled application of **Frequency** and/or **Voltage** variations aimed at gathering information on **Power System** behaviour;

(ii) **Power System Restoration Tests**;

(iii) Testing of standing procedures for **System Emergency Conditions** and **Alert** conditions

(iv) Testing or monitoring of **Power Quality** under various Power System conditions and **Dispatch** configurations.

OC.8.4.3 The provisions of OC.8.6, OC.8.7, OC.8.8, OC.8.10.4 and OC.8.11 shall not apply to **Operational Tests** required by the **TSO** under this OC.8.4.

OC.8.4.4 Where the **TSO** intends to carry out an **Operational Test** in accordance with this OC.8.4 and, in the **TSO's** reasonable opinion, such an **Operational Test** will or may have an **Operational Effect** on a **User's System**, the **TSO** shall, in accordance with OC.7 (Information Exchange) provide such notice to the **User** of the scheduled time and effect of the **Operational Test** as is reasonable in all the circumstances and shall keep the **User** informed as to any changes to the scheduled time and nature of the **Operational Test**.

OC.8.4.5 Where a **User**, having been informed about an **Operational Test** under OC.8.4.4 may, acting reasonably, contact the **TSO** to request additional time to consider the impact of the test on the **User**. The **TSO** shall co-operate with the **User** to assess the risks. The test shall not proceed until all **Users** are satisfied unless, in the **TSO**'s view, a **User** is acting unreasonably.

OC.8.5 Tests Required by the Users

OC.8.5.1 Operation of **Users**' **Plant** in accordance with **Good Industry Practice** requires **Operational Testing** in order to maintain and develop operational procedures, develop and measure **Plant** performance, comply with statutory or other industry obligations and to train staff.

OC.8.5.2 In accordance with **Good Industry Practice** each **User** shall endeavour to limit the frequency of occurrence of **Operational Tests** and to limit the effects of such **Operational Tests** on the **Transmission System**.

OC.8.5.3 **Operational Tests** can comprise of a **Significant Test** and/or a **Minor Test.**

OC.8.6 Procedure for Requesting Operational Tests

OC.8.6.1 **Users** shall submit proposals for an **Operational Test** in a timely fashion in accordance with OC7 (Information Exchange) or alternative procedures agreed with the **TSO**. Notwithstanding the other requirements in OC7, in the case of a **Significant Test**, **Users** shall submit proposals to the **TSO** at least five **Business Days** before the test start date or, with the agreement of the **TSO**, no later than 09:00 two **Business Days** before the test start date.

OC.8.6.2 As part of the proposal **Users**, when requesting an **Operational Test,** shall supply sufficient detail to the **TSO** to allow any operational consequences of the test to be adequately assessed. This shall include the following information:

OC.8.6.2.1 the reason for the proposed test indicating whether the **Operational Test** is a test required by statute, required for compliance with licence conditions, statutory regulations, or safety codes, which may require that execution of the **Operational Test** be expedited and given priority over other **Operational Tests**.

OC.8.6.2.2 the preferred time or times for the test;

OC.8.6.2.3 the milestones for individual stages of the **Operational Test** (if any) which can be completed separately, and/or do not require to be repeated if the **Operational Test** is interrupted by the **TSO** after completion of each stage;

OC.8.6.2.4 whether there may be an adverse material impact on the **User** if the **Operational Test** is cancelled at short notice or delayed (reasonable detail being given by the **User** to the **TSO** of the impact).

OC.8.6.2.5 where the **User** is a **Generator**, **Interconnector Operator**, **Generator Aggregator** or **Demand Side Unit Operator**, the **Dispatch** or **Dispatches** required by the **Generator**,

Interconnector Operator, **Generator Aggregator** or **Demand Side Unit Operator** for completion of the test, if any, including the duration of **Dispatch** shall be supplied to the **TSO** as part of the proposal. Where the **Generator**, **Interconnector Operator**, **Generator Aggregator** or **Demand Side Unit Operator** may not know the entire **Dispatches** required for completion of the test until part of the test is completed then the **Generator**, **Interconnector Operator**, **Generator Aggregator** or **Demand Side Unit Operator** when proposing the test shall:

(a) divide the test into sections as appropriate;

(b) indicate and discuss with the **TSO** which sections of the test can be completed in stages and which cannot; and

(c) indicate possible variations of the test for the sections that can be completed in stages.

Additionally, the factors that 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.

OC.8.6.3 A request by the **Generator**, **Interconnector Operator**, **Generator Aggregator** or **Demand Side Unit Operator** for an **Operational Test** requiring a **Generation Unit**, **Interconnector** or **Demand Side Unit** to be **Dispatched** to a particular **MW Output** or operating condition shall not be considered a **Re-declaration** of **Availability**, **Ancillary Service** capability or **Operating Characteristics**.

OC.8.7 Evaluation of Proposed Operational Tests

OC.8.7.1 The **TSO** shall, on receipt of an **Operational Test** request from the **User**, assess the impact of the proposed test on the operation of the **Power System**. The **TSO** may request additional information from the **User** required to evaluate the impact or impacts of the test.

OC.8.7.2 The **TSO** will evaluate the impact (in terms of continuity and quality of supply only) of the **Operational Test** with significantly affected **Users**. Any reasonable objections from any such **Operationally Affected Users** shall be considered. When discussing the **Operational Test** with any affected **User**, the **TSO** shall not disclose what it reasonably believes to be commercially sensitive or otherwise potentially sensitive information to **Users** without the consent of the **User** requesting the test.

OC.8.7.3 Where an **Operational Test** proposed by a **Generator**, **Interconnector Operator**, **Generator Aggregator** or **Demand Side Unit Operator** in respect of one of its **Generation Units**, **Interconnector** or **Demand Side Units** requires a **Dispatch** that exceeds the currently declared values of **Availability**, **Ancillary Service** capability where applicable, or **Operating Characteristics** of the **Generation Unit**, **Interconnector** or **Demand Side Units**, then the **TSO** may so **Dispatch** the **Generation Unit**, **Interconnector** or **Demand Side Units** for the period required for the **Operational Test**, in accordance with the relevant provisions of the **Grid Code**.

OC.8.8 Approval for Operational Testing

OC.8.8.1 Following receipt of an **Operational Test** proposal and evaluation of the **Operational Test's** likely impact, including discussions of test requirements with the **User** requesting the **Operational Test** and with **Operationally Affected Users** as appropriate, the **TSO** will decide if approval for the requested **Operational Test** is granted.

OC.8.8.2 The criteria for approving **Operational Test** include:

(a) the impact of the **Operational Test** on **Transmission System** operation security;

(b) the impact of the **Operational Test** on **Transmission System** operation economics or on the economics of the operation of the **Other Transmission System**;

(c) the impact of the **Operational Test** on other **Users**' Systems;

(d) the effect of the **Operational Test** on continuity and quality of electricity supply.

OC.8.8.3 On approval by the **TSO** of an **Operational Test** proposed by a **User**, the **TSO** shall contact the **User** outlining the proposed **Dispatch** procedure and schedule.

OC.8.8.3.1 On receipt of the proposed **Dispatch** procedure and schedule of the **Operational Test**, the **Test Proposer** shall notify the **TSO** without undue delay, of the **Test Proposer's** acceptance or rejection of the proposed **Dispatch** procedure and schedule for the test.

OC.8.8.3.2 On notification of rejection of the proposed **Dispatch** procedure and schedule for the **Operational Test** by the **Test Proposer**, then the **Operational Test** shall not take place. The **Test Proposer** may enter into discussions with the **TSO** as to an alternative schedule for the **Operational Test**, or may request a different **Operational Test** or may request the **Operational Test** at an alternative time.

OC.8.8.3.3 On notification of acceptance of the proposed **Dispatch** procedure and schedule for the **Operational Test** by the **Test Proposer**, the **TSO** shall inform other **Users** as to the scheduled time and nature of the test, if in the opinion of the **TSO** those **Users** will or may be significantly affected by the test, or otherwise as dictated by standing arrangements.

OC.8.8.3.4 If **Operationally Affected Users** are not satisfied with the proposed **Operational Test**, they shall advise the **TSO** of their concerns. The **TSO** shall not cancel proposed **Operational Test** unless these objections are reasonable. If **Operationally Affected Users** are still not satisfied with the Operational Test being approved, then they may appeal the decision to the **CRU** in accordance with 0.

OC.8.8.3.5 Notification by the **TSO** to the **Test Proposer** of the proposed **Dispatch** procedure and schedule for an **Operational Test**, or notification by the **Test Proposer** to the **TSO** of acceptance of the proposed **Dispatch** procedure and schedule, does not constitute a **Dispatch Instruction** from the **TSO** to the **Test Proposer**.

OC.8.8.4 On rejection of the proposed **Operational Test** by the **TSO**, the **Test Proposer** may enter into discussions with the **TSO** as to an alternative schedule for the **Operational Test**, or may request a different **Operational Test** or may request the **Operational Test** at an alternative time. If the amended proposal for an **Operational Test** is approved by the **TSO**, and the **User** requesting the **Operational Test** is a **Generator**, then OC.8.8.3 shall apply.

OC.8.8.5 If the **Test Proposer** is not satisfied that there are reasonable grounds for rejecting the proposed **Operational Test,** then they may appeal to the **CRU** according to 0.

OC.8.9 Scheduling of Operational Tests

OC.8.9.1 **Operational Tests** will usually, but not necessarily, be scheduled by the **TSO** in accordance with SDC1 .

OC.8.9.2 Where an **Operational Test** is requested by a **User**, the **User** shall submit **Physical Notifications** consistent with planned **Operational Tests** in accordance with **SDC1** and the **Trading and Settlement Code** consistent with planned **Operational Tests**. The **User** shall also submit all other data as normal as required under the **SDC1**.

OC.8.9.3 The **TSO** shall use reasonable endeavours to prioritise **Operational Tests** where the **Test Proposer** has notified the **TSO** that **Operational Tests** are required in accordance with licence conditions, statutory regulations or safety codes or a delay in the execution of the tests may have an adverse material impact on a **User**.

OC.8.10 Dispatching of Operational Tests

OC.8.10.1 **Dispatch Instructions** for **Operational Tests** shall be issued by the **TSO** in the normal manner for issuing **Dispatch Instructions** in accordance with **SDC2**.

OC.8.10.2 The **TSO** shall use reasonable endeavours to ensure that scheduled **Operational Tests** are dispatched in accordance with the agreed **Dispatch** procedures.

OC.8.10.3 Where the **TSO** foresees a requirement or likely requirement to cancel, postpone or otherwise significantly alter an agreed **Dispatch** procedure and schedule, then the **TSO** shall inform the **Test Proposer** as soon as reasonably possible. In this case the provisions of OC.8.10.4 and OC.8.10.5 apply.

OC.8.10.4 Where the **TSO** assesses that the impact of an **Operational Test** on **Transmission System** security or on the continuity and quality of supply or operation of a **User** may or is likely to be significantly greater than originally estimated, the **TSO** may contact the **Test Proposer** to discuss a revised test procedure or schedule.

OC.8.10.5 The **TSO** may where it considers it necessary cancel, interrupt or postpone an **Operational Test** at any time, but shall where possible utilise the procedures outlined under OC.8.10.4 prior to taking such action where the cancellation, interruption or postponement is for other than technical reasons.

OC.8.10.6 If the **Test Proposer** wishes to cancel an **Operational Test** either before commencement of the test or during the test**,** the **TSO** must be notified by the **Test Proposer**, in accordance with OC.7.

OC.8.11 Test Reporting

OC.8.11.1 Upon conclusion of the scheduled time for an **Operational Test** the **Test Proposer** shall notify the **TSO** as to whether the test has been completed, or sections of the test if divided into sections under OC.8.6.2.3 have been completed.

OC.8.11.2 At the conclusion of the **Operational Test**, the **Test Proposer** shall be responsible for preparing a written report on the **Operational Test** (the "**Final Report**") which shall be available within three months of the conclusion of the **Operational Test** to the **TSO**, **Operationally Effected Users** and the **CRU** on request.

OC.8.11.3 The **Final Report** shall not be submitted to any person who is not a representative of the **TSO** or the **Test Proposer** unless the **TSO** and the **Test Proposer** having reasonably considered the confidentiality issues arising, shall have unanimously approved such submission.

OC.8.11.4 The **Final Report** shall include a description of the **Plant** and/or **Apparatus** tested and a description of the **System Test** carried out together with the results, conclusions and recommendations as they relate to the **TSO** and **Operationally Effected Users**.

OC.8.12 Disputes

OC.8.12.1 **Operationally Affected Users** who consider that the implementation of the proposed **Operational Test** will have a significant negative impact on them may appeal to the **CRU** providing details of their objections.

OC.8.12.2 The **Test Proposer** has right of appeal to the **CRU** if it considers that rejection of the proposed **Operational Test** is unreasonable.

OC.9 Emergency Control and Power System Restoration

OC.9.1 Introduction

OC.9.1.1 Normal operation of the **Transmission System** by the **TSO** is in accordance with the principles and procedures as set out in this **Grid Code** and obligations under the Electricity Supply Act 1927. There will be emergency situations when security of the **Transmission System** is subject to abnormal levels of risk (e.g. during major lightning storms) and this OC.9 provides for specific requirements to address such situations.

OC.9.1.2 Experience has shown that electricity supply systems can suffer **Partial Shutdown** or **Total Shutdown**. Collapses can result from a number of root causes but might most typically be due to a high number of **Plant** failures (**Generation** and/or transmission) resulting from severe weather conditions and/or maloperation of protection systems.

OC.9.1.3 It is therefore necessary in the **Grid Code** to provide for how to deal with a **Partial Shutdown** or **Total Shutdown** of the **Transmission System**, and to ensure that the necessary procedures and facilities are in place to support rapid re-establishment of the shutdown parts and restore supply to **Customers**.

OC.9.1.4 A **Partial Shutdown** or **Total Shutdown** represents one of the most serious fault situations liable to occur on the **Transmission System,** having a major effect on both **Users** and **Customers**. Due to the significance of such an incident and the urgency in restoring supply to all **Customers**, it is imperative that all **Users** should maintain a high level of awareness and training in respect of **Power System Restoration**.

OC.9.2 Objective

OC.9.2.1 The objective of OC.9 is to ensure that in the event of a **Partial Shutdown** or **Total Shutdown** of the **Transmission System**, normal supply is restored to all **Customers** as quickly and as safely as practicable in accordance with **Prudent Utility Practice**. This objective can be subdivided:

(a) to outline the general restoration strategy which will be adopted by the **TSO** in the event of a **Partial Shutdown** or **Total Shutdown** of the **Transmission System**;

(b) to establish the responsibility of the **TSO** to produce and maintain a comprehensive **Power System Restoration Plan**, covering both **Partial Shutdowns** and **Total Shutdowns**;

(c) to establish the responsibility of **Users** to co-operate with the formation and execution of the **Power System Restoration Plan**,

(d) to ensure that the **TSO** and **User** personnel who will potentially be involved with the **Power System Restoration Plan**, should be adequately trained and fully familiar with the relevant details of the plan.

OC.9.3 Scope

OC9 applies to the **TSO** and to all **Users**, which term in this OC.9 means:

(a) **Generators** which for the purposes of OC.9 includes all **Generators** with **Registered Capacity** greater than 5 MW;

(b) **Interconnector Operators**;

(c) The **Distribution System Operator**;

(d) **Demand Customers**; and

(e) **Demand Side Unit Operators.**

OC.9.4 System Alerts

OC.9.4.1 In the event of a **System Emergency Condition** or imminent shortfall of MW capacity, the **TSO** may issue any of several **Alerts** to the Generator, key **Transmission Stations, Distribution Control Centres** and **Demand Side Unit Operators**. These **Alerts** may include an **Amber Alert**, **Red Alert** or **Blue Alert**, or other **Alerts** as may be agreed from time to time.

OC.9.4.2 **Alerts** will normally (except in the case of a failure of the **Electronic Alert System** when it will be given verbally) be transmitted to the **User** via the **Electronic Alert**

System. The **Alert** shall cause an alarm in the receiving location, which must be acknowledged by the **User** in accordance with their **Alert** procedures.

OC.9.4.3 **Amber Alerts**

OC.9.4.3.1 An **Amber Alert** may be issued when a single **Event** would give rise to a reasonable possibility of failure to meet the **Power System Demand**, or of **Frequency** or **Voltage** departing significantly from normal, as per CC.8.2.1(a) and CC.8.3.1(a), or if multiple **Events** are probable due to prevailing weather conditions.

OC.9.4.3.2 Standing procedures to be activated in response to an **Amber Alert** will be developed by the **TSO,** in consultation with **Users,** and notified to each **User** as appropriate. These standing procedures will not impose obligations on the **User** which are not already implicit in the **Grid Code.**

OC.9.4.3.3 Each **User** is responsible for internal procedures necessary to execute the standing procedures.

OC.9.4.4 **Red Alerts**

OC.9.4.4.1 A **Red Alert** may be issued when, other than as provided for in OC.10, the **Frequency** or **Voltage** has deviated significantly from normal, or **User's Demand** has been disconnected, or, in the period immediately ahead there is a high probability of failing to meet the **Power System Demand** or to maintain normal **Voltage**.

OC.9.4.4.2 Standing procedures to be activated in response to a **Red Alert** will be developed by the **TSO**, in consultation with **Users,** and notified to each **User** as appropriate.

OC.9.4.4.3 Standing procedures to be activated in response to a **Red Alert** will be developed by the **TSO**, in consultation with **Users,** and notified to each **User** as appropriate.

OC.9.4.5 **Blue Alerts**

OC.9.4.5.1 The issuing of a **Blue Alert** other than as provided for in OC.9.5.4, by the **TSO** signifies that either a **Partial Shutdown** or a **Total Shutdown** of the **Power System** has taken place.

OC.9.4.5.2 Standing procedures to be activated in response to a **Blue Alert** will be developed by the **TSO**, in consultation with **Users,** and notified to each **User** as appropriate. These standing procedures will not impose obligations on the **User** which are not already implicit in the Grid **Code.**

OC.9.4.5.3 Each **User** is responsible for internal procedures necessary to execute the standing procedures. In developing internal procedures to apply following the activation of **Blue Alert** standing procedures, each **User** shall consult with the **TSO.**

OC.9.5 Power System Restoration

OC.9.5.1 The **Power System Restoration Plan** will be developed and maintained by the **TSO** in consultation with the **DSO** and other **Users** as appropriate. The **TSO** will promulgate the **Power System Restoration Plan** in accordance with **Prudent Utility Practice.**

OC.9.5.2 The procedure for **Power System Restoration** shall be that notified by the **TSO** to the **User** at the time of a **Partial Shutdown** or **Total Shutdown**. Each **User** shall abide by the **TSO's** instructions during the restoration process, subject to safety of personnel and the **TSO's** and the **User's Plant** and **Apparatus**.

OC.9.5.3 It shall be the responsibility of the **User** to ensure that any of its personnel who may reasonably be expected to be involved in **Power System Restoration** are familiar with, and are adequately trained and experienced in their standing instructions and other obligations so as to be able to implement the procedures and comply with any procedures notified by the **TSO** under OC.9.5.2.

OC.9.5.4 The **TSO** shall in consultation with each **User** and on at least one occasion each year, issue a **Blue Alert** to the **User** for the purposes of assisting training. The content of the tests shall be notified in advance to the **User**, and a date and time for execution of the tests shall be agreed. The **User** must, acting in accordance with **Good Industry Practice**, co-operate with any such testing.

OC.9.5.5 **Generators** shall not be permitted to reconnect to the **Transmission System** after an incidental disconnection caused by a **Transmission System** disturbance, unless specified otherwise by the **TSO**. **Generators** shall not be permitted to install automatic reconnection systems, unless specified otherwise by the **TSO**.

OC.9.6 De-Energisation of the User's plant by the TSO

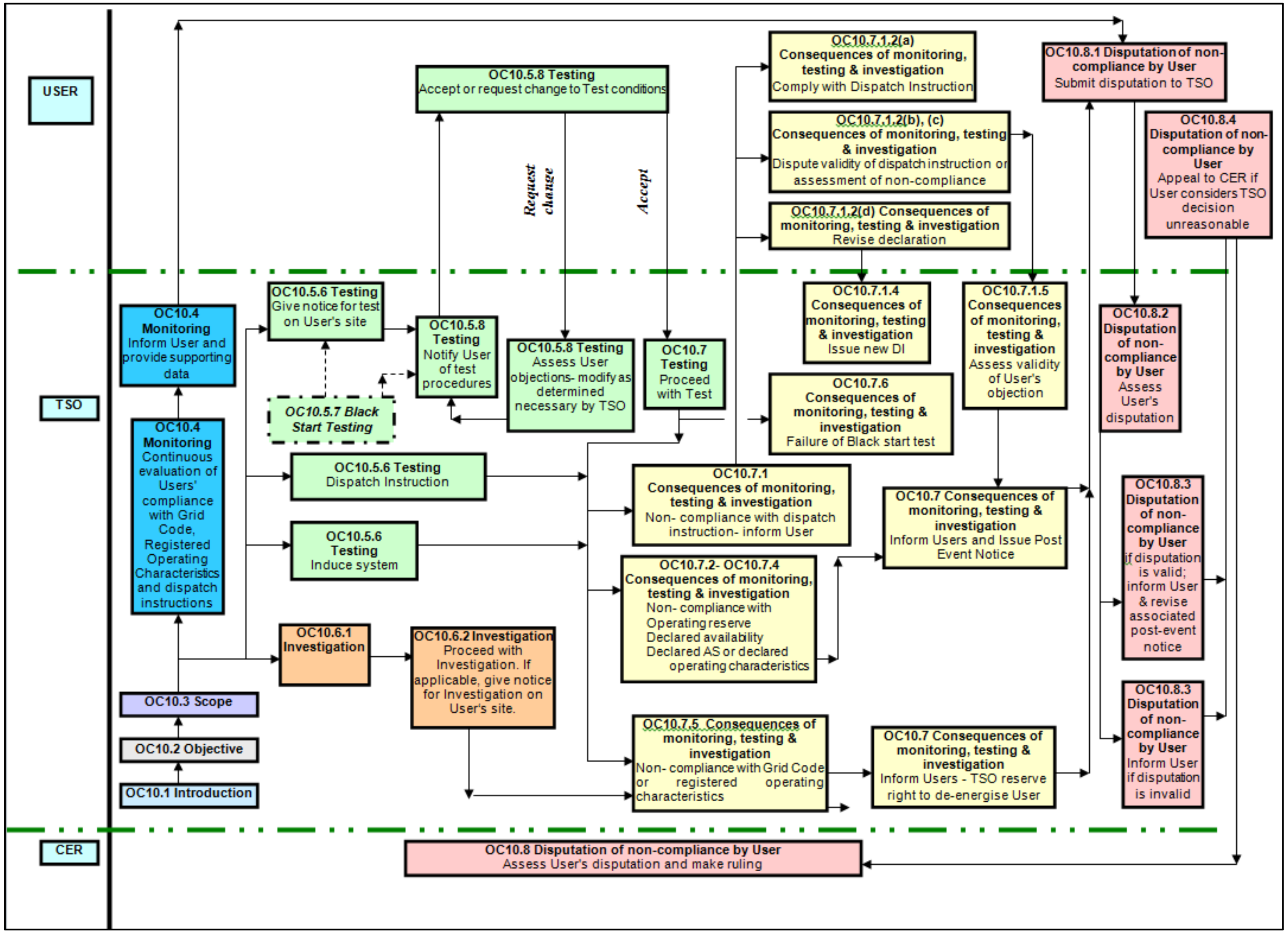
OC.9.6.1 **De-Energisation** of a **User's Plant** and **Apparatus** is also provided for in OC.4.5.6. It may be effected at any time and from time to time if and to the extent that the **TSO**, acting in accordance with **Prudent Utility Practice**, considers it necessary in order to provide for safe and secure operation of the **Transmission System** within prescribed standards, including:

(i) during a **System Emergency Condition**;

(ii) during **Power System Restoration**; and

(iii) following the issue of a **Blue Alert.**

OC.10 Monitoring, Testing and Investigation



OC.10.1 Introduction

OC.10.1.1 In order to discharge its responsibilities in respect of the safe, secure and economic operation of the **Transmission System** and in respect of generation **Dispatch**, the **TSO** will need to carry out certain **Monitoring**, **Testing** and **Investigation** in respect of the performance of **Users' Plant**.

OC.10.1.2 OC.10 does not apply to **Operational Tests**, which may be required by the **TSO** or by **Users**. The procedures by which **Operational Tests** are notified, and approved, executed and reported, are covered under **Operational Testing** (OC.8).

OC.10.2 Objective

OC.10.2.1 The primary objectives of OC.10 are to establish procedures for **Testing** that **Users** are operating within their design, operating and connection requirements, as specified in the **Grid Code**, **Connection Agreements**, **Ancillary Services Agreements and System Support Agreements** between **Users** and the **TSO.**

OC.10.2.2 In order to achieve the primary objective set out in OC.10.2.1, OC.10 establishes procedures for **Monitoring**, **Testing** and **Investigation**. In particular, this facilitates adequate assessment of each of the following:

(a) whether **Centrally Dispatched Generation Units (CDGU)**, **Interconnectors** and **Demand Side Units** comply with **Dispatch Instructions**;

(b) whether **Generators**, **Interconnectors**, **Demand Side Unit Operators** and **Generator Aggregators** are in compliance with **Declarations** of **Availability**, **Ancillary Services** capabilities, **Operating Characteristics** and any other data required to be registered by those **Generators**, **Interconnectors** and **Demand Side Unit Operators** under the **Grid Code**;

(c) whether **Power Quality** of **Users** conforms with CC.10.13.1;

(d) whether **Users** are in compliance with protection requirements and protection settings under the **Grid Code, Users' Connection Agreements**, **Ancillary Service Agreements** and **System Support Agreements** between **Users** and the **TSO;**

(e) whether **Generators** have the ability to generate on **Primary Fuel** and

Secondary Fuel (where applicable) and have the ability to carry out on on-line fuel changeover **; and**

(f) whether **Generators** have the required **Secondary Fuel** stock levels at the **Generator Site** and **Off-Site Storage Location**.

OC.10.3 Scope

OC.10 applies to the **TSO** and to the following **Users**

(a) **Generators** which, for the purposes of OC.10, include all **Generators** with **Generation Unit(s)** subject to **Central Dispatch** or with **Generation Unit(s)** that have a total **Registered Capacity** greater than 4 MW on a single **Site**;

(b) **Interconnector Operators;**

(c) The **Distribution System Operator**;

(d) **Suppliers**;

(e) **Demand Customers**;

(f) **Demand Side Unit Operators** in respect of their **Demand Side Units;** and;

(g) **Generator Aggregators** in respect of the **Generation Units** which they represent.

OC.10.4 Monitoring

OC.10.4.1 **Monitoring** is normally continuous or continuous for periods of time, and is carried out by monitoring, data recording and analysis or by such other methods as the **TSO** shall reasonably determine are appropriate in the circumstances. It does not require advance notification from the **TSO** to **Users**.

OC.10.4.2 Where a data recording and analysis system is used for **Monitoring,** the **TSO** shall inform the **User** that such data recording and analysis system is being used and, on request from the **User**, shall make available to the **User** reasonable information in respect of the data recording and analysis system.

OC.10.4.3 **Monitoring** may be carried out at any time by the **TSO** and may result, without the application of further **Testing**, in the evaluation by the **TSO** of **User** non-compliance. Where the **User** disputes a finding of non-compliance, the **TSO** shall provide the

User with any data collected during **Monitoring** over the period of alleged non-compliance and such other documentation as is reasonably necessary to show evidence of non-compliance.

OC.10.4.4 Performance parameters that the **TSO** shall **Monitor** may include, but are not limited to, the following:

OC.10.4.4.1 Compliance with **Dispatch Instructions**;

OC.10.4.4.2 Compliance with **Declarations** including, without limitation, in respect of:

(a) **Primary**, **Secondary** and **Tertiary Operating Reserve** provided by each of a **Generator's Generation Units,** following a **Low Frequency Event** on the **Transmission System**;

(b) **Frequency Regulation** provided by each **Generation Unit** (to confirm that it is consistent with the **Declared Governor Droop**); and

(c) Tertiary Operating Reserve 2 and Replacement Reserve provided by each of a Generator's Generation Units.

OC.10.4.4.3 Compliance with **IEC Power Quality** standards; and

OC.10.4.4.4 Provision of static and dynamic **Reactive Power**; and

OC.10.4.4.5 Monitoring of **Primary Fuel** and **Secondary Fuel** capability, on-line changeover capability and fuel storage levels.

OC.10.4.5 Monitoring systems and procedures

OC.10.4.5.1 Procedures and systems used for assessment of compliance will be either generic procedures (which will be provided by the **TSO**) or otherwise agreed between the **TSO** and the **User**, such agreement not to be unreasonably withheld.

OC.10.4.5.2 Compliance of **Demand Side Units** with **Dispatch Instructions**

A **Demand Side Unit** shall be deemed compliant with a **Dispatch Instruction** if:

(i) the **Demand Side Unit MW Response** of the **Dispatch Instruction** is achieved in the **Demand Side Unit MW Response Time** and maintained until the subsequent **Dispatch Instruction** or until the **Maximum Down-Time** of the **Demand Side Unit** has elapsed; and

(ii) the **Demand Side Unit Performance Monitoring Percentage Error** is less than 5% for each full quarter-hour **Meter** period of the **Demand Side Unit MW Response** for 90% of the last ten **Dispatches** or 90% of the **Dispatches** in a three-hundred and sixty-five day period

or

the **Demand Side Unit Performance Monitoring Error** is less than 0.250 **MWh** for each full quarter-hour **Meter** period of the **Demand Side Unit MW Response** in 90% of the last ten **Dispatches** or 90% of the **Dispatches** in a three-hundred and sixty-five day period; and

(iii) the **Demand Side Unit Performance Monitoring Percentage Error** is less than 10% for each full quarter-hour **Meter** period of the **Demand Side Unit MW Response**

or

the **Demand Side Unit Performance Monitoring Error** is less than 0.250 **MWh** for each full quarter-hour **Meter** period of the **Demand Side Unit MW Response**; and

(iv) the **Demand Side Unit Performance Monitoring Percentage Error** is on average less than 5% for each full quarter-hour **Meter** period of the **Demand Side Unit MW Response**

or

the **Demand Side Unit Performance Monitoring Error** is on average less than 0.250 MWh for each full quarter-hour **Meter** period of the **Demand Side Unit MW Response**; and

(v) the **Demand Side Unit SCADA Percentage Error** is less than 5% or the **Demand Side Unit SCADA Error** is less than 0.250 **MWh**.

OC.10.5 Testing

OC.10.5.1 Testing may involve attendance by the **TSO** or the **TSO** representative at **User Sites** in order to carry out **Tests** in accordance with the testing procedures set out in OC.10.5.7.

OC.10.5.2 For the purposes of this OC10 a **Test** shall be carried out pursuant to a **Dispatch Instruction** from the **TSO** or by such alternative procedure as is required or permitted by this OC10.

OC.10.5.3 A **Test** may require the **User** to carry out specific actions in response to a **Dispatch Instruction**.

OC.10.5.4 The results of a **Test** may be derived from the **Monitoring** of performance during the **Test**.

OC.10.5.5 The **TSO** may, from time to time, carry out **Tests** in order to determine that a **User** is complying with its **Connection Conditions**, **Registered Operating Characteristics** and **Declarations**. The **TSO** may:

(a) from time to time and for the purposes of **Testing**, issue a **Dispatch Instruction**;

(b) induce controlled **Power System Frequency** or **Voltage** conditions or variations for the purpose of determining that the **Generation Unit's** response is in accordance with its **Declared Availability**, **Ancillary Service** capabilities and **Operating Characteristics**; and

(c) having given three **Business Days** notice, or less where agreed, (identifying the **Ancillary Service** and/or **Operating Characteristic** to be tested), send a representative to the **Generator's Site** to verify by **Testing** in accordance with the **Test** procedures specified in OC.10.5.8, that the **Generator** is in compliance with its **Declared** values;

(d) request **Start-Up** on **Secondary Fuel**, or on-line changeover at **Primary Fuel Switchover Output** from **Primary Fuel** to **Secondary Fuel** or from **Secondary Fuel** to **Primary Fuel** at **Secondary Fuel Switchover Output**; and

(e) having given the **Generator** one **Business Day's** notice send a representative to the **Generator's Site** to verify the **Secondary Fuel** stock levels both at the onsite **Secondary Fuel** storage location and if required at the **Off-Site Storage Location**.

OC.10.5.6 If the **TSO** subcontracts **Testing** work on a **User's Site**, then the **User** and the **TSO** must be in agreement on the selection of a suitable subcontractor.

OC.10.5.7 **Black Start Testing**

OC.10.5.7.1 The **TSO** may require a **Generator** with a **Black Start Station** to carry out a test (a "**Black Start Test**") on a **CDGU** in a **Black Start Station** either while the **Black Start Station** remains connected to an external alternating current electrical supply (a "**Black Start Unit Test**") or while the **Black Start Station** is disconnected from all external alternating current electrical supplies (a "**Black Start Station Test**"), in order to demonstrate that a **Black Start Station** has a **Black Start Capability**.

OC.10.5.7.2 Where the **TSO** requires a **Generator** with a **Black Start Station** to carry out a **Black Start Unit Test**, the **TSO** shall not require the **Black Start Test** to be carried out on more than one **CDGU** at that **Black Start Station** at the same time, and would not, in the absence of exceptional circumstances, expect any other **CDGU** at the **Black Start Station** to be directly affected by the **Black Start Unit Test**.

OC.10.5.7.3 The **TSO** may require a **Generator** or **Interconnector Operator** with a **Black Start Station** to carry out a **Black Start Unit Test** at any time (but will not require a **Black Start Unit Test** to be carried out more than once in each calendar year in respect of any particular **CDGU** or **Interconnector** unless it can justify on reasonable grounds the necessity for further tests or unless the further test is a re-test, and will not require a **Black Start Station Test** to be carried out more than once in every two calendar years in respect of any particular **CDGU** unless it can justify on reasonable grounds the necessity for further tests or unless the further test is a re-test).

OC.10.5.7.4 When the **TSO** wishes a **Generator** or **Interconnector Operator** with a **Black Start Station** to carry out a **Black Start Test**, it shall notify the relevant **Generator** or

Interconnector Operator at least 7 **Business Days** prior to the time of the **Black Start Test** with details of the proposed **Black Start Test**.

OC.10.5.7.5 All **Black Start Tests** shall be carried out at the time specified by the **TSO** in the notice given under OC.10.5.7.4 and shall be undertaken in the presence of a reasonable number of representatives appointed and authorised by the **TSO**, who shall be given access to all information relevant to the **Black Start Test**.

OC.10.5.8 **Test Procedures**

The proposed procedure for a **Test** will be notified to the **User** by the **TSO** in advance of the **Test**. For an existing procedure, three **Business Days** notice shall be given. For a new procedure, seven days notice shall be given and following receipt of such notification the **User**, acting in good faith, may, by five days notice to the **TSO**, reasonably object to the proposed procedure on the grounds that there will be a material risk to the safety of the **User's Plant** or personnel, or that the proposed procedure is technically infeasible or inappropriate to the purpose (in accordance with **Good Industry Practice**), giving full details of its concerns. In the event that the **User** so objects, the **TSO** shall, as it considers necessary, modify the procedure and re-notify the **User**.

OC.10.5.8.1 The **TSO** shall treat information collected from **Users** during **monitoring** and **testing** as confidential.

OC.10.5.9 Results of **Testing** shall be dealt with in accordance with OC.10.7.

OC.10.6 Investigation

OC.10.6.1 The **TSO** may, if it reasonably considers that there may be an issue of non-compliance by the **User**, carry out an **Investigation** to acquire or verify information relevant to **Users' Plant** and/or **Apparatus** design, operation or connection requirements under the **Grid Code**, **Connection Agreements**, **Ancillary Service Agreements and System Support Agreements** between **Users** and the **TSO**.

OC.10.6.2 **Investigation** by the **TSO** usually applies to information not collected on a regular basis by means of **Monitoring** and **Testing**. The **TSO** may, having given reasonable notice, send a representative or subcontractor to a **User's Site** in order to **Investigate** any equipment or operational procedure on or applicable to the **User Site** insofar as the condition of that equipment or operational procedure is relevant to compliance with the **Grid Code**, **Connection Agreements**, and/or other agreements between **Users** and the **TSO.**

OC.10.7 Consequences of Monitoring, Testing and Investigation

OC.10.7.1 **Non-compliance with a Dispatch Instruction issued by the TSO to a Generator, Interconnector Operator, Demand Side Unit Operator or Generator Aggregator.**

OC.10.7.1.1 When the **TSO** considers that a **Generator**, **Interconnector Operator**, a **Demand Side Unit Operator** or a **Generator Aggregator** is not in compliance with a **Dispatch Instruction** then the **TSO** shall inform the **Generator**, the **Interconnector Operator**, the **Demand Side Unit Operator** or the **Generator Aggregator** by agreed methods, identifying the relevant **Generation Unit, Interconnector** or **Demand Side Unit,** and identifying the **Dispatch Instruction** and the time of issue of the **Dispatch Instruction** with which the **TSO** considers the **Generator**, the **Interconnector Operator**, the **Demand Side Unit Operator** or the **Generator Aggregator** is not in compliance. This shall be known as a "**Warning** for non-compliance with a **Dispatch Instruction**". The **Warning** is to contain a **Dispatch Instruction** which may be identical to the original **Dispatch Instruction** or which may differ from it. The occurrence of the **Warning** shall be logged by the **TSO** and by the **Generator**, the **Interconnector Operator**, the **Demand Side Unit Operator** or the **Generator Aggregator.**

OC.10.7.1.2 On receipt of a **Warning** for non-compliance with a **Dispatch Instruction**, the **Generator**, the **Interconnector Operator**, the **Demand Side Unit Operator** or the **Generator Aggregator** must as soon as possible, and in any case within ten (10) minutes of the receipt of the **Warning**:

(a) commence to comply with the **Dispatch Instruction** included with the **Warning** (this may be the original or a modified **Dispatch Instruction** as outlined in OC.10.7.1.1); or

(b) reply to the **TSO**, disputing in good faith the validity of the original **Dispatch Instruction**, detailing the grounds on which the validity is being disputed; or

(c) reply to the **TSO**, disputing in good faith the validity of the assessment of non-compliance. In this event the **Generator**, the **Interconnector Operator**, the **Demand Side Unit Operator** or the **Generator Aggregator** must as soon as is reasonably practicable, inform the **TSO** in detail of the grounds on which the assessment of non-compliance is being disputed; or

(d) reply to the **TSO**, giving a reason for inability to comply with the **Dispatch Instruction**, and making a revised **Declaration** in respect of the **Availability**, **Ancillary Service** capabilities or **Operating Characteristics**, as appropriate.

OC.10.7.1.3 If the **Generator**, **Interconnector Operator**, **Demand Side Unit Operator** or **Generator Aggregator** complies in accordance with OC.10.7.1.2 (a), no further action shall arise.

OC.10.7.1.4 In the event of the **Generator**, **Interconnector Operator**, **Demand Side Unit Operator** or **Generator Aggregator** making a revised **Declaration** under OC.10.7.1.2 (d), the **TSO** shall then issue a new **Dispatch Instruction**, consistent with the revised **Declaration**. The revised **Declaration** will be backdated to the time of issue of the relevant **Dispatch Instruction**. Notwithstanding the backdating of the revised **Declaration**, the **Generator**, **Interconnector Operator**, **Demand Side Unit Operator** or **Generator Aggregator** will still be deemed under OC.10.7.1.1 as having failed to comply with a **Dispatch Instruction**.

OC.10.7.1.5 In the event of OC.10.7.1.2 (b) or OC.10.7.1.2 (c) applying, the **TSO** shall consider the substance of the **Generator's**, **Interconnector Operator's, Demand Side Unit Operator's** or **Generator Aggregator's** disputation. The **TSO** shall, where the **TSO** considers appropriate, communicate with the **Generator**, **Interconnector Operator, Demand Side Unit Operator** or **Generator Aggregator** to clarify aspects relating to the issue and receiving of the **Dispatch Instruction**, and the **Generator's**, **Interconnector Operator's**, **Demand Side Unit Operator's** or **Generator Aggregator's** actions. The **TSO** shall acting reasonably determine the validity of the

Generator's, **Interconnector Operator's**, **Demand Side Unit Operator's** or **Generator Aggregator's** disputation, and shall inform the **Generator, Interconnector Operator's**, **Demand Side Unit Operator** or **Generator Aggregator** as to its decision. The **TSO** shall record both its decision, and also all pertinent information relating to the event, including the **Generator's**, **Interconnector Operator's**, **Demand Side Unit Operator's** or **Generator Aggregator's** disputation and such information shall be deemed to be **Operational Data**.

OC.10.7.1.6 Where the **TSO**, acting reasonably, is of the view that a disputation given by a **Generator**, **Interconnector Operator, Demand Side Unit Operator** or **Generator Aggregator** is not valid or not wholly valid or if the **Generator**, **Interconnector Operator, Demand Side Unit Operator** or **Generator Aggregator** has not replied in accordance with OC.10.7.1.2, the **TSO** shall inform the **Generator**, **Interconnector Operator, Demand Side Unit Operator** or **Generator Aggregator** that it is overriding, by means of a **Post Event Notice**, the **Generator's Declaration** or **Interconnector's Declaration** in respect of the **Availability**, **Ancillary Service** capabilities or **Operating Characteristics** of the **Generation Unit** or **Interconnector** as appropriate. The **Post Event Notice** shall govern until such times as the **Generator**, **Interconnector Operator**, **Demand Side Unit Operator** or **Generator Aggregator** submits a revised **Availability Notice**.

OC.10.7.1.7 Where the **TSO** gives a **Post Event Notice** under OC.10.7.1.6, the **Post Event Notice** shall be backdated to the time of issue of the relevant **Dispatch Instruction**, or the latest time for which there exists compelling evidence that the **Generation Unit, Interconnector** and **Demand Side Unit** was acting in compliance with the **Dispatch Instruction**, whichever is the later. The **Post Event Notice** shall set the level of **Declared Availability**, **Declared Ancillary Service** capability or declared **Technical Parameter**, as the case may be, at such level as the **Monitoring**, **Testing** or **Investigation** indicates the **Generation Unit** or **Interconnector** actually achieved. Notwithstanding the backdating of the **Post Event Notice**, the **User** will still be deemed under OC.10.7.1.1 as having failed to comply with a **Dispatch Instruction**.

OC.10.7.1.8 In the event that the **Demand Side Unit Operator** is deemed by the **TSO** in accordance with the provisions of this OC.10 to be in non-compliance with its

Dispatch Instructions, that is the **Demand Side Unit** failed to comply with three (3) **Dispatch Instructions** in a one calendar month period then the **TSO** shall notify the **Demand Side Unit Operator** of the continued non-compliance. The **Demand Side Unit Operator** shall take immediate action to remedy such non-compliance. The terms of this OC.10.7.1.8 shall be without prejudice to the rights of the **TSO** to instruct the **Market Operator** that the **Demand Side Unit** is in breach of the **Grid Code**. In such cases the **TSO** may set the **Demand Side Unit's Availability** to zero or to a level as deemed appropriate by the **TSO** until **Testing** is completed on compliance with **Dispatch Instructions.**

OC.10.7.2 **Non-compliance by a Generator and Interconnector Operator with Declared Operating Reserve**

OC.10.7.2.1 In evaluating the adequacy of the performance of a **Generation Unit** or **Interconnector** as the case may be, the **TSO** shall compare the actual performance as measured, with the expected performance for that **Generation Unit** or **Interconnector**. The expected performance from the **Generation Unit** or **Interconnector** shall be calculated based on the **Frequency** deviation from the **Pre-Incident Frequency**, and the **Generation Unit's or Interconnector's** then **Declared** values of **Availability, POR, SOR, TOR1, TOR2** and **Governor Droop**;

OC.10.7.2.2 Where the performance of a **Generation Unit** or **Interconnector** is deemed by the **TSO** to be in non-compliance with **Declared Operating Reserve**, then the **TSO** shall notify the **Generator** or **Interconnector Operator**, of the non-compliance, identifying the system or procedure by which non-compliance was measured. The **TSO** shall by means of a **Post Event Notice** override the **Generator's** or **Interconnector Operator's Declaration** in respect of **Operating Reserve**. The revised **Declaration** shall be effective from the time of commencement of the **Test** or **Event** on which the non-compliance has been assessed, or such later time as may, in the opinion of the **TSO** acting reasonably, be appropriate if the non-compliance did not apply to the full period of the **Test** or **Event**.

OC.10.7.2.3 Following the notification of non-compliance, the **TSO** shall make available to the **Generator** or **Interconnector Operator** within three **Business Days** relevant data in relation to the system **Frequency** and **Generation Unit** or **Interconnector** performance, that the **Generator** or **Interconnector** may reasonably require substantiating the assessment of non-compliance.

OC.10.7.2.4 The consequences of non-compliance by a **Generator** or **Interconnector** with **Declared Operating Reserve** will be addressed in the **Trading and Settlement Code** and other agreements as appropriate.

OC.10.7.3 **Non-compliance by a Generator, Interconnector Operator, Demand Side Unit Operator or Generator Aggregator with an Availability Notice**

OC.10.7.3.1 In the event that the performance of a **Generation Unit**, **Interconnector**, **Demand Side Unit** or **Aggregated Generator** is deemed by the **TSO** to be in non-compliance with its **Declared Availability**, then the **TSO** shall notify the **Generator**, **Interconnector Operator**, **Demand Side Unit Operator** or the **Generator Aggregator** of the non-compliance.

OC.10.7.3.2 Having so informed the **Generator**, **Interconnector Operator**, **Demand Side Unit Operator** or **Generator Aggregator**, the **TSO** shall, by means of a **Post Event Notice**, override the **User's Availability Notice**, with a value as appropriate to the outcome of the **Test** or **Investigation**. The revised **Declaration** shall be effective from the time of commencement of the **Test** or **Investigation** on which the non-compliance has been assessed, or such later time as may, in the opinion of the **TSO** acting reasonably, be appropriate if the non-compliance did not apply to the full period of the **Test** or **Investigation**.

OC.10.7.3.3 The economic consequence of non-compliance by a Generator, Interconnector Operator, Demand Side Unit Operator or Generator Aggregator with Declared Availability will be addressed in the SEM Trading and Settlement Code and other agreements as appropriate.

OC.10.7.4 **Non-compliance by a Generator, Demand Side Unit Operator or Interconnector Operator with Declared Ancillary Services or Declared Technical Parameters**

OC.10.7.4.1 In the event that the performance of a **Generation Unit, Demand Side Unit Operator** or **Interconnector** is deemed by the **TSO** to be in non-compliance with its

Declared Ancillary Services capability or **Operating Characteristics**, then the **TSO** shall notify the **Generator, Demand Side Unit Operator** or **Interconnector Operator** of the non-compliance, and having so informed the **Generator, Demand Side Unit Operator** or **Interconnector Operator** then the **TSO** shall by means of a **Post Event Notice** override the **Generator's Declaration, Demand Side Unit Operator's Declaration** or **Interconnector Operator's Declaration** in respect of **Ancillary Services** or **Operating Characteristics** as appropriate.

OC.10.7.4.2 The consequences of non-compliance by a Generator, Demand Side Unit Operator or Interconnector Operator with Declared Ancillary Services or Declared Technical Parameters will be addressed in the SEM Trading and Settlement Code and other agreements as appropriate.

OC.10.7.5 **Non-compliance by a User with a Connection Condition or Registered Operating Characteristics**

OC.10.7.5.1 In the event that the performance of a **Generation Unit** is deemed by the **TSO** in accordance with the provisions of this OC10 to be in non compliance with its **Operating Characteristics** or with a **Connection Condition**, then the **TSO** shall notify the **Generator** of the non-compliance and the **Generator** shall take immediate action to remedy such non compliance. The terms of this OC.10.7.5 shall be without prejudice to the rights of the **TSO** to **De-energise** the **Generator's Plant** and **Apparatus** in accordance with the terms of OC.9.6.

OC.10.7.5.2 In the event that the performance of an **Interconnector** is deemed by the **TSO** in accordance with the provisions of this OC.10 to be in non-compliance with its **Operating Characteristics,** or with a **Connection Condition**, then the **TSO** shall notify the **Interconnector Operator** of the non-compliance and the **Interconnector Operator** shall take immediate action to remedy such non compliance. The terms of this OC.10.7.5 shall be without prejudice to the rights of the **TSO** to **De-energise** the **Interconnector** and **Apparatus** in accordance with the terms of OC.9.6.

OC.10.7.5.3 In the event that the performance of a **Demand Side Unit** is deemed by the **TSO** in accordance with the provisions of this OC.10 to be in non-compliance with its

Operating Characteristics or with a **Connection Condition**, then the **TSO** shall notify the **Demand Side Unit Operator** of the non-compliance and the **Demand Side Unit Operator** shall take immediate action to remedy such non compliance. The terms of this OC.10.7.5 shall be without prejudice to the rights of the **TSO** to **De-energise** the **Demand Site** and **Apparatus** in accordance with the terms of OC.9.6.

OC.10.7.6 **Failure of a Black Start Test**

OC.10.7.6.1 A **Black Start Station** shall fail a **Black Start Test** if the **Black Start Test** shows that it does not have a **Black Start Capability** (i.e. if the relevant **Generating Unit** fails to be **Synchronised** to the **System** within two hours of the **Auxiliary Gas Turbine(s)** or **Auxiliary Diesel Engine(s)** being required to start).

OC.10.7.6.2 If a **Black Start Station** fails to pass a **Black Start Test** the **Generator** or **Interconnector Operator** must provide the **TSO** with a written report specifying in reasonable detail the reasons for any failure of the test so far as they are then known to the **Generator** or **Interconnector Operator** after due and careful enquiry. This must be provided within five **Business Days** of the test. If a dispute arises relating to the failure, the **TSO** and the relevant **Generator** or **Interconnector Operator** shall seek to resolve the dispute by discussion, and if they fail to reach agreement, the **Generator** or **Interconnector Operator** may require the **TSO** to carry out a further **Black Start Test** on 48 hours notice which shall be carried out following the agreed procedure as the case may be, as if the **TSO** had issued an instruction at the time of notice from the **Generator** or **Interconnector Operator**.

OC.10.7.6.3 If the **Black Start Station** concerned fails to pass the re-test and a dispute arises on that re-test, either party may use the **Disputes Resolution Procedure** for a ruling in relation to the dispute, which ruling shall be binding.

OC.10.7.6.4 If following the procedure in OC.10.7.6.2 and OC10.7.6.3 it is accepted that the **Black Start Station** has failed the **Black Start Test** (or a re-test carried out under OC.10.7.6.2), within 14 days, or such longer period as the **TSO** may reasonably agree, following such failure, the relevant **Generator** or **Interconnector Operator** shall submit to the **TSO** in writing for approval, the date and time by which that **Generator** or **Interconnector Operator** shall have brought that **Black Start Station** to a condition where it has a **Black Start Capability** and would pass the **Black Start Test**, and the **TSO** will not unreasonably withhold or delay its approval of the **Generator's** or **Interconnector Operator's** proposed date and time submitted. Should the **TSO** not approve the **Generator's** or **Interconnector Operator's** proposed date and time (or any revised proposal) the **Generator** or **Interconnector Operator** shall revise such proposal having regard to any comments the **TSO** may have made and resubmit it for approval.

OC.10.7.6.5 Once the **Generator** or **Interconnector Operator** has indicated to the **TSO** that the **Generating Station** or **Interconnector** has a **Black Start Capability**, the **TSO** shall either accept this information or require the **Generator** or **Interconnector Operator** to demonstrate that the relevant **Black Start Station** has its **Black Start Capability** restored, by means of a repetition of the **Black Start Test** referred to in OC.10.5.7.4following the same procedure as for the initial **Black Start Test**. The provisions of this OC.10.5.7 will apply to such test.

OC.10.8 Disputation of Assessment of Non-Compliance by a User

OC.10.8.1 In the event that a **User** has received notification from the **TSO** of an assessment of non-compliance and/or application of a **Post Event Notice** under **OC7** then the **User** may reply to the **TSO** disputing in good faith the validity of either the assessment of non-compliance and/or the content of the **Post Event Notice**, detailing the grounds on which the validity is being disputed. Any disputation should be submitted within 12 hours although additional information in support of the disputation may follow within two **Business Days**.

OC.10.8.2 If a **User** submits a disputation to the **TSO** under OC.10.8.1, then the **TSO** shall consider the substance of the **User's** disputation. The **TSO** may, where the **TSO** considers appropriate, communicate with the **User** to clarify aspects of the assessment of non-compliance or the **User's** disputation.

OC.10.8.3 The **TSO** shall determine the validity of the **User's** disputation, and shall inform the **User** within five **Business Days** as to its decision. The **TSO** shall alter or revise any assessment of non-compliance and/or **Post Event Notices** as appropriate.

OC.10.8.4 In the event that there is still disagreement as to the outcome, the dispute shall if requested by either the **TSO** or the **User**, be referred to the **CRU.**

OC.11 Safety Co-ordination

OC.11.1 Introduction

OC.11.1.1 In order to adequately maintain and repair damage to **Transmission System Plant** and/or **Apparatus** it will be necessary for the **TSO** and/or its agents to work on or in close proximity to **Transmission System Plant** and **Apparatus**, or in close proximity to **User's Plant** and **Apparatus**.

OC.11.1.2 **Users** and/or their agents will similarly need to work on or in close proximity to **User's Plant** and **Apparatus** which is connected to, or capable of being connected to in an approved manner, the **Transmission System**, and from time to time to work in close proximity to **Transmission System Plant** and **Apparatus**.

OC.11.1.3 It will also be necessary to facilitate work by third parties in close proximity to **Transmission System Plant** and **Apparatus**.

OC.11.1.4 In order to ensure safe working conditions for each of the above situations, the **TSO**, the **TAO, Users,** and/or their respective agents shall comply with their applicable **Safety Rules** and Irish and EU Health and Safety Legislation.

OC.11.1.5 In the event of a conflict between OC.11 (Safety Co-ordination) and any other section of the **Grid Code**, OC.11 shall take precedence.

OC.11.2 Objective

OC.11.2.1 The objective of OC11 is to ensure that the **TSO**, **Users** and their respective agents operate in accordance with approved safety rules, which ensure the safety of personnel working on or in close proximity to **Transmission System Plant** and

Apparatus or personnel who may have to work at or use the equipment at the interface between the **Transmission System** and the **User System**.

OC.11.2.2 This will normally involve making electrical **Plant** dead and suitably isolating / disconnecting (from all sources of **Energy**) and **Earthing** that **Plant** such that it cannot be made live.

OC.11.2.3 The **Safety Rules** shall also cover work on live **Transmission System Plant** and **Apparatus**.

OC.11.3 Scope

OC11 applies to the **TSO** and to the following **Users**:

(a) **Generators**;

(b) **Interconnector Operators**;

(c) the **Distributor System Operator**;

(d) **Demand Customers**;

(e) **Demand Side Unit Operators**;

(f) the **TAO**; and

(g) agents of **the TSO** or agents of any **User** (as defined in OC.11.3(a),(b),(c) and (d)).

OC.11.4 Safety Rules

OC.11.4.1 The safety of personnel working on or in close proximity to **Transmission System Plant** and **Apparatus** for or on behalf of the **TSO** is governed by the **ESB Networks Electrical Safety Rules**.

The safety of personnel working on or in close proximity to **User Plant** and **Apparatus** is governed by the **ESB Networks Electrical Safety Rules**, **ESB Power Generation Electrical Safety Rules** or **Users Safety Rules**, as appropriate.

OC.11.4.2 In the event of a conflict between the provisions of this Code and the provisions of the **ESB Networks Electrical Safety Rules**, the provisions of the **ESB Networks Electrical Safety Rules** shall take precedence.

OC.11.4.3 In the event of a conflict between the provisions of this Code and the provisions of the **ESB Power Generation Electrical Safety Rules**, the provisions of the **ESB Power Generation Electrical Safety Rules** shall take precedence.

OC.11.4.4 Where clarification is required regarding the correct interpretation of a rule within the **ESB Networks Electrical Safety Rules**, the **TSO** shall issue the interpretation to the **User** as provided by the person responsible for the **ESB Networks Electrical Safety Rules** following consultation with the relevant parties.

OC.11.5 Safety as the Interface between the Transmission System and the User System

OC.11.5.1 There shall be a **Designated Operator** for each **User Site.**

OC.11.5.2 **Operation Instructions** for each **User Site** shall, following consultation with the relevant **User**, be issued by the **TSO to the User** and will include:

(a) detail on the demarcation of responsibility for safety of persons carrying out work or testing at the **User's Site** and on circuits which cross the **User's Site** at any point.

(b) detailed switching sequences for voluntary, fault and emergency switching;

(c) control and operational procedures;

(d) identification of operational boundaries;

(e) identity of the representatives of the **TSO** and the **User(s)** and/or their respective agents who will attend the **Transmission Station** and/or facility for operation and during emergencies;

(f) other matters agreed between the **TSO** and **User**.

OC.11.5.3 The **TSO** and each **User** shall co-operate in developing procedures and agreement on any matters that may be relevant for ensuring overall **Site** safety and, in particular, the overall safety of equipment at the interface between the **Transmission System** and the **User System**.

OC.11.5.4 In the event of a **Modification** or a change in operational practices, which may have an **Operational Effect** on a **User Site**, the **TSO** and the **User** shall review the adequacy of overall **Site** safety.

OC.11.5.5 Adequate means of isolation / disconnection (from all sources of **Energy** shall be provided at the interface between the **Transmission System** and the **User System** to allow work to be carried out safely at, or either side of this point, by the **TSO** and each **User**.

OC.11.5.6 Where necessary adequate facilities for **Earthing** and short circuiting shall be applied to **Plant** and/ or **Apparatus** at either side of the interface between the **Transmission System** and the **User System,** to allow work to be carried out safely at or either side of this point.

SDC1 Scheduling and Dispatch Code No.1

Unit Scheduling

SDC1.1 Introduction

SDC1.1.1 **SEM** Provisions

(a) This Scheduling and Dispatch Code No. 1 ("SDC1") forms part of the **Sections under Common Governance** of the **Grid Code**. The **Sections under Common Governance** are those parts of the **Grid Code** which are under common governance in both the **Grid Code** and the **Other Grid Code**.

(b) The form of this SDC1 is similar to the SDC1 in the **Other Grid Code.** Differences relate to references to relevant power systems and related terms. Where there is a difference between a provision in this **Grid Code** and an equivalent provision in the **Other Grid Code**, the wording in question is shaded in grey. In addition, those parts of this SDC1 that are not part of the **Other Grid Code** are shaded in grey in this SDC1. Differences between the form of this SDC1 and the SDC1 in the **Other Grid Code** are summarised in Annex 1 to this SDC1.

(c) This SDC1 is intended to work in conjunction with other documents, including the **Trading and Settlement Code ("TSC")**. The provisions of the **Grid Code** and the **Other Grid Code** will take precedence over the **TSC**.

(d) Where stated in SDC1 the obligation to submit data in relation to some of the information required to be provided to the **TSO** may be fulfilled by **Users** where such information submitted under the **TSC** by a **User** or by an **Intermediary** on behalf of **Users** is then provided to the **TSO** by the **Market Operator** in accordance with the **TSC**, as further provided in this SDC1. The **TSO** may require **Users** to verify or provide revisions to data received by it via the **Market Operator**.

(e) Further provisions dealing with the **Sections under Common Governance** are contained in the **General Conditions**.

SDC1.1.2 SDC1 sets out the procedure used by the **TSO** to develop unit commitment schedules in respect of **CDGU's, Controllable PPMs** and **Demand Side Units** including the requirements for **Users** to submit data to support this procedure:

i. <u>**Availability**</u>: the submission by a **User** to the **TSO** of an **Availability Notice** in respect of each of its:

(i) **CDGUs** (which for the avoidance of doubt comprise, **Generating Units** subject to **Central Dispatch**, **CCGT Installations**, **Hydro Units**, **Pumped Storage Generation** (but not **Pumped Storage Plant Demand** or **Energy Station Power Station Demand**) and **Dispatchable PPMs**);

(ii) **Pumped Storage Plant Demand**;

(iii) **Energy Storage Power Station Demand;**

(iv) **Interconnector Availability** (in the case of the **Interconnector Owner**);

(v) **Demand Side Units**;

(vi) in the case of **Generator Aggregators**, its **Aggregated Generating Units**; and

(vii) **Controllable PPMs.**

ii. <u>**Technical Parameters**</u>: the notification to the **TSO** of the **Technical Parameters**, in respect of the following **Trading Day**, by each **User** in a **Technical Parameters Notice**, notification of **Other Relevant Data** and notification of other technical data including ***Ancillary Services*** capability;

iii. <u>**Commercial Offer Data**</u>: the notification of **Commercial Offer Data** in accordance with the TSC;

iv. <u>**Physical Notifications:**</u> the declaration by a **User** to the **TSO** of **Physical Notifications** data in accordance with the **TSC**;

v. <u>**Interconnector Schedule Quantities**</u>: the declaration by a **Scheduling Agent** to the **TSO** of **Interconnector Schedule Quantities** in accordance with the **TSC;**

vi. <u>Revisions/**Re-declarations**</u>**:** revisions / **Re-declarations** of such information as provided for this in SDC1;

vii. <u>**Indicative Operations Schedules**</u>: the periodic production and issuing by the **TSO** of **Indicative Operation Schedules** as required under SDC1.4.7 as a statement of which:

(i) **CDGUs;**
(ii) **Pumped Storage Plant Demand;**
(iii) **Energy Storage Power Station Demand;**
(iv) **Interconnectors;**
(v) **Demand Side Units;**
(vi) **Aggregated Generating Units;** and/or
(vii) **Controllable PPMs**

may be required.

SDC1.1.3 The **TSO** (in conjunction with the **Other TSO**) shall develop, maintain and publish the process describing the methodology and parameters to be used by the **TSO** (and the **Other TSO**) in fulfilling their responsibilities under this SDC1 and SDC2.

SDC1.2 Objective

The objectives of SDC1 are:

(a) to ensure (so far as possible) the integrity of the **Transmission System** and to ensure that the **TSO** acts in conjunction with the **Other TSO** so that the **Other TSO** can ensure the integrity of the **Other Transmission System** (with the **Other TSO** having a similar objective in the **Other Grid Code**);

(b) to ensure the security and quality of supply in relation to the **Transmission System** and to ensure that the **TSO** acts in conjunction with the **Other TSO** so that the **Other TSO** can ensure the security and quality of supply in relation to the **Other Transmission System** (with the **Other TSO** having a similar objective in the **Other Grid Code**);

(c) to ensure that sufficient available capacity is scheduled to meet the electrical power demand, and thereby in conjunction with the **Other TSO** to ensure that sufficient available capacity is scheduled to meet the demand on the Island of Ireland at all times and in both cases together with an appropriate margin of reserve;

(d) to enable the **TSO**, in conjunction with the **Other TSO**, to prepare and update **Indicative Operations Schedules** to be used in the scheduling and **Dispatch** process;

(e) to ensure that **Indicative Operations Schedules** are published as provided for in this SDC1.

and, subject to delivering the objectives in SDC1.2(a), SDC1.2(b), and SDC1.2(c) and taking account of the factors set out in [SDC1.4.7.3],

(f) to minimise the cost of scheduled divergence from the **Physical Notifications** in accordance with **Merit Order**, subject to SDC1.2(g);

(g) in fulfilling the objective in SDC1.2(c), minimise the requirement to issue **Notices to Synchronise** before **Gate Closure 2**.

SDC1.3 Scope

SDC1 applies to the **TSO** and to the following **Users**:

(a) **Generators** with regard to their:

CDGUs;

and **Controllable PPMs**.

(b) **Pumped Storage Generators** with regard to their **Pumped Storage Plant Demand**;

(c) **Energy Storage Generators** with regard to their **Energy Storage Power Station Demand**;

(d) In respect of the submission of **Availability Notices** under SDC1.4.1**,** **Interconnector Owners** with regard to their **Interconnectors**;

(e) In respect of the submission of **Interconnector Schedule Quantities** under SDC1.4.4.6, **Scheduling Agents** with regard to the scheduling of imports and exports across each **Interconnector** they have been nominated to schedule;

(f) **Demand Side Unit Operators** in relation to their **Demand Side Units**; and

(g) **Generator Aggregators** in respect of their **Aggregated Generating Units**.

Each of which (other than the **TSO**) is a "**User**" under this SDC1.

SDC1.4 Procedure

SDC1.4.1 Availability Notice

SDC1.4.1.1 Requirement

(a) Each **User** shall, by not later than the **Gate Closure** 1 each day, notify the **TSO** by means of an **Availability Notice** (in such form as the **TSO** may reasonably notify from time to time or in the form published on the **TSO** website) of changes to the **Availability**, and/or **Demand Side Unit MW Availability** (as the case may be) of each of its:

(i) **CDGUs**;
(ii) **Controllable PPMs**;
(iii) **Pumped Storage Plant Demand**;
(iv) **Energy Storage Plant Demand**;
(v) **Interconnectors** (to be submitted by the **Interconnector Owner**);
(vi) **Demand Side Units**; or
(vii) **Aggregated Generating Units** as the case may be.

(b) A **User** may satisfy this obligation by submitting the data under the **TSC**, unless the **TSO** requires, by notice to the **User**, the data to be submitted to it directly under the **Grid Code**.

(c) A **Generator Aggregator** will satisfy the obligation in this SDC1.4.4.1 by notifying to the **TSO** in an **Availability Notice** in the form described in paragraph (a) above the **Availability** of its **Aggregated Generating Units** as the case may be.

(d) As a general requirement, the **User** shall ensure that the data in any **Availability Notice** or any revision thereto is consistent with its obligations under SDC1.4.3.2 and SDC1.4.3.4.

SDC1.4.1.2 Content

(a) The **Availability Notice** shall state the **Availability** of the relevant **CDGU**, **Controllable PPM**, **Interconnector**, **Demand Side Unit** or **Pumped Storage Plant Demand** as the case may be, (including, in the case of a **CCGT Installation**, the **Availability** of each of the ***CCGT Unit*s** within it) for each **Imbalance Settlement Period** in the time up to and including the end of the relevant **Trading Day** (subject to revision under SDC1.4.3.6). A new **Availability Notice** will supersede the previous one in relation to **Availability** for **Imbalance Settlement Periods** which are covered by the new one.

(b) In respect of **Interconnectors**, the **Availability Notice** shall state the physical capability of the **Interconnector**, and shall take account of any further restrictions placed by any relevant agreement or the provisions of any licence in respect of the **Interconnector**, but shall not otherwise take account of any expected transmission constraints or other aspects of the operation of the Transmission System or an **External System**. A new **Availability Notice** will supersede the previous one in relation to **Availability** for **Imbalance Settlement Periods** which are covered by the new one.

(c) In the case of a **Generator Aggregator**, the **Availability Notice** shall state the **Availability** of its **Aggregated Generating Units** as a whole.

SDC1.4.1.3 <u>Whole Numbers</u>

The **MW** figure stated in the **Availability Notice** shall be a whole number.

SDC1.4.1.4 Atmospheric Conditions

In the case of **CDGUs** and **Controllable PPMs** which are affected by ambient conditions, an **Availability Notice** submitted by a **Generator** shall be stated as being the **User's** best estimate of the prevailing atmospheric conditions for **the Imbalance Settlement Period** to which each part of the **Availability Notice** relates.

SDC1.4.2 Additional Grid Code Availability Notice

The following items are required to be submitted by each **User** by no later than the **Gate Closure** 1 each day, with the exception of **Aggregators** and **Demand Side Unit Operator**, direct to the **TSO**, regardless of whether these have to be submitted under the **TSC**. The requirements in SDC1.4.1 in relation to data apply to this SDC1.4.2 as if repeated here.

SDC1.4.2.1 Fuels

In the case where a **CDGU** is capable of firing on different fuels, then the **Generator** shall submit an **Availability Notice** setting out the information in SDC1.4.1 above for each fuel for the **CDGU**.

SDC1.4.2.2 CCGT Availability

(a) The **Availability** of each ***CCGT Unit*** within each **CCGT Installation**;

(b) In the case of a **CCGT Installation**, the **CCGT Installation Matrix** submitted by the **Generator** *under PC.A4.3 of the Planning Code Appendix* (as may be revised as therein provided is used and relied upon by the **TSO** as a 'look up table' to determine the number of ***CCGT Units*** within a **CCGT Installation** which will be synchronised to achieve the **MW Output** specified in a **Dispatch Instruction**. When using a **CCGT Installation Matrix** for **Scheduling** purposes, the **TSO** will take account of any updated information on the individual **Availability** of each ***CCGT Unit*** contained in an **Availability Notice** submitted by a **Generator** pursuant to this SDC1. The individual **Availability** figures submitted under this SDC1.4.2.2 must be consistent with the **Generator's** submission under the **TSC**.

(c) It is accepted that in cases of change in **MW Output** in response to **Dispatch** instructions issued by the **TSO**, there may be a transitional variance to the conditions reflected in the **CCGT Installation Matrix**. Each **Generator** shall notify the **TSO** as soon as practicable after the event of any such variance.

(d) In achieving a **Dispatch Instruction** the range or number of ***CCGT Unit*s** envisaged in moving from one **MW Output** level to the other should not be departed from.

(e) There is a provision in SDC1.4.3.6 for the **Generator** to revise the individual **Availability** of each ***CCGT Unit*** within each **CCGT Installations**, subject always to the provisions of this SDC1.4.2.2;

SDC1.4.3 General Availability Requirements

SDC1.4.3.1 Availability of Generating Units

Each **Generator** and **Generator Aggregator** shall in relation to its **CDGUs**, **Controllable PPMs** or **Aggregated Generating Units** maintain, repair, operate and fuel the **CDGU** and/or **Controllable PPM** and/or **Aggregated Generating Unit** as required by ***Prudent Utility Practice*** and any legal requirements applicable to its jurisdiction, with a view to providing the required ***Ancillary Services** as provided for in an **Ancillary Services Agreement**.*

SDC1.4.3.2 Each **Generator**, and where relevant each **Generator Aggregator**, shall, subject to the exceptions in 0 and SDC1.4.3.3A, use reasonable endeavours to ensure that it does not at any time declare in the case of its **CDGU**, **Controllable PPM**, or **Aggregated Generating Unit**, the **Availability** or **Technical Parameters** at levels or values different from those that the **CDGU**, **Controllable PPM**, and/or an **Aggregated Generating Unit** could achieve at the relevant time. The **TSO** can reject declarations to the extent that they do not meet these requirements.

SDC1.4.3.3 SDC1.4.3.2 shall not apply to the extent:

(a) it would require the **Generator** or, where relevant, the **Generator Aggregator** to declare levels or values better than the **Registered Capacity** and **Technical Parameters** as submitted under the **Planning Code** in respect of a **CDGU**, a **Controllable PPM** and/or an **Aggregated Generating Unit**;

(b) necessary during periods of ***Scheduled Outage*** or ***Short Term Scheduled Outage*** or otherwise with the consent of the **TSO**;

(c) necessary while repairing or maintaining the **CDGU**, the **Controllable PPM** and/or the **Aggregated Generating Unit** or equipment necessary to the operation of the **CDGU**, the **Controllable PPM** and/or the **Aggregated Generating Unit** where such repair or maintenance cannot reasonably, in accordance with ***Prudent Utility Practice***, be deferred to a period of ***Scheduled Outage*** or ***Short Term Scheduled Outage****;*

(d) necessary to avoid an imminent risk of injury to persons or material damage to property (including the **CDGU**, the **Controllable PPM** and/or the **Aggregated Generating Unit**); or

(e) it is not lawful for the **Generator** to operate the **CDGU**, the **Controllable PPM** and/or the **Aggregated Generating Units**.

SDC1.4.3.3A SDC1.4.3.2 shall not apply for a **CDGU**, a **Controllable PPM**, an **Aggregated Generating Unit**, **Energy Storage Power Station Demand** or **Pumped Storage Plant Demand** that is disconnected during the any one or more of the following:

(a) Any **TSO** scheduled **Annual Maintenance Outage** or portion thereof on the **Outturn Availability Connection Asset** lasting up to and including a maximum of five days in total in a calendar year; or

(b) Where work to the **Transmission System** is being carried out that is driven by the relevant **CDGU**, **Controllable PPM**, **Aggregated Generating Unit**, **Energy Storage Power Station Demand** or **Pumped Storage Plant Demand** or driven by works related to the **Connection Agreement** of the relevant **CDGU**, **Controllable PPM, Aggregated Generating Unit**, **Energy Storage Power Station Demand** or **Pumped Storage Plant Demand.** This does not include work carried out related to another **Generation Unit** with a different **Connection Point** but a shared asset.

The relevant **CDGU**, **Controllable PPM**, **Aggregated Generating Unit**, **Energy Storage Power Station Demand** or **Pumped Plant Demand** shall declare **Availability** at a value of zero during any one or more of (a) or (b) above, as advised by the **TSO.**

SDC1.4.3.4 Availability of Demand Side Units

Each **Demand Side Unit Operator** shall, subject to the exceptions in SDC1.4.3.5 and SDC1.4.3.5A, use reasonable endeavours to ensure that it does not at any time declare the **Demand Side Unit MW Availability** and the **Demand Side Unit** characteristics of its **Demand Side Unit** at levels or values different from those that the **Demand Side Unit** could achieve at the relevant time. The **TSO** can reject declarations to the extent that they do not meet these requirements.

SDC1.4.3.5 SDC1.4.3.4 shall not apply to the extent:

(a) it would require the **Demand Side Unit Operator** to declare levels or values better than **Demand Side Unit MW Capacity** and **Technical Parameters** as submitted under the Planning Code in respect of a **Demand Side Unit**;

(b) necessary during periods of ***Scheduled Outage*** or ***Short Term Scheduled Outage*** or otherwise with the consent of the **TSO**;

(c) necessary while repairing or maintaining the **Demand Side Unit** or equipment necessary to the operation of the **Demand Side Unit** where such repair or maintenance cannot reasonably, in accordance with ***Prudent Utility Practice***, be deferred to a period of ***Scheduled Outage*** or ***Short Term Scheduled Outage.***

(d) necessary to avoid an imminent risk of injury to persons or material damage to property (including the **Demand Side Unit**);

(e) it is not lawful for the **Demand Side Unit Operator** to change its **Demand Side Unit MW Response** or to operate its **Demand Side Unit**.

SDC1.4.3.5A SDC1.4.3.4 shall not apply for a **Demand Side Unit** that is disconnected during any one or more of the following:

(a) Any **TSO** scheduled **Annual Maintenance Outage** or protion thereof on the **Outturn Availability Connection Asset** lasting up to and including a maximum of five days in total in a calendar year; or

(b) Where work to the **Transmission System** is being carried out that is driven by the relevant **Demand Side Unit** or driven by works related to **Connection Agreement** of the relevant **Demand Side Unit**. This does not include work carried out to another **Generating Unit** with a different **Connection Point** but a shared asset.

The relevant **Demand Side Unit** shall declare **Availability** at a value of zero during any one or more of (a) or (b) above, as advised by the **TSO**.

SDC1.4.3.6 <u>Changes in Availability</u>:

a) A **User** may, subject to this SDC1.4.3 and as provided for in this SDC1, make revisions to the **Availability Notice** submitted to the **TSO** under SDC1.4.1.1at any time after submission of the **Availability Notice** in accordance with its obligations to make the unit **Available** under SDC1.4.3 by submission by the **Electronic Interface** of a revised **Availability Notice** which shall be in the form set out on the **TSO** website or in such other form as the **TSO** may reasonably notify to each **User** from time to time.

b) In the event that the **TSO** submits a **Post Event Notice** under *OC.10* in relation to any part of the period covered by the **Availability Notice** at any time after submission of the **Availability Notice**, the **User** shall be deemed to have submitted a revised **Availability Notice** consistent with such **Post Event Notice.**

c) The revisions to the **Availability Notice** may include revisions of the levels of **Availability** in the **CCGT Installation Matrix** reflecting the revised **Availability**.

d) <u>Additional **Grid Code Availability Notice**</u>: A **User** may, subject to SDC1.4.3 and to the provisions of this SDC1, make revisions to the **Additional Grid Code Availability Notice** submitted to the **TSO** under SDC1.4.2 at any time after the submission of the **Additional Grid Code Availability Notice** in accordance with its obligations to make the unit **Available** under SDC1.4.3 by submission by the **Electronic Interface** of a revised **Additional Grid Code**

Availability Notice. The Notice shall be in the form set out on the **TSO** website or in such other form as the **TSO** may reasonably notify each **User** from time to time.

e) Increasing **Availability**: If a **Generator**, a **Generator Aggregator** or a **Demand Side Unit Operator** in respect of a **CDGU**, an **Aggregated Generating Unit,** a **Demand Side Unit**, **Energy Storage Power Station** or **Pumped Storage Plant** in relation to **Demand**, issues an **Availability Notice** increasing (from zero or otherwise) the level of **Availability** or **Demand Side Unit MW Availability** from a specified time, such notice shall be construed as meaning that:

(i) in the case of a **CDGU** and/or **Aggregated Generating Unit**, the **CDGU** and/or **Aggregated Generating Unit** is capable of being synchronised to the **Transmission System** or **Distribution System** at that specified time or increasing its **MW Output** at that specified time as the case may be;

(ii) in the case of a **CDGU** which is an **Open Cycle Gas Turbine**, the **CDGU** is capable of being started at that specified time; or

(iii) in the case of a **Demand Side Unit**, the **Demand Side Unit** is capable of delivering a greater **Demand Side Unit MW Response** at that specified time.

f) **Controllable PPM:** If a **Generator** or, where relevant a **Generator Aggregator**, in respect of a **Controllable PPM**, issues an **Availability Notice** increasing (from zero or otherwise) or decreasing the level of **Availability** from a specified time, such notice shall be effective from the **Imbalance Settlement Period** following the specified time.

g) Decreasing **Availability**: When a **CDGU** and/or **Controllable PPM** is **Synchronised** to the **System** the **Generator** may have occasion to issue an **Availability Notice** decreasing the level of **Availability** of the **CDGU** and/or **Controllable PPM** from a specified time. Such notice shall be construed as meaning that the **CDGU** and/or **Controllable PPM** is capable of maintaining

Load at the level of the prevailing **Availability** until the time specified in the notice. Thereafter, the **CDGU** and/or **Controllable PPM** shall be capable of maintaining **Load** to the level which would have been achieved if a **Dispatch Instruction** had been given to reduce the **Load**. This would have occurred with effect from the specified time, at the maximum **De-Loading Rate** and/or **Ramp-Down Rate** declared for the **CDGU** and/or **Controllable PPM** as a **Technical Parameter** at such time down to the level of **Availability** specified in the new **Availability Notice**.

When a **Demand Side Unit** is providing a **Demand Side Unit MW Response** the **Demand Side Unit** may have occasion to issue an **Availability Notice** decreasing the level of **Demand Side Unit MW Availability** of the **Demand Side Unit** from a specified time. Such notice shall be construed as meaning that the **Demand Side Unit** is capable of maintaining **Demand Side Unit MW Response** at the level of the prevailing **Demand Side Unit MW Availability** until the time specified in the notice. Thereafter, the **Demand Side Unit** shall be capable of maintaining **Demand Side Unit MW Response** to the level which would have been achieved if a **Dispatch Instruction** had been given to reduce the **Demand Side Unit MW Response**. This would have occurred with effect from the specified time, at the **Maximum Ramp Down Rate** declared for the **Demand Side Unit** as a **Technical Parameter** at such time down to the level of **Demand Side Unit MW Availability** specified in the new **Availability Notice**.

(h) If an **Interconnector Owner** in respect of an **Interconnector** issues an **Availability Notice** increasing (from zero or otherwise) or decreasing the **Availability** of the **Interconnector** as a whole from a specified time, such notice shall, subject to SDC1.4.3.6a) be effective immediately following the specified time.

SDC1.4.3.7 Default Availability:

(a) Insofar as any data submitted or deemed to have been submitted on any particular day in any **Availability Notice**, or any revision thereto is inconsistent with any other data in any other such notice, then the most recently submitted data which, if substituted for the inconsistent data, would make the data in such notices consistent, shall apply for the next following **Trading Day** *or any other values that the **TSO** may reasonably deem appropriate*.

(b) Insofar as an **Availability Notice** is not submitted, the **User** shall be deemed to have submitted an **Availability Notice** by **Gate Closure 1** stating that the **Availability** of the relevant **CDGU**, **Controllable PPM**, **Demand Side Unit** and/or the **Aggregated Generating Units** for the whole of the relevant **Trading Day** will be the level of **Availability** and **Operating Mode** declared in respect of the final **Imbalance Settlement Period** of the current **Trading Day** *or any other values that the **TSO** may reasonably deem appropriate*.

SDC1.4.3.8 **Outturn Availability**

Outturn Availability shall be set equal to the declared value of **Availability.**

SDC1.4.4 Technical and Commercial Data Requirements

SDC1.4.4.1 Technical Parameters

a)

(i) By not later than the **Gate Closure 1**, each **User** shall in respect of each:

- **CDGU;**
- **Controllable PPM**;
- **Aggregated Generating Unit**,
- **Pumped Storage Plant Demand**
- **Energy Storage Power Station Demand**; and/or
- **Demand Side Unit**,

submit to the **TSO** a **Technical Parameters Notice** in such form as the **TSO** may reasonably notify to each **User** or in the form published on the **TSO** website from time to time, containing the **Technical Parameters** to apply for the relevant **Trading Day**.

(ii) A **User** may satisfy this obligation by submitting the data under the **TSC**, unless the **TSO** requires, by notice in writing to the **User**, the data to be submitted to it under the **Grid Code**.

(iii) Subsequent revisions to the **Technical Parameters Notice** may be submitted according to the technical offer data submission provisions as set out in the **TSC**. If there is a change to the data submitted under the **TSC**, the **User** shall notify the **TSO**.

(iv) As a general requirement, the **User** shall ensure that the data in any **Technical Parameters Notice**, or any revision thereto is consistent with its obligations under SDC1.4.3.2 and SDC1.4.3.4.

(b) Flexibility:

(i) In the case of any **Technical Parameters** as to which the **User** should, acting in accordance with ***Prudent Utility Practice***, have some flexibility either in the revision itself or in the time at which the revision is to take effect the **TSO** may, acting reasonably, suggest an amended data figure and/or an amended time at which the data figure is to take effect.

(ii) Insofar as it is able to do so without breaching any obligations regarding confidentiality contained either in the **TSO Licence** or in any agreement, the **TSO** shall notify the **User** of the reasons for such flexibility request in such degree of detail as the **TSO** considers reasonable in the circumstances.

(iii) If the **User** agrees to such suggestion (such agreement not to be unreasonably withheld) the **User** shall use reasonable endeavours to accommodate such suggestion and submit a revised **Technical Parameters Notice** accordingly. In any event, the **TSO** may require such further information on the revision as is reasonable and the

User shall give the **TSO** such information as soon as reasonably practicable.

A **User** shall notify the **TSO** as soon as it becomes aware, acting in accordance with ***Prudent Utility Practice***, that any of the data submitted under SDC1.4.4.1 changes.

(c) **Changes to Technical Parameters:**

If any of the data submitted to the **TSO** under this SDC1.4.4.1 changes, a **User** shall, subject to SDC1.4.3, make revisions to such data. The **User** shall notify the **TSO** of any revisions to any previously revised data by submitting by the **Electronic Interface** a revised **Technical Parameters Notice** in the form set out on the **TSO** website or in such other form as the **TSO** may reasonably notify to each **User** from time to time.

(d) **Energy Limits** for **Hydro Units**:

A **Generator** in respect of its **Hydro Units** shall resubmit **Energy Limits** on the **Trading Day** regardless of whether the **Energy Limits** have changed since the **Gate Closure 1**. Revised **Energy Limits** for **Hydro Units** may be submitted at any time up until 11.00 hours on the relevant **Trading Day** in a format specified by the **TSO**.

(e) Default **Technical Parameters**:

Insofar as any data submitted or deemed to have been submitted on any particular day in any **Technical Parameters Notice** (such notice not being relevant to an **Interconnector Owner**), or any revision thereto is inconsistent with any other data in any other such notice, then the most recently submitted data which, if substituted for the inconsistent data, would make the data in such notices consistent, shall apply for the next following **Trading Day** *or any other values that the **TSO** may reasonably deem appropriate*.

Insofar as not submitted or revised, the applicable **Standing Technical Offer Data** for **Technical Parameters** shall apply for the next relevant **Trading Day**.

Default **Energy Limits** for **Hydro Units**: Notwithstanding the obligations in SDC1.4.4.1(d), in respect of **Hydro Units**, the **Energy Limit** that applied to the previous **Trading Day** will be used.

SDC1.4.4.2 Additional Grid Code Characteristics Notice

The following items are required to be submitted by each **Use**r direct to the **TSO**:

(a) Individual ***CCGT Unit*** data equivalent to the data required for a **CCGT Installation**. It shall also show any revisions to the **Technical Parameters** for each of the ***CCGT Unit*s** within it.

[Note: The term "CCGT Module" applies to the SONI Grid Code and the term "CCGT Unit" will apply to the EirGrid Grid Code.]

(b) Different Fuels: In the case where a **CDGU** is capable of firing on different fuels, then the **Generator** shall submit an **Additional Grid Code Characteristics Notice** in respect of any additional fuel for the **CDGU**, each containing the information set out in SDC1.4.4.1 above for each fuel and each marked clearly to indicate to which fuel it applies.

(c) *Export adjustment factors applied by the **User** in submitting data and that may be applied by the **TSO** where applicable in issuing **Dispatch Instructions** and otherwise in calculations relating to instructions in relation to the relevant **Plant** and/or **Apparatus**, between the **Generator Terminals** and the **Connection Points**.*

(d) In the case of **Interconnector Owners**, **Interconnector** data, including but not limited to the **Availability** of **Interconnector Filters**.

(e) In relation to each **Demand Side Unit**, the **Demand Side Unit *Notice Time*** and the **Demand Side Unit MW Response Time**.

(f) Where there is a ***Ancillary Services Agreement*** in place, the ***Ancillary Services*** which are **Available**.

(g) The parameters listed in Appendix A Part 2 of SDC1.

(h) *A **Generator** shall submit to the **TSO** the **Operating Reserve** capabilities for each category of **Operating Reserve** defined in OC4.6.3 for each of its **CDGUs** for each **Imbalance Settlement Period**.*

[Note: Please note that the above paragraph only applies to the EirGrid Grid Code only.]

A **User** shall notify the **TSO** as soon as it becomes aware, acting in accordance with ***Prudent Utility Practice***, that any of the data submitted under SDC1.4.4.2 no longer correct.

A **User** may make revisions to the **Additional Grid Code Characteristics Notice** submitted to the **TSO** under SDC1.4.4.2 at any time after the submission of the **Additional Grid Code Characteristics Notice** by submitting by the **Electronic Interface** a revised **Additional Grid Code Characteristics Notice**. The notice shall be in the form set out on the **TSO** website or in such other form as the **TSO** may reasonably notify to each **User** from time to time.

SDC1.4.4.3 *Not used*.

SDC1.4.4.4 <u>**Other Relevant Data**</u>

(a) By not later than the **Gate Closure 1** each day, each **User** in respect of each of its **Plant**, shall in respect of the following **Trading Day** submit to the **TSO** in writing in the form set out on the **TSO** website or in such other form as the **TSO** may reasonably notify to each **User** from time to time), details in relation to the relevant **Trading Day** of any newly arisen special factors, including abnormal risk to loss, which in the reasonable opinion of the **User** may have a material effect on the likely **MW Output** or **Demand Side Unit MW Response** of such **Plant** (including, for a **CCGT Installation** in relation to each of the ***CCGT Unit*s** therein). The notice shall be consistent with the **User's** obligations under SDC1.4.3.2. The provisions of this paragraph also apply to **Interconnector Owners** in relation to their **Interconnector Filters**.
[Note: The term "CCGT Module" will apply to the SONI Grid Code and the term "CCGT Unit" will apply to the EirGrid Grid Code.]

(b) Where a **CDGU** is capable of firing on different fuels, then the **Generator** shall submit details in respect of each fuel for the **CDGU**. Each set of details shall contain the information set out in (a) above for each fuel and each shall be marked clearly to indicate to which fuel it applies.

(c) A **User,** acting in accordance with ***Prudent Utility Practice*****,** shall notify the **TSO** as soon as it becomes aware that any of the data submitted under SDC1.4.4.4 has changed.

(d) Changes to **Other Relevant Data**

If any of the data submitted to the **TSO** under this SDC1.4.4.4 is no longer correct, a **User** shall, subject to SDC1.4.3, make revisions to such data. The **User** must notify the **TSO** of any new **Other Relevant Data** of which it becomes aware at any time, in writing.

(e) Default **Other Relevant Data**

Insofar as any data submitted or deemed to have been submitted on any particular day in any notice of **Other Relevant Data** or any revision thereto is inconsistent with any other data in any other such notice, then the most recently submitted data which, if substituted for the inconsistent data, would make the data in such notices consistent, shall apply for the next following **Trading Day** *or any other values that the **TSO** may reasonably deem appropriate.*

Insofar as not submitted or revised, the last notice relating to **Other Relevant Data** to have been submitted shall apply for the next relevant **Trading Day**.

(f) As a general requirement, the **User** shall ensure that the data in any **Availability Notice, Technical Parameters Notice,** or notice of any **Other Relevant Data** or any revision thereto is consistent with its obligations under SDC1.4.3.2 and SDC1.4.3.4.

SDC1.4.4.5 **Commercial Offer Data**

(a) Each:

- **Generator**;
- **Energy Storage Generator**;
- **Pumped Storage Generator**;
- **Demand Side Unit Operator**; and
- **Generator Aggregator,**

Shall in respect of:

Each of its **CDGUs**;

Each of its **Energy Storage Power Station Demand**;

Each of its **Pumped Storage Plant Demand**;

Each of its **Demand Side Units; an**d

Its **Aggregated Generating Units**,

submit to the **TSO,** either directly or by means of an **Intermediary** on its behalf (if applicable), **Commercial Offer Data** in accordance with the **TSC**.

(b) The **TSO** may require, by notice to the relevant **User**, the data referred to at SDC1.4.4.5(a) to be submitted to it directly under the **Grid Code.** All data items submitted under this SDC1.4.4.5 are to be at levels of **MW Output** at the **Connection Point**.

(c) Amendments to **Commercial Offer Data** shall be in accordance with the **TSC.**

(d) Default **Commercial Offer Data**: Insofar as not submitted or revised, **Commercial Offer Data** shall be deemed in accordance with the **TSC**.

SDC1.4.4.6 **Physical Notifications** and **Interconnector Schedule Quantities**

(a) Each:

- **Generator**,
- **Pumped Storage Generator**,
- **Demand Side Unit Operator**, and
- **Generator Aggregator**.

Shall in respect of:

Each of its **CDGU**s;

Each of its **Pumped Storage Plant Demand**;

Each of its **Demand Side Units**; and

Its **Aggregated Generating Units**,

submit to the **TSO**, either directly or by means of an **Intermediary** on its behalf (if applicable), **Physical Notifications** by **Gate Closure 1** for the corresponding **Trading Days** in accordance with the **TSC.** **Physical Notifications** shall be technically feasible. **Users** shall ensure that the accuracy of **Physical Notifications** is commensurate with **Good Industry Practice**.

(b) Prior to **Gate Closure 2, Physical Notifications** submitted in accordance with SDC1.4.4.6(a) shall be amended by the **User** (or **Intermediary** if applicable) to align with changes to their expected **Active Power Generation** or **Active Power Demand**. A new **Physical Notification** will supersede the previous one in relation to a **Physical Notification** for **Imbalance Settlement Periods** or parts thereof which are covered by the new one. At **Gate Closure 2**, **Physical Notifications** for the relevant **Imbalance Settlement Period** become **Final Physical Notifications** for that **Imbalance Settlement Period**. **Final Physical Notifications** may not be amended.

(c) Each **Generator** may, in respect of their **Controllable PPM** submit **Physical Notifications** in accordance with the provisions of SDC1.4.4.6(a) and SDC1.4.4.6(b).

(d) **Each Scheduling Agent** shall in respect of each **Interconnector** they have been nominated to schedule, submit to the **TSO**, **Interconnector Schedule**

Quantities by **Gate Closure 1** for the corresponding **Trading Days** in accordance with the TSC. Prior to **Gate Closure 2, Scheduling Agents** shall submit further **Interconnector Schedule Quantities** in accordance with the **TSC** to reflect trading in intraday markets. At **Gate Closure 2 (**or an alternative later time advised from time to time by the **TSO** acting in accordance with **Prudent Utility Practice**) for an **Imbalance Settlement Period**, further **Interconnector Schedule Quantities** may not be submitted for that **Imbalance Settlement Period.**

(e) Notwithstanding the obligations in SDC1.4.4.6(a), SDC1.4.4.6(b) and SDC1.4.4.6(d), a value of zero will be deemed in all **Imbalance Settlement Periods**, or parts thereof, for which **Physical Notifications** data or **Interconnector Schedule Quantities** date has not been submitted.

(f) If a **User** has submitted proposals for a test to the **TSO** and subsequently receives approval for the test from the **TSO**, the **User** (or their **Intermediary**, if applicable) shall submit **Physical Notifications** for the unit under test in accordance with the **TSC** to identify the time periods during which their units are under test. The **User** shall ensure that the **Physical Notifications** submitted in respect of a unit under test align with the approved test start time, test **MW Output** profile (or **Demand Unit MW Response** profile in the case of **Demand Side Units**) and test end time.

SDC1.4.5 The **TSO** shall, insofar as it is reasonably able, take account of revisions or notifications submitted under SDC1.4 for **Scheduling** and **Dispatch** purposes.

SDC1.4.6 Form of Submission

a) Where this SDC1 requires a **User** to submit a notice, it may instead of submitting it in writing, submit the information required in such a notice (which information shall be supplied in full) by telephone subject to the **TSO**'s prior consent (identifying unambiguously the type of notice which is thereby being submitted).

b) The individual who is giving the notice by telephone on behalf of the **User** shall firstly specify the time at which the notice is being given, then identify himself and ask the individual receiving the notice on behalf of the **TSO** also to identify himself. The information required by the notice shall then be given, including (without limitation) the identity of the **CDGU**, **Controllable**

PPM, **Energy Storage Power Station Demand**, **Aggregated Generating Unit**, **Pumped Storage Plant** and **Demand Side Unit** to which the notice relates

c) The notice shall then be confirmed by facsimile transmission or by any electronic means as agreed with the **TSO** as soon as possible thereafter (and in any event be sent to th**e TSO** within 2 hours). Where a facsimile is so sent by way of confirmation, it shall state clearly that it is in confirmation of a notice already given by telephone and shall state the exact time at which the notice was given by telephone.

SDC1.4.7 <u>Compilation of **Indicative Operations Schedules**</u>

SDC1.4.7.1 **Indicative Operations Schedules** will be compiled by the **TSO** in conjunction with the **Other TSO** as further provided in this SDC1.4.7 as a statement of which **CDGUs** and/or **Controllable PPM** and/or transfers across any **Interconnector** and/or **Demand Side Units** and/or **Pumped Storage Plant Demand**, **Energy Storage Power Station Demand** and/or **Aggregated Generating Units** and equivalent units in *Northern Ireland* may be required to operate and their expected **MW Output**. The **TSO** in conjunction with the **Other TSO** will periodically update the **Indicative Operations Schedules**.

SDC1.4.7.2 <u>**Merit Order**</u>

Subject as provided below, a **Merit Order** will be compiled by the **TSO** (in conjunction with the **Other TSO**) for each **Imbalance Settlement Period** from the **Price Quantity Pairs**, **Start-Up Cost**, **Shutdown Cost** and **No-Load Cost** (which together shall be known as the "**Price Set**") and, subject as provided in this SDC1, used to determine which of the **CDGUs, Controllable PPMs**, **Pumped Storage Plant Demand**, **Energy Storage Power Station Demand**, **Demand Side Units**, **Aggregated Generating Units** or **Interconnector** power transfer to **Schedule** and **Dispatch** in relation to their **Price Sets** at values that differ from those indicated by **Physical Notifications,** as required to deliver the objectives set out in SDC1.2(a), SDC1.2(b) and SDC1.2(c). The **Merit Order** for increasing **MW Output** above the level indicated in **Physical Notifications** and **Interconnector Schedule Quantities** will be on the basis of ascending prices so that the **CDGU, Controllable PPM**, **Pumped Storage Plant Demand**, **Energy Storage Power Station Demand**, **Demand Side Unit,** or

Aggregated Generating Unit Price Set or bid-offer data from **an External System Operator** at the head of a **Merit Order** will be that which has the lowest price per **MWh**, and that at the foot of a **Merit Order** shall be the one with the highest price per **MWh**. Each **CDGU, Controllable PPM**, **Pumped Storage Plant Demand**, **Energy Storage Power Station Demand, Demand Side Unit**, **Aggregated Generating Units** and**/**or bid-offer data from **an External System Operator** shall appear in the **Merit Order** for each **Price Set** submitted.

The **Merit Order** for dispatching **MW Output** to a level below that indicated in **Physical Notifications** and **Interconnector Schedule Quantities** will be on the basis of descending prices so that the **CDGU, Controllable PPM**, **Pumped Storage Plant Demand**, **Energy Storage Power Station Demand, Demand Side Unit, Aggregated Generating Unit Price Set** or bid-offer data from an **External System Operator** at the head of a **Merit Order** will be that which has the highest price per **MWh**, and that at the foot of a **Merit Order** shall be the one with the lowest price per **MWh**. Each **CDGU, Controllable PPM**, **Pumped Storage Plant Demand**, **Energy Storage Power Demand, Demand Side Unit**, **Aggregated Generating Units** or bid-offer data from an **External System Operator** shall appear in the **Merit Order** for each **Price Set** submitted.

SDC1.4.7.3 In compiling the **Indicative Operations Schedules** in conjunction with the **Other TSO**, the **TSO** will take account of the following factors (and the equivalent factors on the **Other Transmission System** will be so treated separately by the **Other TSO**):

(i) **Physical Notifications, Final Physical Notifications** or **Interconnector Schedule Quantities** (as the case may be) submitted in accordance with SDC1.4.4.6;

(ii) **Transmission System** constraints from time to time, as determined by the **TSO;**

(iii) Reserve constraints from time to time, as determined by the **TSO;**

(iv) the need to provide an **Operating Margin** (by using the various categories of reserve as specified in *OC.4.6 and CC.7.3.1.1* (as the case may be), as determined by the **TSO** acting in conjunction with the **Other TSO**;

(v) **Transmission System** stability considerations;

(vi) the level of **MW Output** and availability covered by **Non Centrally Dispatched Generating Units**, by **Plant** subject to **Priority Dispatch** and by **Controllable PPM**;

(vii) the **Energy Limits** for **Hydro Units**;

(viii) in respect of all **Plant**, the values of their **Technical Parameters** registered under this SDC1 and other information submitted under SDC1.4.4.4;

(ix) **Commercial Offer Data** for each **CDGU** and/or **Controllable PPM** and **Demand Side Unit** and equivalent commercial data provided by an **External System Operator** in respect of **Interconnectors**;

(x) the requirements, as determined by the **TSO**, for **Voltage Control** and **Mvar** reserves;

(xi) **CDGU** and/or **Controllable PPM** stability, as determined by the **TSO**;

(xii) other matters to enable the **TSO** to meet its **Licence Standards** and the **Other TSO** to meet its equivalent;

(xiii) the requirements as determined by the **TSO,** for maintaining **Frequency Control**;

(xiv) **Monitoring** and/or **Testing** and/or **Investigations** to be carried out, or being carried out, under *OC.10* (as the case may be), Testing to be carried out, or being carried out, at the request of a User under *OC.8* and/or **Commissioning Testing** under the CC;

(xv) **System Tests,** ***Operational Tests*** *and* ***Commissioning Tests***;

(xvi) the inability of any **CDGU** and/or **Controllable PPM** to meet its full reserve capability;

(xvii) **Inter-jurisdictional Tie Line** limits;

(xviii) other facts as may be reasonably considered by the **TSO** to be relevant to the **Indicative Operations Schedule**;

(xix) the inflexible characteristics as declared by the **Generator** and abnormal risks;

(xx) losses on the **Transmission System** and on the **Other Transmission System;**

(xxi) requirements within any **Constrained Group**;

(xxii) factors used by the **TSO** (and the **Other TSO**) in order to comply with Statutory Instruments, Statutory Regulations and/or the **Licence** which may impact scheduling and **Dispatch;**

(xxiii) factors used by the **TSO** (and the **Other TSO**) to comply with the objectives in SDC1.2(g);

SDC1.4.7.4 Taking account of and applying the factors referred to in SDC1.4.7.3, **Indicative Operations Schedules** shall be compiled by the **TSO** in conjunction with the **Other TSO** to schedule such **CDGUs, Controllable PPM, Pumped Storage Plant Demand**, **Energy Storage Power Station Demand**, **Demand Side Units**, **Aggregated Generating Units** and/or such **Interconnector** power transfers, and equivalent units or power transfers of equivalent units in *Northern Ireland*, which have been declared **Available** in an **Availability Notice** (and the equivalents on the **Other Transmission System**):

(i) in accordance with the applicable **Merit Order**;

(ii) as will in aggregate (after taking into account electricity delivered other than from **CDGUs**, **Controllable PPMs**, **Aggregated Generating Units**, and/or **Interconnector** power transfers and variation in **Demand** from **Pumped Storage Plant Demand**, **Energy Storage Power Station Demand** and **Demand Side Units**) be sufficient to match at all times (to the extent possible having regard to the **Availability** or **Demand Side Unit MW Availability** of **CDGUs, Controllable PPMs, Pumped Storage Plant Demand**, **Energy Storage Power Station Demand, Demand Side Units**, **Aggregated Generating Units** and **Interconnector** power transfers) the forecast aggregated **Demand** (derived under OC1 of the **Grid Code** and the **Other Grid Code**) together with such margin of reserve as the **TSO** working in conjunction with the **Other TSO** shall consider to be appropriate; and

(iii) as will in aggregate be sufficient to match minimum forecast **Demand** levels together with a sufficient **Minimum Demand Regulation**.

The taking account of and application of the factors in SDC1.4.7.3 will mean that, in general, strict adherence to **Merit Order** may not necessarily be feasible.

SDC1.4.7.5 The **TSO** will periodically rerun the scheduling process and issue revised **Indicative Operations Schedules** to take account of any of the following factors (and the equivalent factors on the **Other Transmission System** which will be so dealt with separately by the **Other TSO**)

a) changes to **Physical Notifications** and **Interconnector Schedule Quantities**;

b) changes to Commercial Offer Data [and bid-offer data from **External Transmission System Operators**];

c) changes to **Availability** or **Demand Side Unit MW Availability** and/or **Technical Parameters** of **CDGUs** and/or **Controllable PPM** and/or **Aggregated Generating Units** and/or **Interconnectors** and/or **Demand Side Units** notified to the **TSO**;

d) changes to **Demand** forecasts on the Island of Ireland;

e) changes to resource forecasts on the Island of Ireland;

f) changes to **Transmission System** constraints, emerging from the necessarily iterative process of **Scheduling** and network security assessment;

g) changes to **CDGU** and/or **Controllable PPM** requirements following notification to the **TSO** of the changes in capability of a **Generator** to provide a **Special Action** as described in SDC2;

h) changes to **CDGU** and/or **Controllable PPM** requirements within **Constrained Groups**, following re-appraisal of **System Demand** forecasts on the Island of Ireland within that **Constrained Group**;

i) changes to **Monitoring** and/or **Testing** and/or **Investigations** to be carried out, or being carried out, under *OC.10* (as the case may be), changes to testing to be carried out, or being carried out, at the request of a **User** under *OC.8* and/or **Commissioning Testing** under CC15

j) changes to any conditions which in the reasonable opinion of the **TSO**, would impose increased risk to the **Transmission System** and would therefore require an increase in the **Operating Margin**;

k) known (or emerging) limitations and/or deficiencies of the **Scheduling** process.

SDC1.4.7.6 When:

a) adverse weather is anticipated;

b) there is a high risk to the whole or part of the **Transmission System** and/or the **Other Transmission System**;

c) **Demand Control** has been instructed by the **TSO**; or

d) a **Total Shutdown** or **Partial Shutdown** exists;

these factors may mean that a **CDGU**, **Controllable PPM, Pumped Storage Plant Demand**, **Energy Storage Power Station Demand, Demand Side Unit**, **Aggregated Generating Unit** and/or **Interconnector** transfers is/are chosen other than in accordance with the profile described in **Physical Notifications** (the **Active Power** profile derived from **Interconnector Schedule Quantities** in respect of **Interconnectors**) and amended in line with **Merit Order** to a greater degree than would be the case when merely taking into account and giving due weight to the factors listed in SDC1.4.7.3 in order to seek to maintain the integrity of the **Transmission System**.

SDC1.4.7.7

a) The **Synchronising** and **De-Synchronising** times (and, in the case of **Pumped Storage Plant Demand** and **Energy Storage Power Station Demand**, the relevant effective time) shown in the **Indicative Operations Schedule** are indicative only and it should be borne in mind by **Users** that the **Dispatch Instructions** could reflect more or different **CDGU**, **Aggregated Generating Unit** and/or **Controllable PPM, Pumped Storage Plant Demand**, **Energy Storage Power Station Demand**

and/or **Aggregate Generating Unit** requirements than in the **Indicative Operations Schedule**. The **TSO** may issue **Dispatch Instructions** in respect of any **CDGU** and/or **Aggregated Generating Unit**, **Controllable PPM, Pumped Storage Plant Demand**, **Energy Storage Power Station Demand** or **Aggregated Generating Unit** which has not declared an **Availability** or **Demand Side Unit MW Availability** of 0 **MW** in an **Availability Notice**. **Users** with **CDGUs** and/or **Aggregated Generating Units**, **Controllable PPM, Pumped Storage Plant Demand** or **Energy Storage Power Station Demand** shall ensure that their units are able to be **Synchronised**, or in the case of **Pumped Storage Plant Demand,** used at the times **Scheduled**, but only if so **Dispatched** by the **TSO** by issue of a **Dispatch Instruction**. **Users** shall, as part of a revision to the **Technical Parameters**, indicate to the **TSO** the latest time at which a **Dispatch Instruction** is required to meet the scheduled **Synchronising** time or in the case of **Pumped Storage Plant Demand** or **Energy Storage Power Station Demand**, the **Scheduled** relevant effective time.

b) The provisions of SDC1.4.7.7(a) shall apply to **Demand Side Units** with the exception that reference to relevant effective time shall be read as a reference to **Demand Side Unit NoticeTime**.

SDC1.4.7.8 <u>Content of **Indicative Operations Schedules**</u>

The information contained in the **Indicative Operations Schedules** will indicate, where appropriate, on an individual **CDGU**, **Controllable PPM, Pumped Storage Plant Demand**, **Energy Storage Power Station Demand**, **Demand Side Unit, Aggregated Generating Units** and/or **Interconnector** basis, the period and **Loading** for which it is **Scheduled**. In the case of a **CDGU** which is capable of firing on two different fuels, it will also indicate the fuel for which it is **Scheduled**. If no fuel is contained in the **Indicative Operations Schedule**, then the most recently specified fuel shall be treated as having been indicated.

SDC1.4.7.9 <u>Issue of **Indicative Operations Schedules**</u>

(a) The initial **Indicative Operations Schedule** for a **Trading Day** will be published for access by **Users** by 1600 hours on the **Trading Day** preceding the relevant **Trading Day.** However, if on any occasion the **TSO** is unable to meet this time, the **TSO** also reserves the right to extend the timescale for the issue of the **Indicative Operations Schedules** to the extent necessary. Following the issue of the initial **Indicative Operations Schedule** preceding the relevant **Trading Day**, the **TSO** will periodically issue revised **Indicative Operations Schedules** to reflect updated information from the scheduling process.

(b) **Indicative Operations Schedules** issued by the **TSO** may comprise several schedules covering short term, medium term or long term timeframes where long term covers the period up to 48 hours immediately following real time.

(c) The **TSO** may issue **Dispatch Instructions** to **Users** in respect of **CDGUs, Controllable PPMs, Pumped Storage Plant Demand**, **Energy Storage Power Station Demand** and**/**or **Demand Side Units** and/or **Aggregated Generating Units** and/or **Interconnector** power transfers before the issue of the initial **Indicative Operations Schedule** for the **Trading Day** to which the **Dispatch** instruction relates if the **Synchronous Start Up Time** for the relevant **CDGUs** and/or **Controllable PPMs, Pumped Storage Plant Demand**, **Energy Storage Power Station Demand** and**/**or **Demand Side Unit** and/or **Aggregated Generating Unit** requires the **Dispatch** instruction to be given at that time. When the length of the time required for **Notice to Synchronise** is within 30 minutes of causing the **CDGU** and/or **Controllable PPMs** and/or **Pumped Storage Plant Demand** and/or **Energy Storage Power Station Demand** to be unable to meet the indicative **Synchronising** time in the **Indicative Operations Schedule** or a subsequent indicative **Synchronising** time and no **Dispatch Instruction** has been received, the **Generator** shall inform the **TSO** without delay.

SDC1.4.7.10 <u>Regulation</u>

It is a requirement for running the **Transmission System** that all **Synchronised CDGUs** and/or **Controllable PPMs** shall at all times be capable of reducing **MW Output** sufficient to allow a sufficient **Regulating Margin** for adequate **Frequency Control**. The **TSO** will monitor the **MW Output** data of the **Indicative Operations Schedule** against forecast of **System Demand** on the Island of Ireland to see whether the level of regulation for any period is sufficient, and may take any shortfall into account in **Scheduling** and **Dispatch**.

SDC1.4.7.11 <u>Data Requirements</u>

SDC1 Appendix A Part 1 sets out the **Technical Parameters** for which values are to be supplied by a **User** in respect of each of its **CDGUs** and/or **Controllable PPMs** and/or **Pumped Storage Plant Demand** and/or **Demand Side Units** and/or **Energy Storage Power Station Demand** and/or **Aggregated Generating Units** by not later than **Gate Closure 1** for the relevant **Trading Day**.

SDC1 Appendix A Part 2 sets out the additional data items required in respect of an **Additional Grid Code Characteristics Notice**.

SDC1 – APPENDIX A

Part 1. Technical Parameters

[Note: The factors applicable to CDGUs below 10 MW apply to the EirGrid Grid Code only.]

Technical Parameter	CDGU				Control PPM	DSU		Agg. Gen	*CDGU <10 MW*	ESPS Demand	Pump Storage Demand
	Thermal	Hydr/ En Ltd	Disp. PPM	Pump S Gen	-	Indiv. Demand Site	Agg. Demand Sites		-	-	-
Block Load Cold	✓	✓	✓	✓	✓				✓		
Block Load Hot	✓								✓		
Block Load Warm	✓								✓		
Charging Capacity			✓ ESPS Gen Only							✓	
Cycle Efficiency			✓ ESPS Gen Only	✓							
Demand Side Unit MW Availability						✓	✓				
Demand Side Unit MW Response Time						✓	✓				
Demand Side Unit Notice Time						✓	✓				
Deload Break Point	✓	✓	✓	✓	✓				✓		
De-Loading Rate 1	✓	✓	✓	✓	✓				✓		
De-Loading Rate 2	✓	✓	✓	✓	✓				✓		
Dwell Time Up 1	✓	✓	✓	✓	✓				✓		
Dwell Time Up 2	✓	✓	✓	✓	✓				✓		
Dwell Time Up 3	✓	✓	✓	✓	✓				✓		
Dwell Time Down 1	✓	✓	✓	✓	✓				✓		

Technical Parameter	CDGU				Control PPM	DSU		Agg. Gen	*CDGU <10 MW*	ESPS Demand	Pump Storage Demand
	Thermal	Hydr/ En Ltd	Disp. PPM	Pump S Gen	-	Indiv. Demand Site	Agg. Demand Sites		-	-	-
Dwell Time Down 2	✓	✓	✓	✓	✓				✓		
Dwell Time Down 3	✓	✓	✓	✓	✓				✓		
Dwell Time Up Trigger Point 1	✓	✓	✓	✓	✓				✓		
Dwell Time Up Trigger Point 2	✓	✓	✓	✓	✓				✓		
Dwell Time Up Trigger Point 3	✓	✓	✓	✓	✓				✓		
Dwell Time Down Trigger Point 1	✓	✓	✓	✓	✓				✓		
Dwell Time Down Trigger Point 2	✓	✓	✓	✓	✓				✓		
Dwell Time Down Trigger Point 3	✓	✓	✓	✓	✓				✓		
End Point of Start Up Period	✓	✓	✓	✓	✓				✓		
Energy Limit		✓									
Forecast Minimum Output Profile				✓ ESPS Gen Only	✓					✓	✓
Forecast Minimum Generation Profile	✓	✓	✓	✓					✓		
Demand Side Unit MW Response Time						✓	✓				
Load Up Break Point Cold (1)	✓	✓	✓	✓	✓				✓		

Technical Parameter	CDGU				Control PPM	DSU		Agg. Gen	*CDGU <10 MW*	ESPS Demand	Pump Storage Demand
	Thermal	Hydr/ En Ltd	Disp. PPM	Pump S Gen	-	Indiv. Demand Site	Agg. Demand Sites		-	-	-
Load Up Break Point Cold (2)	✓	✓	✓	✓	✓				✓		
Load Up Break Point Hot (1)	✓								✓		
Load Up Break Point Hot (2)	✓								✓		
Load Up Break Point Warm (1)	✓								✓		
Load Up Break Point Warm (2)	✓								✓		
Loading Rate Cold (1)	✓	✓	✓	✓	✓				✓		
Loading Rate Cold (2)	✓	✓	✓	✓	✓				✓		
Loading Rate Cold (3)	✓	✓	✓	✓	✓				✓		
Loading Rate Hot (1)	✓								✓		
Loading Rate Hot (2)	✓								✓		
Loading Rate Hot (3)	✓								✓		
Loading Rate Warm (1)	✓								✓		
Loading Rate Warm (2)	✓								✓		
Loading Rate Warm (3)	✓								✓		
Max Ramp Down Rate (shall be a number greater than zero)						✓	✓				
Max Ramp Up Rate (shall be a number greater than zero)						✓	✓				

Technical Parameter	CDGU				Control PPM	DSU		Agg. Gen	*CDGU <10 MW*	ESPS Demand	Pump Storage Demand
	Thermal	Hydr/ En Ltd	Disp. PPM	Pump S Gen	-	Indiv. Demand Site	Agg. Demand Sites		-	-	-
Maximum Charge Capacity			✓ ESPS Gen Only							✓	
Maximum Down Time						✓	✓				
Maximum Generation / Registered Capacity	✓	✓	✓	✓	✓				✓		
Maximum On Time	✓	✓	✓	✓	✓				✓		
Maximum Storage Capacity				✓							
Minimum Charge Capacity			✓ ESPS Gen Only							✓	
Minimum Down Time						✓	✓				
Minimum Generation	✓	✓	✓	✓	✓				✓		
Minimum off time	✓	✓	✓	✓	✓				✓		
Minimum on time	✓	✓	✓	✓	✓				✓		
Minimum Storage Capacity				✓							✓✓
Off to Generating Time				✓							
Off to Spin Pump Time											✓
(Other relevant technical parameters)	✓	✓	✓	✓	✓			✓	✓		
Pumping capacity				✓							✓
Ramp Down Break Point 1	✓	✓	✓	✓	✓			✓	✓		

Technical Parameter	CDGU				Control PPM	DSU		Agg. Gen	*CDGU <10 MW*	ESPS Demand	Pump Storage Demand
	Thermal	Hydr/ En Ltd	Disp. PPM	Pump S Gen	-	Indiv. Demand Site	Agg. Demand Sites		-	-	-
Ramp Down Break Point 2	✓	✓	✓	✓	✓			✓	✓		
Ramp Down Break Point 3	✓	✓	✓	✓	✓			✓	✓		
Ramp Down Break Point 4	✓	✓	✓	✓	✓			✓	✓		
Ramp Down Rate 1	✓	✓	✓	✓	✓			✓	✓		
Ramp Down Rate 2	✓	✓	✓	✓	✓			✓	✓		
Ramp Down Rate 3		✓	✓	✓	✓			✓			
Ramp Down Rate 4	✓	✓	✓	✓	✓			✓	✓		
Ramp Down Rate 5	✓	✓	✓	✓	✓			✓	✓		
Ramp Up Break Point 1	✓	✓	✓	✓	✓			✓	✓		
Ramp Up Break Point 2	✓	✓	✓	✓	✓			✓	✓		
Ramp Up Break Point 3	✓	✓	✓	✓	✓			✓	✓		
Ramp Up Break Point 4	✓	✓	✓	✓	✓			✓	✓		
Ramp Up Rate 1	✓	✓	✓	✓	✓			✓	✓		
Ramp Up Rate 2	✓	✓	✓	✓	✓			✓	✓		
Ramp Up Rate 3	✓	✓	✓	✓	✓			✓	✓		
Ramp Up Rate 4	✓	✓	✓	✓	✓			✓	✓		
Ramp Up Rate 5	✓	✓	✓	✓	✓			✓	✓		
Short Term Maximisation Capability	✓	✓	✓	✓	✓				✓		
Short Term Maximisation Time	✓	✓	✓	✓	✓				✓		

Technical Parameter	CDGU				Control PPM	DSU		Agg. Gen	*CDGU <10 MW*	ESPS Demand	Pump Storage Demand
	Thermal	Hydr/ En Ltd	Disp. PPM	Pump S Gen	-	Indiv. Demand Site	Agg. Demand Sites		-	-	-
Soak Time Cold (1)	✓	✓	✓	✓	✓				✓		
Soak Time Cold (2)	✓	✓	✓	✓	✓				✓		
Soak Time Hot (1)	✓								✓		
Soak Time Hot (2)	✓								✓		
Soak Time Trigger Point Cold (1)	✓	✓	✓	✓	✓				✓		
Soak Time Trigger Point Cold (2)	✓	✓	✓	✓	✓				✓		
Soak Time Trigger Point Hot (1)	✓								✓		
Soak Time Trigger Point Hot (2)	✓								✓		
Soak Time Trigger Point Warm (1)	✓								✓		
Soak Time Trigger Point Warm (2)	✓								✓		
Soak Time Warm (1)	✓								✓		
Soak Time Warm (2)	✓								✓		
Spin Pump to Pumping Energy Time											✓
Synchronous Start-Up Time Cold	✓	✓	✓	✓	✓				✓		
Synchronous Start-Up Time Hot	✓	✓	✓	✓	✓				✓		
Synchronous Start-Up Time Warm	✓								✓		
Target Charge Level			✓ ESPS Gen							✓	

Technical Parameter	CDGU				Control PPM	DSU		Agg. Gen	*CDGU <10 MW*	ESPS Demand	Pump Storage Demand
	Thermal	Hydr/ En Ltd	Disp. PPM	Pump S Gen	-	Indiv. Demand Site	Agg. Demand Sites		-	-	-
Percentage			Only								
Start of Restricted Range 1	✓	✓	✓	✓	✓				✓		
End of Restricted Range 1	✓	✓	✓	✓	✓				✓		
Start of Restricted Range 2	✓	✓	✓	✓	✓				✓		
End of Restricted Range 2	✓	✓	✓	✓	✓				✓		

Part 2. Additional data items required in an Additional Grid Code Characteristics Notice

Table (i)

Variable	***Applies to***
Declared POR	***CDGUs***, *excluding* ***Dispatchable PPMs***
Declared SOR	***CDGUs***, *excluding* ***Dispatchable PPMs***
Declared TOR*1*	***CDGUs***, *excluding* ***Dispatchable PPMs***
Declared TOR*2*	***CDGUs***, *excluding* ***Dispatchable PPMs***
Declared Replacement Reserve	***CDGUs***, *excluding* ***Dispatchable PPMs***
Minimum MW for ***POR***	***CDGUs***, *excluding* ***Dispatchable PPMs***
Minimum MW for ***SOR***	***CDGUs***, *excluding* ***Dispatchable PPMs***
Minimum MW for ***TOR****1*	***CDGUs***, *excluding* ***Dispatchable PPMs***
Minimum MW for ***TOR****2*	***CDGUs***, *excluding* ***Dispatchable PPMs***
Minimum MW for ***Replacement Reserve***	***CDGUs***, *excluding* ***Dispatchable PPMs***
POR Decrement Rate	***CDGUs***, *excluding* ***Dispatchable PPMs***
SOR Decrement Rate	***CDGUs***, *excluding* ***Dispatchable PPMs***
TOR*1* ***Decrement Rate***	***CDGUs***, *excluding* ***Dispatchable PPMs***
TOR*2* ***Decrement Rate***	***CDGUs***, *excluding* ***Dispatchable PPMs***
Replacement Reserve Decrement Rate	***CDGUs***, *excluding* ***Dispatchable PPMs***
Governor Droop	***CDGUs***, *excluding* ***Dispatchable PPMs***

Table (ii)

Black Start Capability *(yes/no)*	***CDGUs***, *excluding* ***Dispatchable PPMs***
Declared Reactive Power *(Consumption)*	***CDGUs***, *excluding* ***Dispatchable PPMs***
Declared Reactive Power *(Production)*	***CDGUs***, *excluding* ***Dispatchable PPMs***
Correction Factor *(****Mvar consumption****)*	***CDGUs***, *excluding* ***Dispatchable PPMs***
Correction Factor *(****Mvar*** *Production)*	***CDGUs***, *excluding* ***Dispatchable PPMs***
Export Adjustment Factor 1	***CDGUs***, *excluding* ***Dispatchable PPMs***
Export Adjustment Factor 2	***CDGUs***, *excluding* ***Dispatchable PPMs***
Unit Loss Factor	***CDGUs***, *excluding* ***Dispatchable PPMs***

SDC1 ANNEX I

Explanatory Note of differences between SDC1 in the SONI Grid Code and EirGrid Grid Code

This annex is an explanatory note only and does not form part of the Grid Code.

1. General Differences in wording

The table below summarises the general differences in wording between the form of SDC1 in the SONI Grid Code and the form of SDC1 in the EirGrid Grid Code, which appear repeatedly throughout SDC1.

Terms used in SONI Grid Code	**Equivalent terms used in EirGrid Grid Code (where different)**	**Reason**
System Support Services	Ancillary Service(s)	The existing arrangements for Ancillary Services and System Support Services are continuing until further notice.
System Support Services Agreement	Ancillary Service(s) Agreement	These agreements will continue to stay in place with their existing names
CCGT Module	CCGT Unit	This is the phrase currently used to describe the individual parts of a Combined Cycle Plant CCGT Module is an important concept in Northern Ireland and is reflected in many other agreements. EirGrid is keeping the phrase CCGT Unit, as it more closely describes the concept of an individual unit and EirGrid has formerly used CCGT Module to describe the whole CCGT Installation.

Prudent Operating Practice	Prudent Utility Practice	Each Code uses a different phrase for this concept.
Planned Outage	Schedule Outage	Each Code uses a different phrase for this concept.
Planned Maintenance Outage	Short Term Scheduled Outage	Each Code uses a different phrase for this concept.

2. Specific differences in wording between equivalent provisions in both Grid Codes

The table below provides a list of the other specific differences in wording between equivalent provisions of SDC1 in both Grid Codes.

Provision	**SONI Grid Code**	**EirGrid Grid Code**	**Reason**
SDC1.4.4.2(b)	Reference is made to "PCA2.3.4"	Reference is made to "PC.A4.3 of the Planning Code Appendix"	These are the respective requirements for the provision of the CCGT Installation data.
SDC1.4.3.6(b)	Reference is made to "OC11"	Reference is made to "OC.10"	These are the respective requirements for Testing Monitoring and Investigation
SDC1.4.3.6(d)	Reference is made to a User acting in accordance with its obligations under "SDC1.4.3 and Appendix B to this SDC1"	Reference is made to a User acting in accordance with its obligations under "SDC1.4.3" only	SONI has separate requirements for Availability and Technical Parameter related issues in respect

			of PPA Generation.
SDC1.4.3.7		The EirGrid Grid Code contains the following additional words at the end of the paragraph: *“or any other values that the **TSO** may reasonably deem appropriate”*	Difference is due to different requirements in both jurisdictions.
SDC1.4.7.1	Reference is made to “the Republic of Ireland”.	Reference is made to “Northern Ireland”.	Reference is being made in each Grid Code to the other jurisdiction.
SDC1.4.7.3(iv)	Reference is made to “OC.3”	Reference is made to “OC.4.6 and CC.7.3.1.1”	These are the respective references to Operating Margin.
SDC1.4.7.3(xiv)	Reference is made to “OC.11” and then to “OC11.8”	Reference is made to “OC.10” and then to “OC.8”	These are the respective references to Testing Monitoring and Investigation and Operational Testing.
SDC1.4.7.3(xiv)	Reference is made to “Commissioning/Acceptance Testing”	Reference is made to “Commissioning/Testing”	These are the respective terms used in each Grid

			Code
SDC1.4.7.3(xv)	Reference is made to "System Tests" only	Reference is made to "System Tests, Operational Tests and Commissioning Tests"	The EirGrid Grid Code definition of System Tests excludes Operational and Commissioning Tests whereas the SONI definition includes them.
SDC1.4.7.4	Reference is made to "the Republic of Ireland".	Reference is made to "Northern Ireland".	Reference is being made in each Grid Code to the other jurisdiction.
SDC1 Appendix A Part 2	Part 2 refers to factors applicable to the SONI Grid Code only	Part 2 refers to factors applicable to the EirGrid Grid Code only	The two System Operators require some data items specific to that system and they are detailed here.

3. Provisions applicable to one Grid Code only

The table below provides a list of the provisions of SDC1 which exist in one Grid Code only.

Provisions used in SONI Grid Code only	**Reason**
SDC1.1.4	SONI has extra requirements due to the presence of PPA Generation in Northern Ireland.
SDC1.4.3: Introductory sentence	
SDC1.4.4: Introductory sentence	
SDC1.4.8.3(xxiv)	
SDC1 Appendix B	

SDC1.4.2.2(f)	The CCGT Matrix can be amended in the SONI Grid Code as per a specific requirement in the Planning Code Appendix, whereas the EirGrid Code can be amended as per any Planning Code data.
SDC1.4.4.2(i)	This provision is necessary to deal with conversion factors applicable to PPA Generators in Northern Ireland.
SDC1.4.4.3	There are differences in how Reserve capabilities are notified to both SONI and EirGrid.

Provisions used in EirGrid Grid Code only	
SDC1.4.4.2(h)	There are differences in how Operating Reserve capabilities are notified to both SONI and EirGrid.
SDC1.4.4.2(c)	The SONI Grid Code addresses the issue of conversion factors in a different way by cross-referring to the Planning Code.

SDC2 Scheduling and Dispatch Code No.2

Control Scheduling and Dispatch

SDC2.1 Introduction

SDC2.1.1 <u>**SEM** Provisions</u>

(a) This Scheduling and Dispatch Code No. 2 ("SDC2") forms part of the **Sections under Common Governance** of the **Grid Code**. The **Sections under Common Governance** are those parts of the **Grid Code** which are under common governance in both the **Grid Code** and the **Other Grid Code**.

(b) The form of this SDC2 is similar to the SDC2 in the **Other Grid Code.** Differences relate to references to relevant power systems and related terms. Where there is a difference between a provision in this **Grid Code** and an equivalent provision in the **Other Grid Code**, the wording in question is shaded in grey. In addition, those parts of this SDC2 that are not part of the **Other Grid Code** are shaded in grey in this SDC2. Differences between the form of this SDC2 and the SDC2 in the **Other Grid Code** are summarised in Annex 1 to this SDC2.

(c) This SDC2 is intended to work in conjunction with other documents, including the **Trading and Settlement Code ("TSC")**. The provisions of the **Grid Code** and the **Other Grid Code** will take precedence over the **TSC**.

(d) Where stated in this SDC2, the obligation to submit data in relation to some of the information required to be provided to the **TSO** by this SDC2 may be fulfilled by **Users** where such information submitted under the **TSC** by a **User** or by an **Intermediary** on behalf of **Users** is then provided to the **TSO** by the **Market Operator** in accordance with the **TSC**, as further provided in this SDC2. The **TSO** may require **Users** to verify or update data received by it via the **Market Operator**.

(e) **Dispatch Instructions** issued pursuant to this SDC2 may be utilised for settlement in respect of **SEM** generator units which have been registered in accordance with the **TSC**.

(f) Further provisions dealing with the **Sections under Common Governance** are contained in the **General Conditions**.

SDC2.1.2 SDC2 sets out the procedure for the **TSO** to issue **Dispatch Instructions** to:

(a) **Generators** in respect of their **CDGUs** (which for the avoidance of doubt comprise, **Generating Units** subject to **Central Dispatch**, **CCGT Installations**, **Hydro Units**, **Pumped Storage Generation** and **Dispatchable PPMs**);

(b) **Pumped Storage Generators** in respect of their **Pumped Storage Plant Demand**;

(c) **Energy Storage Generators** in respect of their **Energy Storage Power Station Demand**;

(d) **Interconnector Owners** in respect of their **Interconnectors**;

(e) **Demand Side Unit Operators** in respect of their **Demand Side Units**; and

(f) **Generator Aggregators** in respect of their **Aggregated Generating Units**.

Controllable PPMs are not currently subject to **Dispatch Instructions.** However, remote signals sent by the **TSO** to **Controllable PPMs** in order to limit **Active Power Output** may be utilised by the **MO** as **Dispatch Instructions** in accordance with the **TSC**.

SDC2.2 Objective

The procedure for the issue of **Dispatch Instructions** by the **TSO**, is intended to enable (as far as possible) the **TSO** to match continuously **CDGU**, **Demand Side Unit**, **Aggregated Generating Units** output (or reduction as the case may be) and/or

Interconnector transfers to **Demand**, and thereby in conjunction with the **Other TSO**, the demand on the Island of Ireland, by utilising the **Physical Notifications** and **Merit Order** derived pursuant to SDC1 and the factors to be taken into account listed there and by taking into account any **NCDGU MW Output** in both cases together with an appropriate margin of reserve, whilst maintaining (so far as possible) the integrity of the **Transmission System** together with the security and quality of supply (with the **Other TSO** having a similar objective with regard to its **Transmission System**).

SDC2.3 Scope

SDC2 applies to the **TSO**, and:

(a) **Generators** with regard to their **CDGUs**;

(b) **Pumped Storage Generators** with regard to their **Pumped Storage Plant Demand**;

(c) **Energy Storage Generators** with regard to their **Energy Storage Power Station Demand;**

(d) **Interconnector Owners** with regard to their **Interconnectors**;

(e) **Demand Side Unit Operators** in relation to their **Demand Side Units**; and

(f) **Generator Aggregators** in respect of their **Aggregated Generating Units**.

Each of which (other than the **TSO**) is a "**User**" under this SDC2.

SDC2.4 Procedure

SDC2.4.1 Information Used

SDC2.4.1.1 The information which the **TSO** shall use in assessing which **CDGU**, **Demand Side Unit**, **Interconnector** transfers, **Pumped Storage Plant Demand** and/or **Energy Storage Power Station Demand** and/or **Aggregated Generating Units** to **Dispatch**, will be:

(a) **Final Physical Notifications** (or **Physical Notifications** in circumstances where **Dispatch Instructions** must be issued before **Gate Closure 2**) and **Interconnector Schedule Quantities**;

(b) the **Availability Notices**;

(c) the **Merit Order** as derived under SDC1;

(d) the other factors to be taken into account under SDC1 and which were used by the **TSO** to compile the **Indicative Operations Schedule**; and

(e) the

(i) **Technical Parameters**;

(ii) **Additional Grid Code Characteristics Notices**;

(iii) **Reserve Characteristics**; and

(iv) **Other Relevant Data**,

in respect of that **CDGU**, **Demand Side Unit**, **Interconnector** transfers**,** **Pumped Storage Plant Demand** and/or **Energy Storage Power Station Demand** and/or **Aggregated Generating Units** subject to any subsequent revisions to the data under SDC1 and SDC2.

SDC2.4.1.2 Additional factors which the **TSO** will also take into account are:

(a) those **Generators** or **Demand Side Unit Operators** who have not complied with **Dispatch Instructions** or **Special Actions**;

(b) real time variation requests; and

(c) the need to **Dispatch CDGUs**, **Aggregated Generating Units, Demand Side Units**, **Interconnector** transfers, **Pumped Storage Plant Demand** and **Energy Storage Power Station Demand** for **Monitoring, Testing** or **Investigation** purposes (and/or for other trading purposes whether at the request of a **User**, for **Commissioning** or **Acceptance**, **System Tests** or otherwise)

SDC2.4.1.3 In the event of two or more **CDGUs**, **Demand Side Units**, **Pumped Storage Plant Demand, Energy Storage Power Station Demand** and/or **Aggregated Generating Units** having the same **Price Set** and the **TSO** not being able to differentiate on the basis of the factors identified in SDC1.4.7.2, SDC1.4.7.3 and SDC1.4.7.4, then the **TSO** will select first for **Dispatch** the one which in the **TSO**'s reasonable judgement is most appropriate in all the circumstances.

SDC2.4.1.4 Following **Gate Closure 2**, **Users** may no longer submit or amend **Physical Notifications**, **Interconnector Schedule Quantities** or **Commercial Offer Data** in respect of **Imbalance Settlement Periods** for which the **Gate Closure 2** has occurred (subject to SDC1.4.4.6(d)). Notwithstanding SDC1.4.7, the **TSO** will continue to rerun the scheduling process and issue **Indicative Operations Schedules**.

SDC2.4.2 **Dispatch Instructions**

SDC2.4.2.1 Introduction

As far as is reasonably practicable, **Dispatch Instructions** will normally be issued at any time following **Gate Closure 2** in respect of the relevant **Imbalance Settlement Periods**. The **TSO** may, however, at its discretion, issue **Dispatch Instructions** in relation to a **CDGU**, **Demand Side Unit**, **Interconnector** transfers, **Pumped Storage Plant Demand** and/or **Energy Storage Power Station Demand** and/or **Aggregated Generating Units** prior to **Gate Closure 2.**

SDC2.4.2.2 Issue of **Dispatch Instructions**

The **TSO** will issue **Dispatch Instructions** direct to:

(a) the **Generator** for the **Dispatch** of each of its **CDGUs**.

(b) the **Generator Aggregator** for the **Dispatch** of its **Aggregated Generating Units**.

(c) the **Energy Storage Generator** for the **Dispatch** of its **Energy Storage Power Station Demand**.

(d) the **Demand Side Unit Operator** and the **Pumped Storage Demand User** in respect of each of their **Demand Side Units** and **Pumped Storage Plant Demand** respectively.

(e) the **Interconnector Owner** for the **Dispatch** of the **Interconnector** transfers.

(f) The **TSO** may issue **Dispatch Instructions** for any **CDGU**, **Demand Side Unit**, **Interconnector** transfers, **Pumped Storage Plant Demand** and/or **Energy**

Storage Power Station Demand and/or **Aggregated Generating Units** which has been declared **Available** in an **Availability Notice** even if that **CDGU**, **Demand Side Unit**, **Interconnector** transfers, **Pumped Storage Plant Demand** and/or **Energy Storage Power Station Demand** and/or **Aggregated Generating Units** was not included in an **Indicative Operations Schedule**.

SDC2.4.2.3 Scope of **Dispatch Instructions**

*In addition to instructions relating to the **Dispatch** of **Active Power, Dispatch Instructions** (unless otherwise specified by the **TSO** at the time of giving the **Dispatch Instructions**) shall be deemed to include an automatic instruction of **Operating Reserve,** the level of which is to be provided in accordance with the **Declared Operating Reserve Availability** under SDC1 and the **Ancillary Service Agreement.***

SDC2.4.2.4 In addition to instructions relating to the **Dispatch** of **Active Power**, **Dispatch Instructions** in relation to **CDGUs** and, **Demand Side Units** and/or **Pumped Storage Plant Demand** and/or **Energy Storage Power Station Demand** may include:

(a) a **Dispatch Instruction** to provide an ***Ancillary Service***;

(b)

(i) **Mvars**: the individual **Reactive Power** output from **CDGUs** at the **Generator Terminals** or ***Voltage*** levels (at instructed **MW** level) at the **Connection Point** which will be maintained by the **CDGU**.

(ii) The issue of **Dispatch Instructions** for **Active Power** will be as at the **Connection Point** and will be made with due regard to any resulting change in **Reactive Power** capability and may include instruction for reduction in **Active Power** generation to increase **Reactive Power** capability.

(iii) In the event of a sudden change in **System** voltage a **Generator** must not take any action in respect of any of its **CDGUs** to override automatic **Mvar** response unless instructed otherwise by the **TSO** or unless immediate action is necessary to comply with stability limits. A

Generator may take such action as is in its reasonable opinion necessary to avoid an imminent risk of injury to persons or material damage to property (including the **CDGU**).

(iv) *Further provisions in relation to **Dispatch Instructions** regarding **Generator Reactive Power Dispatch** are set out in Appendix B to this SDC2.*

(c) Fuels: **Fuels** to be used by the **Generator** in operating the **CDGU**. The **Generator** shall only be permitted to change **Fuels** with the **TSO's** prior consent.

(d) **Special Protection Scheme**: an instruction to switch into or out of service an **Special Protection Scheme** or other **Intertripping Scheme**;

(e) Time to **Synchronise**/react: a time to **Synchronise** or **De-Synchronise CDGUs** and, where appropriate **Demand Side Units** and/or **Energy Storage Power Stations** in relation to **Energy Storage Power Station Demand** and/or **Pumped Storage Plants** in relation to **Pumped Storage Plant Demand** and time to react for **Demand Side Units**;

(f) **Synchronous Compensation**: an instruction, (where contracted, where that is necessary), for a **CDGU** to operate in **Synchronous Compensation** mode;

(g) **Testing** etc: an instruction in relation to the carrying out of **Testing, Monitoring** or **Investigations** as required under *OC.10*, or testing at the request of a **User** under *OC.8.5*, or **Commissioning Testing** under the CC;

[Note: Please note that the SONI Grid Code will referring to "OC11" and "OC11.8", whereas the EirGrid Grid Code will be referring to "OC.10" and "OC.8.5".]

(h) <u>**System Tests**</u>: an instruction in relation to the carrying out of a **System Test** as required under *OC.8.4*;

(i) <u>**Maximisation**</u>: in the case of a **CDGU** which is subject to an agreement with the **TSO** for the provision of **Maximisation** an instruction requiring it to generate at a level in excess of its **Availability** but not exceeding its **Short Term Maximisation Capability** which may only be given if, at the time of issue of the instruction, the **CDGU** is **Dispatched** to a **MW Output** equal to its **Availability** and provided that the limit on the number of hours for which such instructions may be given in any year, as set out in any arrangement relating to the relevant agreement is not thereby exceeded. Such an instruction shall be identified as a "**Maximisation Instruction**". When the **TSO** gives a **Dispatch Instruction** which is in excess of the **Availability** of the **CDGU** which is not designated a "**Maximisation Instruction**", the **Generator** must inform the **TSO** immediately that the **Dispatch Instruction** is so in excess in order that the **TSO** can so designate the **Dispatch Instruction** as a **Maximisation Instruction** or withdraw the instruction. The **Generator** shall not then be obliged to comply with the **Dispatch Instruction** unless and until the **TSO** notifies it that the instruction is designated a "**Maximisation Instruction**";

(j) <u>**Cycle Operating Mode**</u>: in the case of a **CCGT Installation**, an instruction specifying the **Cycle Operating Mode** and/or an instruction to **Dispatch** a **CCGT Installation** in **Open Cycle Mode**. The **Generator** must then ensure that the **CCGT Installation** achieves the new **Dispatched Operating Mode**, without undue delay, in accordance with the **CCGT Installation's** declared **Availability** and declared **Technical Parameters. Dispatch Instructions** in relation to **Cycle Operating Modes** issued by the **TSO** shall reflect the applicable **Availability Notice** and **Technical Parameters**;

(k) **<u>Pumped Storage</u>**: mode changes for **Pumped Storage Plants**, where contracted, in relation to **Pumped Storage Plant Demand**;

(l) **<u>Energy Storage Power Station</u>:** mode changes for **ESPS**, where contracted, in relation to **Energy Storage Power Station Demand**;

(m) **<u>Dispatch Instruction Test Flags</u>**: **Dispatch Instruction Test Flags** shall be applied to **Dispatch Instructions** in respect of new or amended test proposals submitted by a **Generator** after **Gate Closure 2** has already occurred for the relevant **Imbalance Settlement Periods** (since **Final Physical Notifications** cannot be amended) and the **Generator** could not have reasonably foreseen the need for the new or amended test request before **Gate Closure 2** for the relevant **Imbalance Settlement Period**. The **Dispatch Instruction Test Flag** shall be applied to the portion of the **Dispatch Instruction** which diverges from **Physical Notifications** submitted by a **Generator** in respect of a test proposal which has been approved by the **TSO**. The part of a **Dispatch Instruction** subject to the flag will not be deemed to be a **Dispatch Instruction** for settlement purposes;

(n) <u>Gas supply emergency</u>: instructions relating to gas supply emergencies, where the ordinary **Dispatch** process may not be followed;

SDC2.4.2.5 <u>Form of Instruction</u>

(a) Instructions may normally be given via **Electronic Interface** but can be given by telephone, by facsimile transmission. In the case of a **Special Protection Scheme**, a **Low Frequency Relay** *or any other automatic **Primary Frequency Control** scheme (excluding governor response)* initiated response from a **CDGU**, **Demand Side Unit**, and/or **Pumped Storage Plant** in relation to **Pumped Storage Plant Demand** and/or **Energy Storage Power Station** in relation to **Energy Storage Power Station Demand**, the instruction will be given for the effective time which is consistent with the time at which the **Low Frequency Relay** operation occurred. This **Dispatch Instruction** will be issued retrospectively.

(b) The reduction by a **Generator** of the **MW Output** of one of its **CDGUs** under *OC.4.3* shall be deemed to have followed a **Dispatch Instruction** issued by the **TSO**.

(c)

(i) In the event of a temporary loss of the ***NI Control Centre/National Control Centre*** as described under *OC.9*, each **Generator** shall, subject to the provisions of SDC2.4.2.5(c)(ii), continue to operate its **CDGUs** in accordance with the last **Dispatch Instructions** to have been issued by the **TSO** but shall use all reasonable endeavours to maintain **System Frequency** at the indicated **Target Frequency** *plus or minus 0.05Hz* by monitoring **Frequency** and increasing/decreasing the **MW Output** of its **CDGUs** as necessary until such time as new **Dispatch Instructions** are received from the **TSO**.

(ii) When operating its **CDGUs** in the circumstances described under SDC2.4.2.5(c)(i), a **Generator** shall never be required to **Dispatch** these units in a manner in which the **TSO** would not be entitled to require such units to be **Dispatched** by means of a **Dispatch Instruction** issued in accordance with this SDC2.

(d) The **De-Synchronisation** of a **CDGU** following the operation of a **Special Protection Scheme** selected by the **TSO** shall be deemed to have happened as a result of a **Dispatch Instruction** issued by the **TSO**.

SDC2.4.2.6 **Target Frequency**

(a) **Dispatch Instructions** to **Generators** will generally indicate the target **MW** (at **Target Frequency**) to be provided at the **Connection Point** to be achieved in accordance with the respective **CDGU's Technical Parameters** and/or parameters as provided in the **Additional Grid Code Characteristics**

Notices provided under SDC1 or this SDC2, or such rate within those parameters as is specified by the **TSO** in the **Dispatch Instructions**.

(b) **Dispatch Instructions** deemed to be given upon the operation of an agreed **Low Frequency Relay** will be deemed to indicate the target **MW** (at **Target Frequency**), which may either be at maximum **MW Output** or at some lower **MW Output** (as previously specified by the **TSO**), to be provided at the **Connection Point** which reflects and is in accordance with the **CDGU's Technical Parameters** and/or parameters as provided in the **Additional Grid Code Characteristics Notice** data given under (or as revised in accordance with) SDC1 or this SDC2.

SDC2.4.2.7 To aid clarity, the form of and terms to be used by the **TSO** in issuing instructions together with their meanings are set out in the Appendices to this SDC2.

SDC2.4.2.8

(a) Subject only to SDC2.4.2.9 and as provided below in this SDC2.4.2.8**,** **Dispatch Instructions** will not be inconsistent with the **Availability** and/or **Technical Parameters** and/or **Additional Grid Code Characteristics Notice** data and **Other Relevant Data** notified to the **TSO** under SDC1 (and any revisions under SDC1 or this SDC2 to that data).

(b) A new **Dispatch Instruction** may be subsequently given (including an instruction for a **Cancelled Start**) at any time.

(c) **Dispatch Instructions** may however be inconsistent with the **Availability** and/or **Technical Parameters** and/or **Additional Grid Code Characteristics Notice** data and/or **Other Relevant Data** so notified to the **TSO** for the purposes of carrying out a test at the request of the relevant **Generator** under *OC.8.5* or a **System Test** at the request of the relevant **Generator** under *OC.8.6*, to the extent that such **Dispatch Instructions** are consistent with the procedure agreed (or otherwise determined) for conducting the test or **System Test** (as the case may be).

(d) For the avoidance of doubt, any **Dispatch Instructions** issued by the **TSO** for the purposes of carrying out a test at the request of the relevant **Generator** under *OC.8.5* or a **System Test** at the request of the relevant **Generator** under *OC.8.6* shall not be deemed to be **Dispatch Instructions** given pursuant to SDC2.4.2.9.

SDC2.4.2.9

(a) To preserve **System** integrity under emergency circumstances where, for example, **Licence Standards** cannot be met the **TSO** may, however, issue **Dispatch Instructions** to change **CDGU**, **Aggregated Generating Units**, **Demand Side Unit, Interconnector** transfers and/or **Pumped Storage Plant Demand MW Output** and/or **Energy Storage Power Station Demand MW Output** or **Demand Side Unit MW Response** even when this is outside parameters so registered or so amended. This may, for example, be an instruction to trip or partially load a **CDGU**. The instruction will be stated by the **TSO** to be one in relation to emergency circumstances under SDC2.4.2.9.

(b) A **User** may refuse to comply or continue to comply with instructions referred to in this SDC2.4.2.9 but only in order to avoid, in the **Generator's** reasonable opinion, an imminent risk of injury to persons or material damage to property (including in the case of a **Generator**, the **CDGU**).

SDC2.4.2.10 Communication with **Users**

(a) **Dispatch Instructions** whether given via **Electronic Interface**, by telephone, by facsimile transmission must be formally acknowledged immediately by the **User** at the **Control Facility** by **Electronic Interface** or, with the **TSO's** prior consent, by telephone, by return facsimile transmission, in the manner agreed between the **User** and the **TSO** or a reason must be given as soon as possible for non-acceptance, which may (subject to SDC2.4.2.9) only be to avoid, in the **User's** reasonable opinion, an imminent risk of injury to persons or material damage to property (including the **CDGU**) or because they are not in accordance with the applicable **Availability Notice,** or **Technical Parameters**, or **Additional Grid Code Characteristics Notices** or do not reflect **Other Relevant Data** submitted by the **User** pursuant to SDC1.

(b) In the event that in carrying out the **Dispatch Instructions**, an unforeseen problem arises, giving rise, in the **User's** reasonable opinion, to an imminent risk of injury to persons or material damage to property (including the **CDGU**) the **TSO** must be notified as soon as possible by telephone.

(c) When issuing **Notice to Synchronise** to **Generators** in respect of their **Generating Units**, the **TSO** shall recongise the applicable heat state of each relevant **Generating Unit** at the proposed **Synchronisation** effective time and facilitate the synchronous start up time applicable to that heat state as indicated by the **Generator** in the **Technical Parameters** supplied for the **Generating Unit**.

SDC2.4.2.11 Action Required from **Users**

(a) Each **User** will comply in accordance with SDC2.4.2.12 with all **Dispatch Instructions** given by the **TSO** unless the **User** has given notice to the **TSO** under the provisions of SDC2.4.2.10 regarding non-acceptance of **Dispatch Instructions**.

(b) When complying with **Dispatch Instructions** for a **CCGT Installation** a **Generator** will operate its ***CCGT Units*** in accordance with the applicable **CCGT Installation Matrix**.

(c) Where the **TSO** issues a **Synchronising** time to a **Generator** for a specific **CDGU** and the **Generator** identifies that such **CDGU** will not be **Synchronised** within *-15/+15* minutes of the instructed time, the **Generator** must immediately (at the time the discrepancy is identified) inform the **TSO** of the situation and estimate the new **Synchronising** time.

(d) *If the **CDGU** has not synchronised within 15 minutes of the **Synchronising** time in the original **Notice to Synchronise** the **TSO** will issue a **Failure to Follow Notice to Synchronise Instruction** and the **Generator** shall re-declare, by **Electronic Interface** or by other form as the **TSO** may reasonably notify to* *each **User** from time to time, its **Availability** to 0 MW for the **CDGU** effective at the **Synchronising** time in the original **Notice to Synchronise.***

SDC2.4.2.12 Implementation of Instructions by **Users**

When a **User** has received a **Dispatch Instruction** given by the **TSO**, it will react by responding to that **Dispatch Instruction** given by the **TSO** without undue delay, and, in any event, within one minute in accordance with the instruction *or in the case of **Dispatch Instructions** for **Mvars** within two minutes of the instruction*, including those **Dispatch Instructions** issued pursuant to SDC2.4.2.9. Instructions indicating a target **MW Output** at the **Target Frequency** will be complied with by **Users** notwithstanding any tolerance bands set out in any **Testing** requirement or elsewhere in the **Grid Code**.

For the avoidance of doubt, **Demand Side User operators** and **Generator Aggregators** shall comply with SDC2.4.2.12, as detailed above.

When a **User** has received a **Dispatch Instruction** given by the **TSO**, it will react by responding to that **Dispatch Instruction** given by the **TSO** within 10 seconds. This set point must be reached in a time no greater than 10 seconds plus the ramp rate for the **Generation Unit** or **Interconnector**, including those **Dispatch Instructions** issued pursuant to SDC2.4.2.9.

A tolerance will apply to the **Dispatch Instruction**. This will be the greater of 1 MW or 1% of the dispatched quantity. Instructions indicating a target **MW Output** at the **Target Frequency** will be complied with by **Users** notwithstanding any tolerance bands set out in any **Testing** requirement or elsewhere in the **Grid Code**.

Manual local measures shall be allowed in cases where the automatic remote control devices are out of service. The **Active Power** set point must be reached within 1 hour.

When a **User** has received a ***Dispatch Instructions** for **Mvars*** it will respond to that **Dispatch Instruction** given by the **TSO** *within two minutes of the instruction*.

SDC2.4.2.13

(a) Subject to the exception set out below in this SDC2.4.2.13, **Generators** will only **Synchronise** or **de-Synchronise CDGUs** when they have received these **Dispatch Instructions** from the **TSO** or unless it occurs automatically as a result of **Special Protection Schemes** or **Low Frequency Relay** operations. Subject to the exception set out below in this SDC2.4.2.13, **Demand Side Unit Operators** will only reduce or increase their **Demand Side Unit MW Response** to the **Dispatch Instructions** of the **TSO** or unless it occurs automatically as a result of **Special Protection Schemes** or **Low Frequency Relay** operations.

(b) **De-Synchronisation** may otherwise only take place without the **TSO's** prior agreement if it is to avoid, in the **Generator's** reasonable opinion, an imminent risk of injury to persons or material damage to property (including the **CDGU**). **Demand Side Units**, who cannot maintain the provision of any **Demand Side Unit MW Response,** may otherwise only take place without the **TSO's** prior agreement if it is to avoid, in the **Demand Side Unit Operator's** reasonable opinion, an imminent risk of injury to persons or material damage to property (including the **Demand Side Unit**).

(c) If one of these exceptions occur, then the **TSO** must be informed that it has taken place as soon as possible.

SDC2.4.2.14 The **TSO** may suspend the issue of **Dispatch Instructions** to **User's Plant** in accordance with the **Merit Order** (having taken account of and applied the factors referred to in SDC1.4.7.3) to the extent that the conditions in SDC1.4.7.6 or SDC2.4.2.4(n) arise. When necessary the **TSO** will issue **Dispatch Instructions** for a **Black Start**.

SDC2.4.2.15 **User Plant** Changes

Each **User** at its **Control Facility** will, without delay, notify the **TSO** by **Electronic Interface**, telephone or by facsimile transmission of any change or loss (temporary or otherwise) to the operational capability of its **Plant** including any changes to the **Technical Parameters** and/or **Additional Grid Code Characteristics Notice** data of each of the **User's Plant** (in the case of **Technical Parameters**, by the submission of a **Technical Parameters Revision Notice**) indicating (where possible) the magnitude and the duration of the change. In the case of **CDGUs** already **Synchronised** to the **System**, each **Generator**, in respect of its **Generating Units**, must also state whether or not the loss was instantaneous.

SDC2.4.2.16 Each **Generator**, in respect of its **Generating Units**, will operate its **Synchronised CDGUs** with **AVRs** and **Var** limiters in service at all times (where required pursuant to *CC.7.3 and SDC2.B.7*) unless released from this obligation in respect of a particular **CDGU** by the **TSO**.

SDC2.4.2.17 Each **Generator**, in respect of its **Generating Units**, shall request the **TSO's** agreement for one of its **CDGUs** at that **Generating Plant** to be operated without the **AVR** or **Var** limiter in service. The agreement of the **TSO** will be dependent on the risk that would be imposed on the **System**. However, a **Generator** may, in any event, take such action in relation to that **CDGU** as is reasonably necessary to avoid, in the **Generator's** reasonable opinion, an imminent risk of injury to persons or material damage to property (including the **CDGU**).

SDC2.4.2.18 **Minimum Demand Regulation ("MDR")**

Synchronised CDGUs must at all times be capable of reducing **MW Output** sufficient to allow a sufficient **Regulating Margin** for adequate **Frequency Control**. The **TSO** will monitor the **MW Output** data of the **Indicative Operations Schedule** against the forecast **Demand** to see whether the level of **MDR** for any period is insufficient, and may take any shortfall into account in **Dispatch**.

SDC2.4.3 **Special Actions**

The **TSO** may also issue **Dispatch Instructions** for **Special Actions** (either pre- or post-fault) to a **User** in respect of any of its **Plant** in the event that the **TSO** in its reasonable opinion believes that such instructions are necessary in order to ensure that the **Licence Standards** are met. **Special Actions** will generally involve a **Load** change, a **Load** reduction change or a change in required **Notice to Synchronise** (or, in the case of a **Demand Side Unit** or **Pumped Storage Plant Demand** or **Energy Storage Power Station Demand**, a change in the relevant effective time) in a specific timescale on individual or groups of **CDGUs**. They may also include selection of **Special Protection Scheme** for stability or thermal reasons. Instructions for **Special Actions** will always be within **Technical Parameters**.

SDC2 - APPENDIX A

Dispatch Instructions for CDGUs and Demand Side Unit

SDC2.A.1 General

This Appendix A to SDC2 provides further information on the form of a **Dispatch Instruction** as well as an example of a **Dispatch Instruction** for **CDGUs** and **Demand Side Units**.

SDC2.A.2 Form of **Dispatch Instruction**

SDC2.A.2.1 All **Loading/De-Loading Rates** will be assumed to be in accordance with **Technical Parameters** and **Additional Grid Code Characteristics Notice** data. Each **Dispatch Instruction** will, wherever possible, be kept simple, drawing as necessary from the following forms and SDC2.4.2**.**

SDC2.A.2.2 The **Dispatch Instruction** given by **Electronic Interface**, telephone, or facsimile transmission will normally follow the form:

(a) where appropriate, the specific **CDGU** or **User's Plant** to which the instruction applies;

(b)

(i) the **MW Output** (or **Demand Side Unit MW Response**) to which it is instructed; or

(ii) the **MW Output** (or **Demand Side Unit MW Response**) to which it is instructed until, a specified time, in which case the instructed **MW Output** shall be followed until a further **Dispatch Instruction** is issued;

(c) if the start time is different from the time the instruction is issued, the start time will be included;

(d) where specific **Loading/De-Loading Rates** are concerned, a specific target time;

(e) the issue time of the instruction;

(f) the fuel;

(g) in the case of **CDGUs** , if the instruction is designated as a "**Maximisation Instruction**", this will be stated; and

(h) in the case of a **CCGT Installation**, the **Operating Mode** to which it is instructed.

SDC2.A.2.3 Where the **MW Output** (or **Demand Side Unit MW Response**) is instructed until a specified time, that time shall normally be within the **Trading Days** for which **Gate Closure 1** has passed. The **TSO** may, however, at its discretion, specify a time beyond the end of the **Trading Days** for which **Gate Closure 1** has passed.

SDC2.A.3 **Dispatching** a **Synchronised CDGU** to increase or decrease **MW Output**

SDC2.A.3.1 If the time of the **Dispatch Instruction** is 1400 hours, the Unit is Unit 1 and the **MW Output** to be achieved is 205 **MW**, the relevant part of the instruction would be, for example:

"Time 1400 hours. Unit 1 to 205 **MW** until further notice"
Or,
“Time 1400 hours. Unit 1 to 205 **MW** effective until 1500 hours”

SDC2.A.3.2 If the start time is 1415 hours, it would be, for example:

"Time 1400 hours. Unit 1 to 205 **MW** until further notice, start at 1415 hours"
Or
“Time 1400 hours. Unit 1 to 205 **MW** effective until 1500 hours, start at 1415 hours”

SDC2.A.3.3 **Loading** and **De-Loading Rates** are assumed to be in accordance with **Technical Parameters** and **Additional Grid Code Characteristics Notice** data unless otherwise stated. If different **Loading** or **De-Loading Rates** are required, the time to be achieved will be stated, for example:

"Time 1400 hours. Unit 1 to 205 **MW** by 1420 hours until further notice"
Or
“Time 1400 hours. Unit 1 to 205 **MW** by 1420 hours, effective until 1500 hours”

SDC2.A.4 **Dispatching** a **CDGU** to **Synchronise/de-Synchronise**

SDC2.A.4.1 **CDGU Synchronising**

SDC2.A.4.1.1 In this instance, for **CDGUs**, the **Dispatch Instruction** issue time will always have due regard for the ***Synchronous Start-Up Time*** *(for cold, hot, warm states)* declared to the **TSO** by the **Generator** as a **Technical Parameters** or as part of **Additional Grid Code Characteristics Notice** data.

The instruction will follow the form, for example:

"Time 1300 hours. Unit 1, **Synchronise** at 1600 hours"

In relation to an instruction to **Synchronise**, the **Synchronising** time referred to in SDC2.A.2.2 will be deemed to be the time at which **Synchronisation** is to take place.

SDC2.A.4.1.2 Unless a **Loading** programme is also given at the same time it will be assumed that the **CDGU(s)** are to be brought to **Minimum Generation** and on the **Generator** reporting that the unit has **Synchronised** a further **Dispatch Instruction** will be issued.

SDC2.A.4.1.3 When a **Dispatch Instruction** for a **CDGU** to **Synchronise** is cancelled (i.e. a **Cancelled Start**) before the unit is **Synchronised**, the instruction will follow the form, for example:

"Time 1400 hours. Unit 1, cancel **Synchronising** instruction"

SDC2.A.4.1.4 If a **CDGU** fails to **Synchronise** more than *15* minutes after the ***Synchronising*** time specified in a **Notice to Synchronise**, the **TSO** *will* issue a **Failure to Follow Notice to Synchronise Instruction**. If a **Generator** requests to **Synchronise** a **CDGU** more than 15 minutes before the ***Synchronising*** time set out in the **Notice to Synchronise**, the **TSO** may agree to the **CDGU** being **Synchronised** at that time or request that the **CDGU** be **Synchronised** at the original ***Synchronising*** time. If the **TSO** accepts the request to **Synchronise** more than 15 minutes before the original ***Synchronising*** time, the **TSO** will not amend the original ***Synchronising*** time but the **Generator** shall be entitled to **Synchronise** the **CDGU**, and the **CDGU** shall be deemed to have met the original ***Synchronising*** time.

SDC2.A.4.1.5 When in respect of a **CDGU** a **Generator** receives a **Failure to Follow Notice to Synchronise Instruction** the original **Notice to Synchronise** is deemed never to have been issued and the **CDGU** is not entitled to **Synchronise.** The **TSO** will then decide whether or not to instruct again the **Generator to Synchronise** the **CDGU**, and will notify the **Generator** in relation to that **CDGU** accordingly.

SDC2.A.4.1.6 When a **CDGU** trips before reaching **Minimum Generation** a **Failure to Reach Minimum Generation Instruction** will be issued. The **Failure** to **Reach Minimum Generation Instruction** will negate the **Notice to Synchronise** received by the **CDGU**. The **TSO** will then decide whether or not to instruct the **CDGU** to **Synchronise** again, and will notify the **Generator** in relation to that **CDGU** accordingly.

*SDC2.A.4.1.7 The **TSO** may request a **CDGU** to endeavour to **Synchronise** earlier than the declared **Synchronous Start Up Time** (for cold, hot, warm states). In this event the **TSO** will issue the **Dispatch Instruction** with a **Synchronising** time that reflects the **CDGU** declared **Synchronous Start Up Time** (for cold, hot, warm states) accompanied by a written or verbal request that the unit **Synchronise** as soon as possible. If the **CDGU Synchronises** ahead of the **Synchronising** time in the **Dispatch Instruction** the **TSO** will cancel that **Dispatch Instruction** and issue a new **Dispatch Instruction** with a **Synchronising** time equal to the actual time the unit **Synchronised**.*

SDC2.A.4.2 **<u>CDGUs De-Synchronising</u>**

SDC2.A.4.2.1 The **Dispatch Instruction** will normally follow the form, for example:

"Time 1300 hours. Unit 1, **Shutdown**"

If the instruction start time is for 1400 hours the form will be, for example:

"Time 1300 hours. Unit 1, **Shutdown**, start at 1400 hours"

Both the above assume **De-Loading Rate** at declared **Technical Parameters**. Otherwise the message will conclude with, for example:

"... and **De-Synchronise** at 1500 hours"

SDC2.A.5 **<u>Frequency Control</u>**

SDC2.A.5.1 All the above **Dispatch Instructions** will be deemed to be at the instructed **Target Frequency**, i.e. where a **CDGU** is in the **Frequency Sensitive Mode** instructions refer to target **MW Output** at **Target Frequency**. **Target Frequency** changes will always be given to the **Generator** by telephone or **Electronic Interface** and will normally only be 49.95, 50.00, 50.05Hz.

*The adjustment of **MW Output** of a **CDGU** for **System Frequency** other than an average of 50 Hz, shall be made in accordance with the current **Declared** value of **Governor Droop** for the **CDGU**.*

SDC2.A.5.2 **CDGUs** required to be **Frequency** insensitive will be specifically instructed as such. The **Dispatch Instruction** will be of the form for example:

"Time 2100 hours. Unit 1, to **Frequency** insensitive mode"

SDC2.A.5.3 **Frequency Control** instructions may be issued in conjunction with, or separate from, a **Dispatch Instruction** relating to **MW Output**.

SDC2.A.6 ***Emergency*** **Load** Drop

The **Dispatch Instruction** will be in a pre-arranged format and normally follow the form, for example:

"Time 2000 hours. Emergency **Load** drop of "X"**MW** in "Y" minutes"

SDC2.A.7 **Voltage Control** Instruction

[Note: Voltage is used as a defined term in the EirGrid code but not in the SONI Code.]

In order that adequate **System** ***Voltage*** profiles are maintained under normal and fault conditions a range of **Voltage Control** instructions will be utilised from time to time, for example:

i. Operate to target ***Voltage*** of 117 kV;
ii. Maximum production or absorption of **Reactive Power** (at current instructed **MW Output)**
iii. Increase reactive output by 10 **Mvar** (at current instructed **MW Output**);
iv. *Change **Reactive Power** to 100 **Mvar** production or absorption;*
v. *Increase **CDGU Generator** step-up transformer tap position by [one] tap or go to tap position [x];*
vi. *For a **Simultaneous Tap Change**, change **CDGU Generator** step-up transformer tap position by one [two] taps to raise or lower (as relevant) **System Voltage**, to be executed at time of telegraph (or other) **Dispatch Instruction**.*
vii. *Achieve a target **Voltage** of 210 kV and then allow to vary with **System** conditions; and*
viii. *Maintain a target **Voltage** of 210 kV until otherwise instructed. Tap change as necessary."*

*In relation to **Mvar Dispatch** matters, **Mvar** production is an export onto the **System** and is referred to as "lagging **Mvar**", and **Mvar** absorption is an import from the **System** and is referred to as "leading **Mvar**".*

*It should be noted that the excitation control system constant **Reactive Power** level control mode or constant **Power Factor** output control mode will always be disabled, unless agreed otherwise with the **TSO**.*

SDC2.A.8 Instruction to change fuel

When the **TSO** wishes to instruct a **Generator** to change the fuel being burned in the operation of one of its **CDGUs** from one **Dispatched Fuel** (or fuel) to another (for example from 1% sulphur oil to 3% sulphur oil), the **Dispatch Instruction** will follow the form, for example:

"Time 1500 hours. Unit 2 change to 3% fuel at 1700 hours".

SDC2.A.9 Instruction to change fuel for a dual firing **CDGU**

When the **TSO** wishes to instruct a **Generator** to change the fuel being burned in the operation of one of its **CDGUs** which is capable of firing on two different fuels (for example, coal or oil), from one **Designated Fuel** (or fuel) to another (for example, from coal to oil), the instruction will follow the form, for example:

"Time 1500 hours. Unit 1 generate using oil at 1800 hours"**.**

SDC2.A.10 **Maximisation Instruction to CDGUs**

When the **TSO** wishes to instruct a **Generator** to operate a **CDGU** at a level in excess of its **Availability** in accordance with SDC2.4.2.4(i), the instruction will follow the form, for example:

"**Maximisation Instruction**. Time 1800 hours. Unit GT2 to 58 **MW**."

SDC2.A.11 ***Emergency Instruction***

*If a **Dispatch Instruction** is an **Emergency Instruction** the **Dispatch Instruction** will be prefixed with the words. This is an **Emergency Instruction.** It may be in a pre-arranged format and normally follow the form, for example:*

*This is an **Emergency Instruction.** Reduce **MW Output** to "X"MW in "Y" minutes, **Dispatch Instruction** timed at 2000 hours.*

SDC2.A.12 **Dispatching** a **Demand Side Unit** to a **Demand Side Unit MW Response**

SDC2.A.12.1 For **Demand Side Units**, the **Dispatch Instruction** issue time will always have due regard for the **Demand Side Unit Notice Time** declared to the **TSO** by the **Demand Side Unit Operator** as a **Technical Parameter** or as part of **Additional Grid Code Characteristics Notice** data.

SDC2.A.12.2 If the time of the **Dispatch Instruction** is 1400 hours, the **Demand Side Unit** is XX1, the **Demand Side Unit Notice Time** is 10 minutes and the **Demand Side Unit MW Response** to be achieved is 20 **MW,** the relevant part of the instruction would be for example:

"Time 1400 hours. Unit XX1 to 20 **MW** until further notice, start at 1410 hours"
Or
"Time 1400 hours. Unit XX1 to 20 **MW** until 1500 hours, start at 1410 hours"

SDC2 - APPENDIX B

[Note: This Appendix applies to the EirGrid Grid Code only.]

Dispatch Instructions for Generator Reactive Power

SDC2.B.1 *The **Mvar Output** of any **CDGU** in respect of which a **Dispatch Instruction** is given under SDC2.4.2.4(b) shall, in accordance with its declared **Technical Parameters**, be adjusted to the new target **Mvar** level so **Instructed**, within, a tolerance of +/- 2% of the target or +/- 2 **Mvar**, whichever is greater. The **Reactive Power** output of a **CDGU** shall not be adjusted (other than under **AVR** action) except in response to a **Dispatch Instruction** from the **TSO**.*

SDC2.B.2 ***Generators** having achieved the new target **Mvar Output**, should not attempt to sustain this level of **Mvar Output** as the **System Voltage** varies but should, rather, allow the **Reactive Power** output to vary under **AVR** control in accordance with the then applicable **Declarations of Ancillary Service** capabilities and **Technical Parameters**.*

SDC2.B.3 *While a **Reactive Power Dispatch Instruction** shall normally specify a new **Mvar** target for a **CDGU**, the **TSO** may also from time to time instruct **Generators** to perform one or more tap changes on the generator step-up transformer of a **CDGU**. The **Dispatch Instructions** for tap changes may be a **Simultaneous Tap Change Instruction** whereby the tap change shall be effected by the **Generator** in response to a **Dispatch Instruction** from the **TSO** issued simultaneously to relevant **Power Stations**. The **Dispatch Instruction**, which is normally preceded by advance warning, shall be effected within 1 minute of receipt from the **TSO** of the **Dispatch Instruction**.*

*SDC2.B.4 **Dispatch Instructions** in relation to **Reactive Power** may include target voltage levels to be achieved by the **CDGU** on the **Transmission System** at **Grid Connection Point** (or on the **User System** at the **User System Entry Point** in the case of an **Embedded Generator**, namely on the higher voltage side of the **Generator** step-up transformer). Where a **CDGU** is **Instructed** to a specified target voltage, the **Generator** shall achieve that target within a tolerance of 1 kV by tap changing on the **Generator** step-up transformer unless otherwise agreed with the **TSO**. Under normal operating conditions, once this target voltage level has been achieved, the **Generator** shall not tap change again without prior consultation with and agreement of the **TSO**.*

SDC2.B.5 *Under certain conditions such as low **System Voltage**, a **Dispatch Instruction** to maximum **Mvar** production at **Instructed MW Output** may be given and the **Generator** shall take appropriate action to maximise **Mvar** production unless constrained by plant operational limits or safety grounds relating to personnel or plant.*

SDC2.B.6 *Under certain conditions such as high **System Voltage**, a **Dispatch Instruction** to maximum **Mvar** absorption at **Instructed MW Output** may be given and the **Generator** shall take appropriate action to maximise **Mvar** absorption unless constrained by plant operational limits or safety grounds relating to personnel or plant.*

SDC2.B.7 *The excitation system, unless otherwise agreed with the **TSO**, shall be operated only in its constant terminal voltage mode of operation with var limiters in service, with any constant **Reactive Power** output control mode or constant **Power Factor** output control mode always disabled, unless agreed otherwise with the **TSO**.*

SDC2.B.8 *A **Dispatch** Instruction relating to **Reactive Power** will be implemented without delay and, notwithstanding the provisions of SDC2.4.2.12 and subject as provided in this Appendix B will be achieved not later than 2 minutes after the **Dispatch Instruction** time, or such longer period as the **TSO** may **Instruct**.*

SDC2.B.9 *Where **Dispatch Instructions** relating to **Active Power** and **Reactive Power** are given together, and to achieve the **Reactive Power** output would cause the **CDGU** to operate outside **Technical Parameters** as a result of the **Active Power Dispatch Instruction** being met at the same time, then the adjustment of the **Reactive Power** output may be delayed until the operating limits no longer prevent the change. In any case the **Active** and **Reactive Power Dispatch Instruction** shall be followed without undue delay.*

SDC2.B.10 *In circumstances where the **TSO** issues new **Dispatch Instructions** in relation to more than one **CDGU** at the same **Power Station** at the same time tapping will be carried out by the **Generator** one tap at a time either alternately between (or in sequential order, if more than two), or at the same time on, each **CDGU**, as the case may be.*

SDC2.B.11 *Where the **Dispatch Instructions** require more than two taps per **CDGU** and that means that the **Dispatch Instructions** cannot be achieved within 2 minutes of the time of the **Dispatch Instructions** (or such longer period at the **TSO** may have*

*Instructed), the **Dispatch Instructions** shall each be achieved with the minimum of delay after the expiry of that period;*

SDC2.B.12 *On receiving a new **MW Dispatch Instruction**, no tap changing shall be carried out to change the **Mvar Output** unless there is a new **Mvar Dispatch Instruction**.*

SDC2.B.13 *Where a **Dispatch Instructions** to **Synchronise** is given, or where a **CDGU** is **Synchronised** and a **MW Dispatch Instruction** is given, a **Mvar Dispatch Instruction** consistent with the **CDGU's** relevant parameters may be given. In the absence of a **Mvar Dispatch Instruction** with an instruction to **Synchronise**, the **Mvar Output** should be 0 **Mvar**.*

SDC2.B.14 *Where a **Dispatch Instructions** to **De-Synchronise** is given, a **Mvar Dispatch Instruction**, compatible with shutdown, may be given prior to **De-Synchronisation** being achieved. In the absence of a separate **Mvar Dispatch Instruction**, it is implicit in the **Dispatch Instructions** to **De-Synchronise** that **Mvar** output should at the point of synchronism be 0 **Mvar** at **De-Synchronisation**.*

SDC2.B.15 *A **Dispatch Instruction** relating to **Reactive Power** may be given in respect of **CCGT Units** within a **CCGT Installation** where running arrangements and/or **System** conditions require, in both cases where connection arrangements permit.*

SDC2.B.16 *On receipt of a **Dispatch Instruction** relating to **Reactive Power**, the **Generator** may take such action as is necessary to maintain the integrity of the **CDGU** (including, without limitation, requesting a revised **Dispatch Instruction**), and shall contact the **TSO** without delay.*

SDC2.B.17 *Under **System** fault conditions it is possible for **AVR** action to drive **Reactive** Power output for a **CDGU** outside of its **Declared Operating Characteristic** limits. The **Generator** shall immediately inform the **TSO** of the situation. However if the **Generator** reasonably believes that the situation may be dangerous to personnel or **Plant**, then limited action may be taken to improve the situation.*

SDC 2 ANNEX I

Explanatory Note of differences between SDC2 in the SONI Grid Code and EirGrid Grid Code

This annex is an explanatory note only and does not form part of the Grid Code.

1. **General Differences in wording**

The table below summarises the general differences in wording between the form of SDC2 in the SONI Grid Code and the form of SDC2 in the EirGrid Grid Code, which appear repeatedly throughout SDC2.

Terms used in SONI Grid Code	**Equivalent terms used in EirGrid Grid Code (where different)**	**Reason**
System Support Services	Ancillary Service(s)	The existing arrangements for Ancillary Services and System Support Services are continuing until further notice.
CCGT Module	CCGT Unit	This is the phrase currently used to describe the individual parts of a Combined Cycle Plant CCGT Module is an important concept in Northern Ireland and is reflected in many other agreements. EirGrid is keeping the phrase CCGT Unit, as it more closely describes the concept of an individual unit and EirGrid has formerly used CCGT Module to describe the whole CCGT Installation.

voltage	Voltage	"Voltage" is a defined term in the EirGrid Grid Code but not in the SONI Grid Code.
emergency	Emergency	"Emergency" is a defined term in the EirGrid Grid Code but not in the SONI Grid Code.

2. **<u>Specific differences in wording between equivalent provisions in both Grid Codes</u>**

The table below provides a list of the other specific differences in wording between equivalent provisions of SDC1 in both Grid Codes.

Provision	**SONI Grid Code**	**EirGrid Grid Code**	**Reason**
SDC2.1.2(a)	Reference is made to "but not Pumped Storage Demand" after the words "Pumped Storage Generation".		Reference to these words in the SONI Grid Code is made for clarity reasons.
SDC2.4.2.4(g)	Reference is made to "OC.11" and "OC11.8"	Reference is made to "OC.10" and "OC.8.5" and to the word "Acceptance" after "Commissioning"	These are the respective requirements in relation to testing, monitoring and investigations
SDC2.4.2.4(h)	Reference is made to "OC.10"	Reference is made to "OC.8.4"	These are the respective System Tests requirements
SDC2.4.2.5	Reference is made to "radio telephones" in the list of means of communications of a Dispatch Instruction	No reference is made to "radio telephones" and in addition, after the words "Frequency Relay" the EirGrid Grid Code also refers to "or any other automatic Primary Frequency Control Scheme (excluding governor	These are respective requirements regarding the form of a Dispatch Instruction

		response)”.	
SDC2.4.2.5(b)	Reference is made to “SDC3.6.1”	Reference is made to “OC.4.3”	These are the respective requirements in relation to actions required in response to high frequency
SDC2.4.2.5(c)(i)	Reference is made to “OC7”	Reference is made to “OC.9”	These are the respective references in respective of temporary losses at the TSOs’ Control Centres
SDC2.4.2.8(c)	Reference is made to “OC11.8” and “OC10.4”	Reference is made to “OC.8.5” and “OC8.6”	These are the respective requirements in respect of testing and System Tests
SDC2.4.2.8(d)	Reference is made to “OC11.8” and “OC10.4”	Reference is made to “OC8.5” and “OC.8.6”	These are the respective requirements in respect of testing and System Tests
SDC2.4.2.10(a)	Reference is made to “radio telephones” in the list of means of communication	No reference is made to “Radio telephones”	The reference to “radio telephones” is specific to the means of communication

			under the SONI Grid Code.
SDC2.4.2.11(c)	Reference is made to “+15/-5 minutes”	Reference is made to “+/- 10 minutes”	These are the respective delays in synchronising times which trigger an obligation on a Generator to notify the TSO of the delay in synchronising times.
SDC2.4.2.12	No reference is made to Dispatch Instructions for Mvars	Reference is made to “or in the case of a Dispatch Instruction for Mvars within two minutes of the instruction” after the words “in accordance with the instruction”	The EirGrid Grid Code has several specific requirements for the dispatch of Generator Reactive Power.
SDC2.4.2.16	Reference is made to “CC.S1.5”	Reference is made to “CC.7.3 and SDC2.B.7”	These are the respective requirements for Generating Unit Control arrangements
SDC2.A.2.2	Reference is made to “Designated Fuel” and “Declared Fuel”	Reference is only made to “fuel”	This is due to the PPA specific fuel terminology in the SONI Grid Code

3. **Provisions applicable to one Grid Code only**

The table below provides a list of the provisions of SDC1 which exist in one Grid Code only.

Provisions used in SONI Grid Code only	**Reason**
SDC2.1.3	This paragraph cross-refers to Appendices C and D which both deal with specific issues applicable to PPA Generation only.
SDC2.4.1.4	This provision is necessary in the SONI Grid Code to specify that specific CCGT requirements contained in the Generating Unit Agreements, Power Station Agreements and System Support Services Agreements prevail over the requirements of the Grid Code in case of inconsistency.
SDC2.4.2.3	This paragraph is necessary to deal with issues specific to PPA Generation, and in particular the fact that for PPA Generation, a Dispatch Instruction may include an automatic instruction of Spinning Reserve.
SDC2.4.2.4(c) – final sentence	This final sentence is specific to the SONI Grid Code as it cross-refers to Appendix C that sets out the different terminology and requirements relating to fuel for PPA Generation.
SDC2.4.2.4(n)	This is a SONI Grid Code only requirement in respect of instructions to change Generator Transformer tap positions
SDC2.A.1 – second paragraph	This is a SONI Grid Code only provision which provides that for PPA CCGT Modules and Units, provisions in the Power Purchase Arrangements and SSSAs prevail over Grid Code requirements

	where there is an inconsistency.
SDC2 Appendix C	This appendix deals with fuel provisions which apply to PPA Generation only.
SDC2 Appendix D	This appendix deals with additional provisions which apply to PPA Generation only.

Provisions used in EirGrid Grid Code only	**Reason**
SDC2.4.2.3	This paragraph is necessary in order to deal with the EirGrid specific requirement that a Dispatch Instruction may include an automatic instruction of Operating Reserve.
SDC2.4.2.4(b)(iv)	This paragraph is EirGrid specific as it cross-refers to Appendix B which sets out EirGrid specific requirements for Generator Reactive Power Dispatch.
SDC2.A.5.1 – second paragraph	This provision deals with EirGrid specific requirements in respect of MW Output adjustment of a CDGU for System Frequency.
SDC2.A.7 iv to viii and final 2 paragraphs	These additional paragraphs deal with EirGrid specific Generator Reactive Power dispatch requirements
SDC2.A.11	This additional paragraph deals with EirGrid specific Dispatch Instructions in relation to emergencies.
SDC2 Appendix B	This appendix deals with the EirGrid specific requirements for the Dispatch of Generator Reactive Power

PPM1 Controllable PPM Power Station Grid Code Provisions

PPM1.1 Introduction

All **Generators** connecting to the **Transmission System** are required to comply with the **Grid Code**. The **Grid Code** was originally developed with synchronous generators in mind. Since **Generation Units** do not have the same characteristics as synchronous generators, it was considered appropriate to develop a new set of **Grid Code** provisions specifically for **Controllable PPMs**. This section of the **Grid Code** gives the specific requirements for **Controllable PPMs** and **PPM Extensions** to pre-existing **Controllable PPMs** where an extension to a **PPM** shall be classified as one of the following two types:

(a) Transmission Connected Type A

A **PPM Extension** which is not separately controllable.

(b) Transmission Connected Type B

A **PPM Extension** which is separately controllable will be considered as a unique **PPM** with the exception of its requirements to **PPM1.6 Transmission System Voltage Requirements** which will be tested in aggregate with the existing **Controllable PPM**.

Transmission Connected Type A **PPM Extensions** and Transmission Connected Type B **PPM Extensions** will be subject to full **Grid Code** Compliance testing at the discretion of the **TSO**. Where a **Controllable PPM** has been granted derogations or exemptions from the **Grid Code** any **PPM Extension** to that **Controllable PPM** will be a Transmission Connected Type B **PPM Extension**.

PPM1.2 Objective

The primary objective of PPM1 is to establish the technical rules which **Controllable PPMs** and **PPM Extensions** must comply with in relation to their connection to and operation on the **Transmission System**.

PPM1.3 Scope

PPM1.3.1 PPM1 applies to the following **Users**:

(a) The **TSO**;

(b) **Grid Connected Controllable PPMs**; and

(c) **Grid Connected Controllable PPM Extensions;** and

(d) **Grid Connected Energy Storage Power Station Demand**

For the avoidance of doubt, DC-Connected PPMs are categorized as **Grid Connected Controllable PPMs**

PPM1.3.2 In addition to PPM1, **Controllable PPMs** and **Energy Storage Power Station Demand** are required to comply with the following sections of the **Grid Code**:

- GC - General Conditions
- PC - Planning Code
- PCA – Planning Code Appendix
- CC- Connection Conditions excluding:
  - *CC.7.2.5.1*
  - *CC.7.2.5.2*
  - *CC.7.3.1.1 (a) to (h)and (j) to (u) and (y) and (dd)*
  - *CC.7.3.1.2*
  - *CC.7.3.5*
  - *CC.7.3.6*
  - *CC.7.3.7*
  - *CC.7.3.8*
  - *CC.12.2*
  - CC.12.3
- OC.1
- OC.2

- OC.4 excluding:
    - *OC.4.3.4*
    - *OC.4.4.5.3*
    - *OC.4.4.5.4*
    - OC.4.4.5.5
- OC.6
- OC.7 excluding
    - *OC.7.2.4.2*
- OC.8
- OC.9
- OC.10 excluding
    - *OC.10.5.7*
    - *OC.10.7.1*
    - *OC.10.7.2*
    - *OC.10.7.3*
    - *OC.10.7.4*
    - *OC.10.7.6*
- OC.11
- SDC1

Dispatchable PPMs and **Energy Storage Power Station Demand** are also required to comply with SDC2.

In the **Grid Code**, where applicable, for the purposes of **Controllable PPMs** references to **Generation Unit** or **Generator** should be interpreted to mean **Controllable PPM**.

For the avoidance of doubt, within PPM1, references to **Controllable PPM** and **PPM** also include **Energy Storage Power Station Demand**.

PPM1.4 Fault Ride Through Requirements

PPM1.4.1 A **Controllable PPM** shall remain connected to the **Transmission System** for **Transmission System Voltage Dips** on any or all phases, and shall remain **Stable**, where the **Transmission System Phase Voltage** measured at the HV terminals of the **Grid Connected Transformer** remains above the heavy black line in *Figure PPM 1.1*.

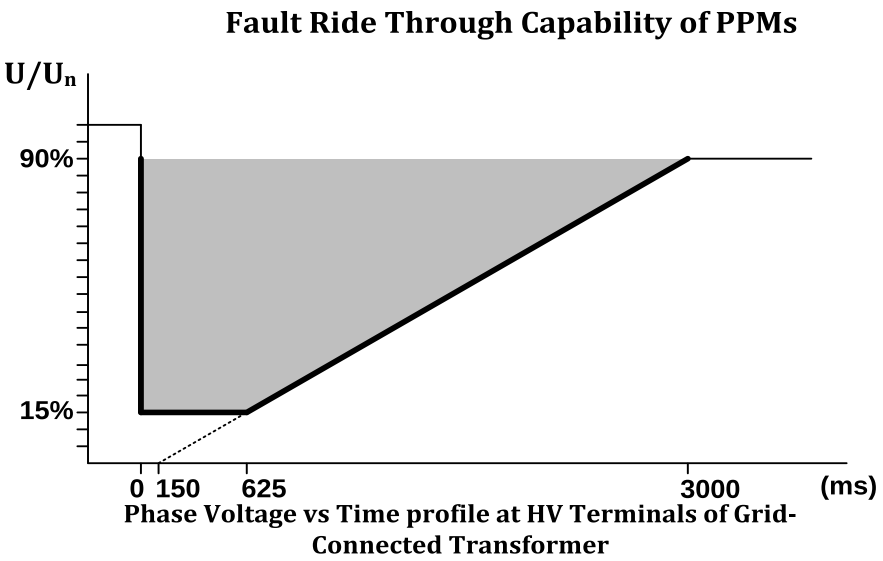


*Figure PPM 1.1 - **Fault Ride-Through** Capability of **Controllable PPMs***

PPM1.4.2 In addition to remaining connected to the **Transmission System**, the **Controllable PPM** shall have the technical capability to provide the following functions:

(a) During **Transmission System Voltage Dips,** the **Controllable PPM** shall provide **Active Power** in proportion to retained **Voltage** and provide reactive current to the **Transmission System**, as set out in PPM1.4.2(c)**.**

The provision of reactive current shall continue until the **Transmission System Voltage** recovers to within the normal operational range of the **Transmission System** as specified in CC.8.3.1, or for at least 500 ms, whichever is the sooner.

The provision of reactive current shall continue until the **Transmission System Voltage** recovers to within the normal operational range of the **Transmission System** as specified in CC.7.3.1.1 (x), or for at least 500 ms, whichever is the sooner.

The **Controllable PPM** may use all or any available reactive sources, including installed statcoms or SVCs, when providing reactive support during **Transmission System Fault Disturbances** which result in **Voltage Dips**.

(b) The **Controllable PPM** shall provide at least 90 % of its maximum **Available Active Power** or **Active Power Set-point**, whichever is lesser, as quickly as the technology allows and in any event within 500 ms of the **Transmission System Voltage** recovering to 90% of nominal **Voltage**, for **Fault Disturbances** cleared within 140 ms. For longer duration **Fault Disturbances**, the **Controllable PPM** shall provide at least 90% of its maximum **Available Active Power** or **Active Power Set-point**, whichever is lesser, within 1 second of the **Transmission System Voltage** recovering to 90% of the nominal **Voltage**.

(c) During and after faults, priority shall always be given to the **Active Power** response as defined in PPM1.4.2(a) and PPM1.4.2(b). The reactive current response of the **Controllable PPM** shall attempt to control the **Voltage** back towards the nominal **Voltage**, and should be at least proportional to the **Voltage Dip**. The reactive current response shall be supplied within the rating of the **Controllable PPM**, with a **Rise Time** no greater than 100ms and a **Settling Time** no greater than 300ms. For the avoidance of doubt, the **Controllable PPM** may provide this reactive response directly from individual **Generation Units**, or other additional dynamic reactive devices on the site, or a combination of both.

(d) The **Controllable PPM** 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 **Transmission System Voltage Dip**.

The **Controllable PPM** shall revert to its pre-fault reactive control mode and setpoint within 500ms of the **Transmission System Voltage** recovering to its normal operating range as specified in CC.8.3.1.

The **Controllable PPM** shall revert to its pre-fault reactive control mode and setpoint within 500ms of the **Transmission System Voltage** recovering to its normal operating range as specified in CC.7.3.1.1 (x).

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

(f) **Controllable PPMs** connected to the **Transmission System** shall be capable of staying connected to the **Transmission System** and continuing to operate stably during **Voltage Dips**. The voltage-against-time profile specifies the required capability for the minimum voltage and **Fault Ride-Through Time** at the **Connection Point** before, during and after the **Voltage Dip**. That capability shall be in accordance with the voltage-against-time profile as specified in Figure PPM1.4.2.

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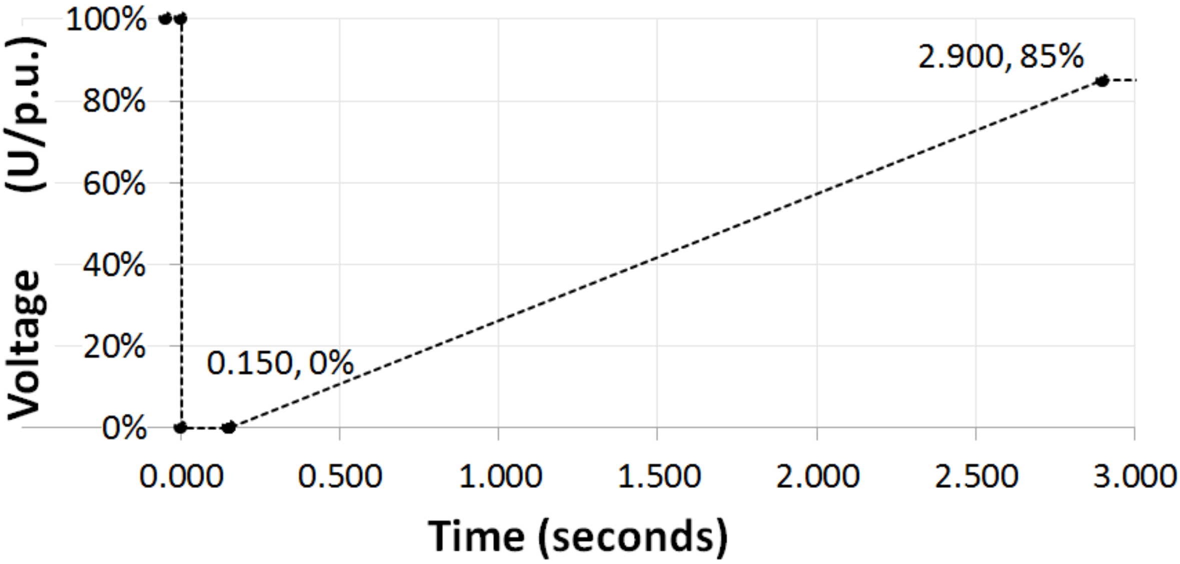

Figure PPM1.4.2: Voltage-against-time profile at the connection point for fault conditions

The **TSO** specifies the pre-fault and post-fault conditions for the fault-ride-through capability on a case-by-case base, and where requested by the **Controllable PPM**. The specified pre-fault and post-fault conditions for the fault-ride-through capability will be made publicly available. This includes;

(i) the calculation of the pre-fault minimum short circuit capacity at the **Connection Point** (MVA);

(ii) pre-fault **Active** and **Reactive power** operating point of the **Controllable PPM** at the **Connection Point** and **Voltage** at the **Connection Point**; and

(iii) calculation of the post-fault minimum short circuit capacity at the **Connection Point** (MVA).

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In the case of DC-connected **Controllable PPM**, the calculation point shall be the **Interconnector** interface point.

PPM1.5 Transmission System Frequency Ranges

PPM1.5.1 **Controllable PPMs** shall have the capability to:

(a) operate continuously at normal rated output at **Transmission System Frequencies** in the range 49.5 Hz to 50.5 Hz;

(b) remain connected to the **Transmission System** at **Transmission System Frequencies** within the range 47.5 Hz to 52.0 Hz for a duration of 60 minutes;

(c) remain connected to the **Transmission System** at **Transmission System Frequencies** within the range 47.0 Hz to 47.5 Hz for a duration of 20 seconds required each time the **Transmission System Frequency** is below 47.5 Hz;

(d)

(i) remain connected to the **Transmission System** during rate of change of **Transmission System Frequency** of values up to and including 0.5 Hz per second.

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(ii) remain connected to the **Transmission System** for a **Rate of Change of Frequency** up to and including 1 Hz per second as measured over a rolling 500 milliseconds period. **Voltage** dips may cause localised **ROCOF** values in excess of 1 Hz per second for short periods, and in these cases, the **Fault-Ride Through** clause PPM1.4.2(f) supersedes this clause. For the avoidance of doubt, this requirement relates to the capabilities of **Controllable PPMs** only, and does not impose the need for **Rate of Change of Frequency** protection nor does it impose a specific setting for anti-islanding or loss-of-mains protection relays.

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e) remain connected, in the case of a DC-connected **Controllable PPM**, to the remote-end **Interconnector Converter Station** network and operate within the **Frequency** ranges and time periods specified in Table PPM1.5.1. Where a nominal **Frequency** other than 50Hz, or a **Frequency** variable by design is used, the applicable **Frequency** ranges and time periods shall be specified by the TSO taking into account specific characteristics of the system and the requirements of Table PPM1.5.1.

Table PPM1.5.1 Minimum Time Periods for DC-connected Controllable PPMs to Remain Operational without Disconnecting for Different Frequency Ranges

Frequency range	***Time period for operation***
47 – 47.5 Hz	60 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

Wider **Frequency** ranges or longer minimum times for operation can be agreed between the **TSO** and the DC-connected **Controllable PPM** if needed to preserve or to restore system security. If wider **Frequency** ranges or longer minimum times for operation are economically and technically feasible, the

DC-connected **Controllable PPM Operator** shall not unreasonably withhold consent.

The DC-connected **Controllable PPM** shall be capable of automatic disconnection at specified frequencies, if specified by the **TSO**. Terms and settings for automatic disconnection shall be agreed between the **TSO** and the DC-connected **Controllable PPM Operator**.

f) remain connected, in the case of DC-connected **Controllable PPM**, to the remote-end **Interconnector Converter Station** network for a **Rate of Change of Frequency** up to +/- 2 Hz per second (measured at any point in time as an average of the rate of change of **Frequency** for the previous 1 second) at the **Interconnector** interface point of the DC-connected **Controllable PPM** at the remote end **Interconnector Converter Station**.

No additional **Generation Unit** shall be started while the **Transmission System Frequency** is above 50.2 Hz.

PPM1.5.2 **ACTIVE POWER MANAGEMENT**

A **PPM Control System** shall be installed by the **Controllable PPM** to allow for the provision of **Active Power Control** and **Frequency Response** from the **Controllable PPM**. The **PPM Control System** and **Frequency Response System** shall provide the functionality as specified in this section PPM1.5.2.

PPM1.5.2.1 **Active Power Control**

The **PPM Control System** shall be capable of operating each **Generation Unit** at a reduced level if the **Controllable PPM's Active Power** output has been restricted by the **TSO**. In this **Active Power Control Mode**, the **PPM Control System** shall be capable of receiving an on-line **Active Power Control Set-point** sent by the **TSO** and shall commence implementation of the set-point within 10 seconds of receipt of the signal from the **TSO**. 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, as per PPM1.5.4. The **TSO** acknowledges 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 **Generation Units** going through a start-up sequence. In such a case, **Generation Units** 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.

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Manual local measures shall be allowed in cases where the automatic remote control devices are out of service. The **Active Power** set point must be reached within 1 hour. Best endeavours shall be made to resolve the loss of automatic remote control in as quick a timeframe as possible.

PPM1.5.3 **FREQUENCY RESPONSE**

PPM1.5.3.1 In **Resource Following Mode**, the **Frequency Response System** shall have the capabilities as displayed in the *Power-Frequency Response Curve* in *Figures PPM 1.2,* where the power and frequency ranges required for points A, B, C, D, E are defined below in *Table PPM 1.1 and Table PPM 1.2.* **Controllable PPM Frequency Response** and **Governor Droop** shall be calculated with respect to **Registered Capacity.**

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.

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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 F_B-F_C in the Power-Frequency Response Curve.

A DC-connected **Controllable PPM** shall be capable of receiving a fast signal from a connection point in the **Transmission System** to which **Frequency** response is being provided, and be able to process this signal within 100 ms from sending to completion of processing the signal for activation of the response. **Frequency** shall be measured at the connection point in the **Transmission System** to which **Frequency** response is being provided. If **Frequency** response is provided to more than one synchronous area, then DC-connected **Controllable PPM** shall be capable of delivering coordinated **Frequency** control as specified by the **TSO**.

PPM1.5.3.2 When in **Active Power Control Mode,** the **Controllable PPM** shall always operate in **Frequency Sensitive Mode** with a **Governor Droop** as set out in PPM1.5.3.1 and with a deadband of +/-15mHz, or as otherwise agreed with the **TSO.**

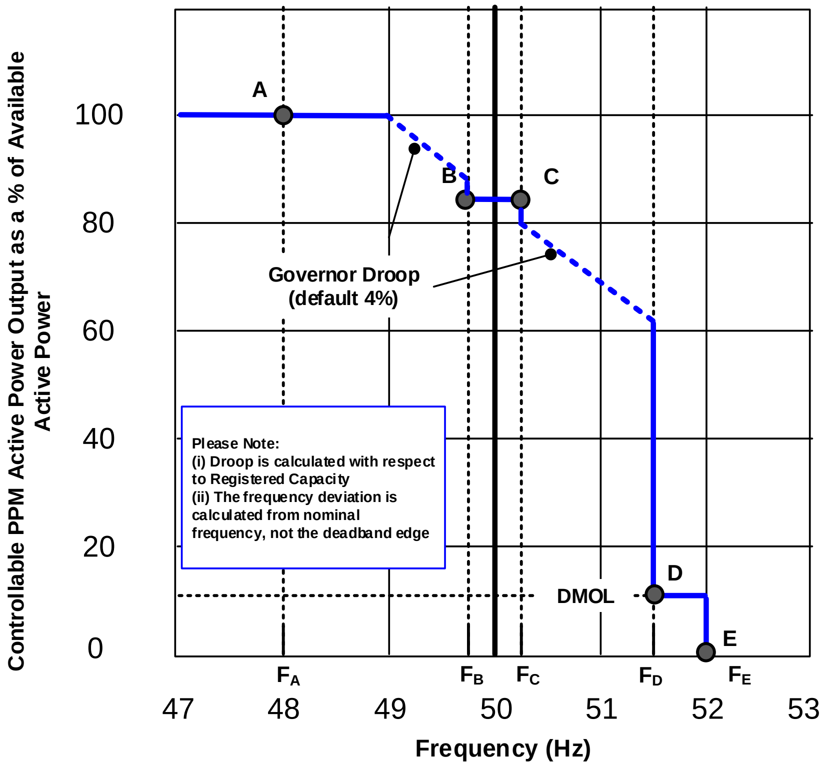

*Figure PPM 1.2 –Example of Power-Frequency Response Curve for **Resource Following Mode***

PPM1.5.3.3 When acting to control **Transmission 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 **Transmission System Frequency** excursion outside the range F_B-F_C, or in the case of a **Controllable PPM** in **Active Power Control Mode**, when the **Transmission System Frequency** goes outside the deadband set out in PPM1.5.3.2.

PPM1.5.3.4 When the **Transmission 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 **Transmission System Frequency** first exceeded F_C, due to an increase in **Available Active Power** in that period.

PPM1.5.3.5 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 **Generation Unit** which has disconnected shall be brought back on load as fast as technically feasible, provided the **Transmission System Frequency** has fallen below 50.2 Hz.

PPM1.5.3.6 Points 'A', 'B', 'C', 'D' and 'E' shall depend on a combination of the **Transmission System Frequency**, **Active Power** and **Active Power Control Set-point** settings. These settings may be different for each **Controllable PPM** depending on system conditions and **Controllable PPM** location. These settings are defined in *Table PPM 1.1*.

Point	***Transmission System Frequency*** *(Hz)*	***Controllable 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**)
E	F_E	P_E = 0 %

*Table PPM 1.1: **Transmission System Frequency** and % **Available Active Power** Settings for the Points 'A', 'B', 'C', 'D' and 'E' illustrated in Figure PPM 1.2*

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 PPM1.5.3.16 below). The **Controllable PPM** shall be responsible for implementing the appropriate settings during **Commissioning**.

PPM1.5.3.7 *Table PPM 1.2* shows the **Transmission System Frequency** and **Active Power** ranges for $\boldsymbol{F_A}$, $\boldsymbol{F_B}$, $\boldsymbol{F_C}$, $\boldsymbol{F_D}$, $\boldsymbol{F_E}$, $\boldsymbol{P_A}$, $\boldsymbol{P_B}$, $\boldsymbol{P_C}$, $\boldsymbol{P_D}$ and $\boldsymbol{P_E}$.

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

Table PPM 1.2: ***Transmission System Frequency*** *&* ***Active Power*** *ranges appropriate to Figure PPM 1.2.*

For the **Transmission System Frequency** values in *Table PPM1.2* above, $F_A \leq F_B \leq F_C \leq F_D \leq F_E$.

PPM1.5.3.8 Alterations to the **Controllable PPM's Active Power** output, triggered by **Transmission System Frequency** changes, shall be achieved by proportionately altering the **Active Power** output of all available **Generation Units** as opposed to switching individual **Generation Units** on or off, insofar as possible.

PPM1.5.3.9 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 **Transmission 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**.

PPM1.5.3.10 If the **Transmission System Frequency** rises to a level above 'D'-'E', as defined by the *Power-Frequency Response Curve in Figure PPM 1.2*, the **TSO** accepts that **Generation Units** may disconnect. Any **Generation Unit** which has disconnected shall be brought back on load as fast as technically feasible (provided the **Transmission System Frequency** has fallen below 50.2 Hz).

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PPM1.5.3.11 **Limited Frequency Sensitive Mode – Over-frequency**

The following shall apply for **Controllable PPMs** operating in Limited Frequency Sensitive Mode – Over Frequency:

(a) **Controllable PPMs** shall be capable of providing **Active Power Frequency Response** when the **Transmission System Frequency** rises to or above 50.2 Hz.

(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%.

(c) 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 **Controllable PPM's** local security and safety conditions permit.

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

(e) **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.

(f) In the case of DC-connected **Controllable PPM**, operation in Limited **Frequency** Sensitive Mode – Over- **Frequency** is subject to fast signal response as specified in PPM1.5.3.1.

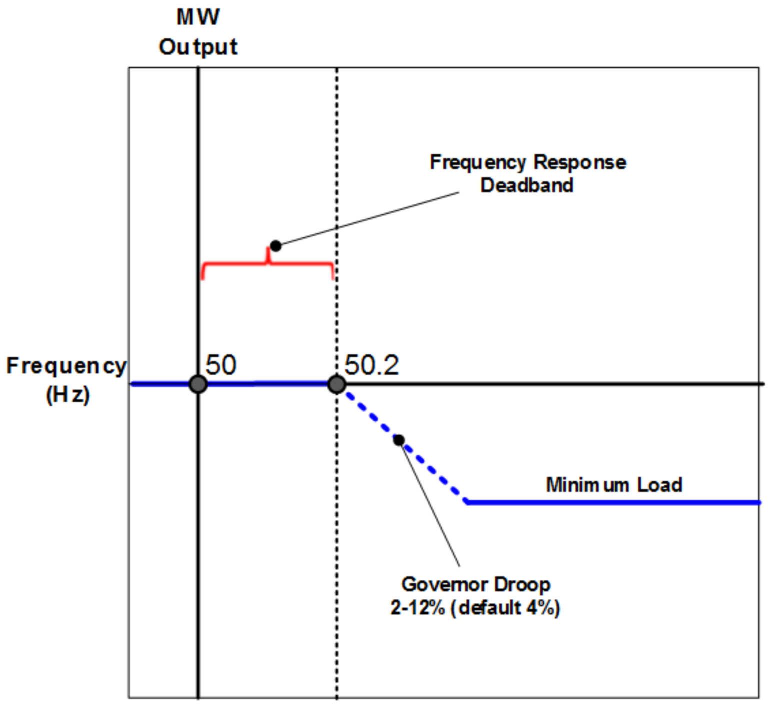


Figure PPM1.5.3.11: Limited Frequency Sensitive Mode – Over-frequency

PPM1.5.3.12 **Limited Frequency Sensitive Mode – Under-frequency**

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

(a) **Controllable PPMs** shall be capable of providing **Active Power Frequency Response** when the **Transmission System Frequency** falls to or below 49.5 Hz.

(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%.

(c) 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 **Controllable PPM's** local security and safety conditions permit.

(d) **Controllable PPMs** 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**.

(e) **Controllable PPMs** shall be capable of providing a power increase up to **Available Active Power**. Stable operation shall be ensured.

(f) **Controllable PPMs** capable of acting as a load shall be capable of disconnecting their load. This requirement does not extend to auxiliary supplies.

(g) In the case of DC-connected **Controllable PPM**, operation in Limited **Frequency** Sensitive Mode – Under- **Frequency** is subject to fast signal response as specified in PPM1.5.3.1.

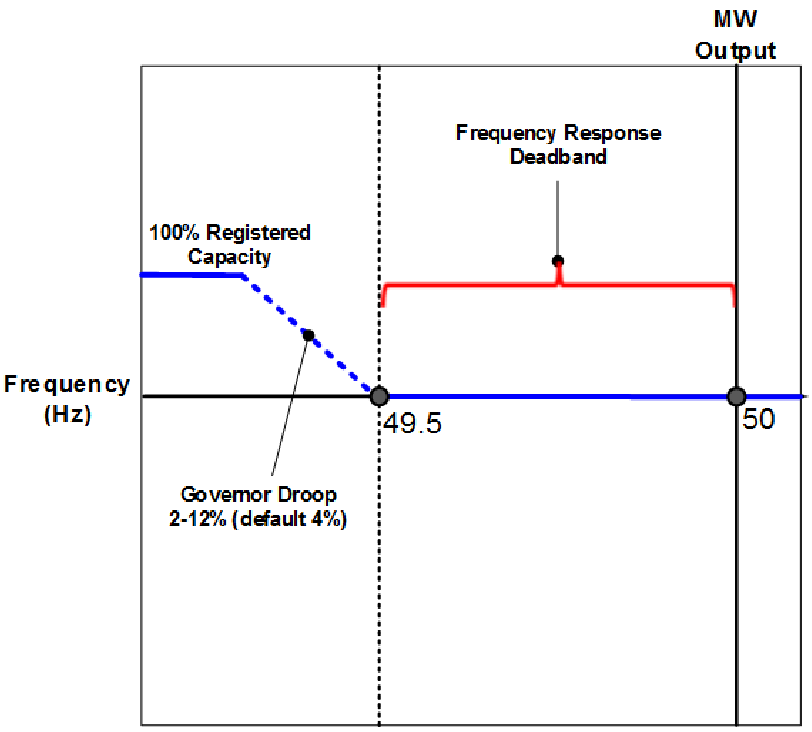


Figure PPM1.5.3.12: Limited Frequency Sensitive Mode – Under-frequency

PPM1.5.3.13 **Frequency Sensitive Mode**

The following shall apply for **Controllable PPMs** for **Frequency Sensitive Mode** operation:

(a) 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**.

(b) A **Controllable PPM** shall be capable of setting **Governor Droop** between 2% and 12%. The default **Governor Droop** setting shall be 4%.

(c) **Controllable PPMs** shall be capable of providing **Active Power Frequency Response** in accordance with the parameters specified in Table PPM1.5.3.13.1.

Table PPM1.5.3.13.1: Parameters for **Active Power Frequency Response**

Parameter	Value
Frequency Response Insensitivity (Δf)	15mHz
Frequency Response Insensitivity ($\Delta f/f$)	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.

(d) In response to **Low Frequency Events**, **Controllable 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.

Controllable PPMs 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.

PPM1.5.3.14 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**. **Controllable PPMs** may be instructed to be in

PPM1.5.3.15 both Limited Frequency Sensitive Mode – Under-frequency and Limited Frequency Sensitive Mode – Over-frequency at the same time. Generators 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.

PPM1.5.3.16 **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 **Controllable PPM's** scheduled **Operational Date.** The **Controllable 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 **Controllable PPM** a minimum of two weeks notice if changes to either 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 **Controllable PPM** shall formally confirm that any requested changes have been implemented within two weeks of receiving the **TSO's** formal request.

PPM1.5.3.17 In the case of DC-connected **Controllable PPMs**, if a constant nominal **Frequency** other than 50 Hz, a **Frequency** variable by design or a DC system voltage is used, subject to the agreement of the **TSO**, the capabilities listed in PPM1.5.1.(f), PPM1.5.2.1, PPM1.5.3.11.(f), PPM1.5.3.12.(g) and PPM1.5.4.1, and the parameters associated with these capabilities shall be specified by the **TSO**.

PPM1.5.4 **RAMP RATES**

PPM1.5.4.1 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 PPM1.5.3.1**.** The **TSO** acknowledges that rapidly changing resource availability may cause temporary deviations from the ramp rate settings of the **Controllable PPM**.

These deviations should not be allowed to exceed 3% of **Registered Capacity**.

These deviations should not exceed the greater of 3% of **Registered Capacity** or +/- 0.5 MW.

PPM1.5.4.2 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 between 1% and 100% of **Registered Capacity** per minute.

PPM1.5.4.3 **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 **Controllable PPM's** scheduled **Operational Date.** The **Controllable 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 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 **TSO's** formal request.

PPM1.6 Transmission System Voltage Requirements

PPM1.6.1 TRANSMISSION SYSTEM VOLTAGE RANGE

Controllable PPMs shall remain continuously connected to the **Transmission System** at maximum **Available Active Power** or **Controlled Active Power** output for normal and disturbed system conditions and for step changes in **Transmission System Voltage** of up to 10 %. The following are the ranges which may arise during **Transmission System** disturbances or following transmission faults:

(a) 400 kV system: 350 kV to 420 kV;

(b) 220 kV system: 200 kV to 245 kV;

(c) 110 kV system: 99 kV to 123 kV.

Controllable PPMs shall remain continuously connected to the **Transmission System** at maximum **Available Active Power** or **Controlled Active Power** and operate within the ranges of the **Transmission System Voltage** at the **Connection Point**, for an unlimited time period, as specified below:

(a) 400 kV system: 360 kV to 420 kV (0.9 p.u. – 1.05 p.u.)

(b) 220 kV system: 198 kV to 245 kV (0.9 p.u. – 1.114 p.u.)

(c) 110 kV system: 99 kV to 123 kV (0.9 p.u. – 1.118 p.u.)

DC-connected **Controllable PPM** shall remain connected to the remote-end **Interconnector Converter Station** network and operate within the **Volt**age ranges and time periods specified in Table PPM1.6.1.

*Table PPM1.6.1 Minimum Time Periods for DC-connected **Controllable PPMs** to Remain Operational without Disconnecting for Different Voltage Ranges*

System Voltage	***Voltage Range***	***Duration***
400 kV	340 kV to 360 kV (0.85 p.u. – 0.9 p.u.)	60 minutes
	360 kV to 420 kV (0.9 p.u. – 1.05 p.u.)	Unlimited
	420 kV to 460 kV(1.05 p.u. – 1.15 p.u.)	Not allowed
220 kV	187 kV to 198 kV (0.85 p.u. – 0.9 p.u.)	60 minutes
	198 kV to 246 kV (0.9 p.u. – 1.118 p.u.)	Unlimited
	246 kV to 253 kV(1.118 p.u. – 1.15 p.u.)	Not allowed
110 kV	93.5 kV to 99 kV (0.85 p.u. – 0.9 p.u.)	60 minutes
	99 kV to 123 kV (0.9 p.u. – 1.118 p.u.)	Unlimited
	123 kV to 126.5 kV(1.05 p.u. – 1.15 p.u.)	Not allowed

Wider **Voltag**e ranges or longer minimum times for operation can be agreed between the **TSO** and the DC-connected **Controllable PPM** if needed to preserve or to restore system security. If wider **Voltage** ranges or longer minimum times for operation are economically and technically feasible, the DC-connected **Controllable PPM Operator** shall not unreasonably withhold consent.

The DC-connected **Controllable PPM** shall be capable of stable operation within the minimum to maximum range of short circuit power and network characteristics of the **Interconnector** interface point specified by the **TSO**.

For **Interconnector Converter Station** interface points at AC **Voltages** other than those given in Table PPM1.6.1, the **TSO** shall specify applicable requirements at the connection point.

In the case of DC-connected **Controllable PPMs**, if a constant nominal **Frequency** other than 50 Hz is used, the **Voltage** ranges and time periods specified by the **TSO** shall be proportional to those given in Table PPM1.6.1.

PPM1.6.2 **AUTOMATIC VOLTAGE REGULATION**

PPM1.6.2.1 **Controllable PPMs** shall have a continuously-variable and continuously-acting **Voltage Regulation System** with similar response characteristics to a conventional **Automatic Voltage Regulator** and shall perform generally as described in BS4999 part 140, or equivalent European Standards.

PPM1.6.2.2 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 **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;**

○

The **Controllable PPM** shall be capable of controlling the **Reactive Power** at least within the **Reactive Power** ranges specified in PPM1.6.3, with setting steps no greater than 0.01 p.u.. The **Power Factor** shall be maintained within a tolerance of ± 0.5 %. The tolerance will be measured with reference to the maximum **Reactive Power** 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**;

○

The **Controllable PPM** shall be capable of setting the **Reactive Power** set-point at least within the **Reactive Power** range specified in PPM1.6.3, with setting steps no greater than 5 Mvar or 5 % (whichever is smaller) of maximum **Reactive Power**, controlling the **Reactive Power** at the connection point to an accuracy within ± 5 Mvar or ± 5 % (whichever is smaller) of the maximum **Reactive Power**;

(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 rapid **Voltage** change limits as set out in CC.10.13.1**.**

The **Controllable PPM** shall be capable of contributing to voltage control at the **Connection Point** by provision of **Reactive Power** exchange with the **Transmission System** with a **Voltage Regulation Set-point** covering 0.95 to 1.05 p.u. in steps no greater than 0.01 p.u.. The **Reactive Power** output shall be zero when the grid voltage value at the connection point equals the **Voltage Regulation Set-point**.

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 **Reactive Power** must settle at the steady-state **Reactive Power** response within 5 seconds, with a steady-state **Reactive Power** tolerance no greater than 5 % of the maximum **Reactive Power**.

Subject to agreement with TSO, the **Voltage Regulation Set-point** may be operated with or without a deadband selectable in a range from zero to ±5% of reference 1 p.u. **Transmission System** voltage in steps no greater than 0.5%.

A change to the **Power Factor** (PF) control set-point, **Reactive Power** (Q) control set-point or **Voltage Regulation** (kV) **Set-Point** shall be implemented by the **Controllable PPM** within 20 seconds of receipt of the appropriate signal from the **TSO,** within its reactive power capability range as specified in PPM1.6.3.

One **Reactive Power Control** mode shall be operational at all times with the facility to toggle between each of the **Reactive Power** control modes from NCC. 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.

PPM1.6.2.3

The **Voltage Regulation System Slope Setting** shall be capable of being set to any value between 1 % and 10 %.

The **Voltage Regulation System Slope Setting** shall be capable of being set to any value between 2 to 7 % in steps no greater than 0.5%

The setting shall be specified by the **TSO** 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 **Transmission System** needs. The **TSO** 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 **TSO's** formal request.

PPM1.6.2.4 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.

PPM1.6.3 **REACTIVE POWER CAPABILITY**

PPM1.6.3.1 **Controllable PPMs** 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 PPM1.4,* as measured at the **Connection Point** over the normal and disturbed **Transmission System Voltage** ranges specified in CC.8.3.2; subject to the exception in PPM1.6.3.2, where additional **Reactive Power** compensation may be utilised to compensate for the **Reactive Power** demand of the connection between the **Connection Point** and the **Controllable PPM.**

Referring to *Figure PPM1.4:*

Point A represents the minimum Mvar absorption capability of the **Controllable PPM** at 100% **Registered Capacity** and is equivalent to 0.95 power factor leading;

Point B represents the minimum Mvar production capability of the **Controllable PPM** at 100% **Registered Capacity** and is equivalent to 0.95 power factor lagging;

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 **Generation Units**;

Point F represents the minimum Mvar production capability of the **Controllable PPM** at the cut-in speed of the individual **Generation Units**;

The **TSO** accepts that the values of Points E and F may vary depending on the number of **Generation Units** generating electricity in a low resource scenario;

Figure PPM1.4 represents the minimum expected **Reactive Power** capabilities of the **Controllable PPM**. The **Controllable PPM** is obliged to tell the **TSO**/**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 **TSO** during **Commissioning.**

The **Grid Connected Transformer** tap changing range must be capable of ensuring nominal voltage at the lower voltage side of the grid connected transformer, for any **Voltage** at the **Connection Point** within the ranges specified in PPM1.6.1.

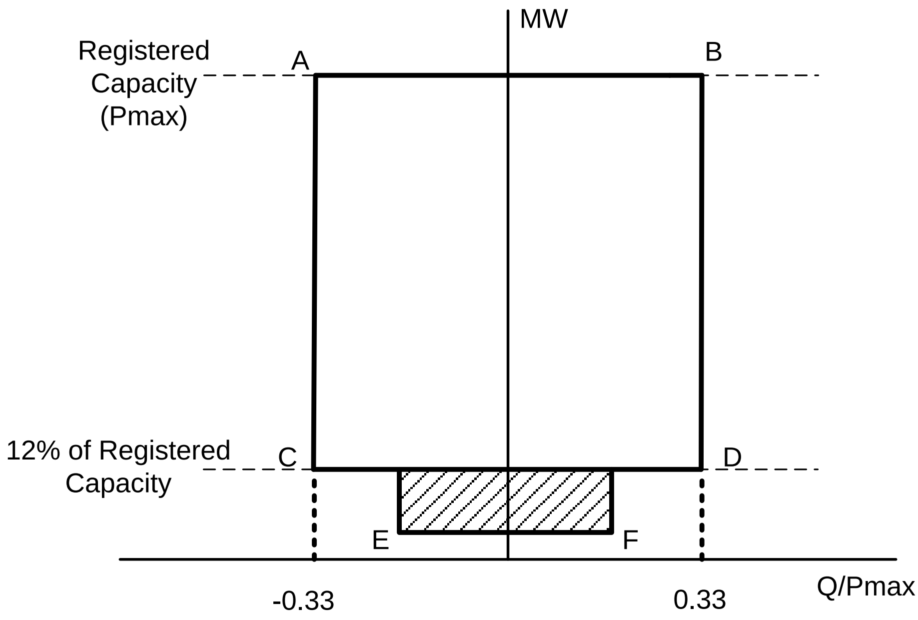


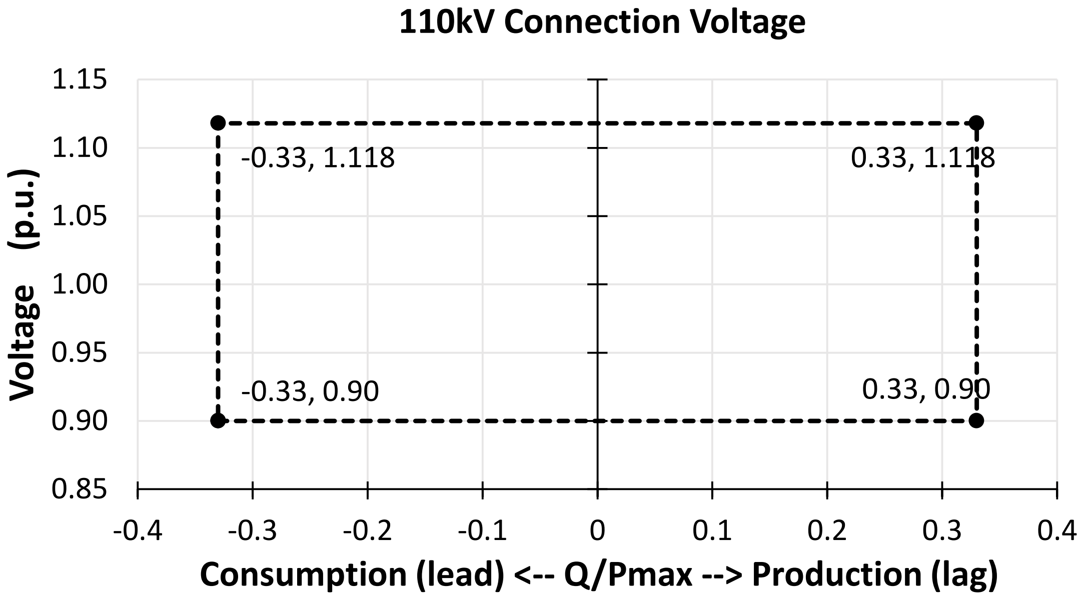
Figure PPM1.4– Minimum **Reactive Power** Capability of **Controllable PPM**

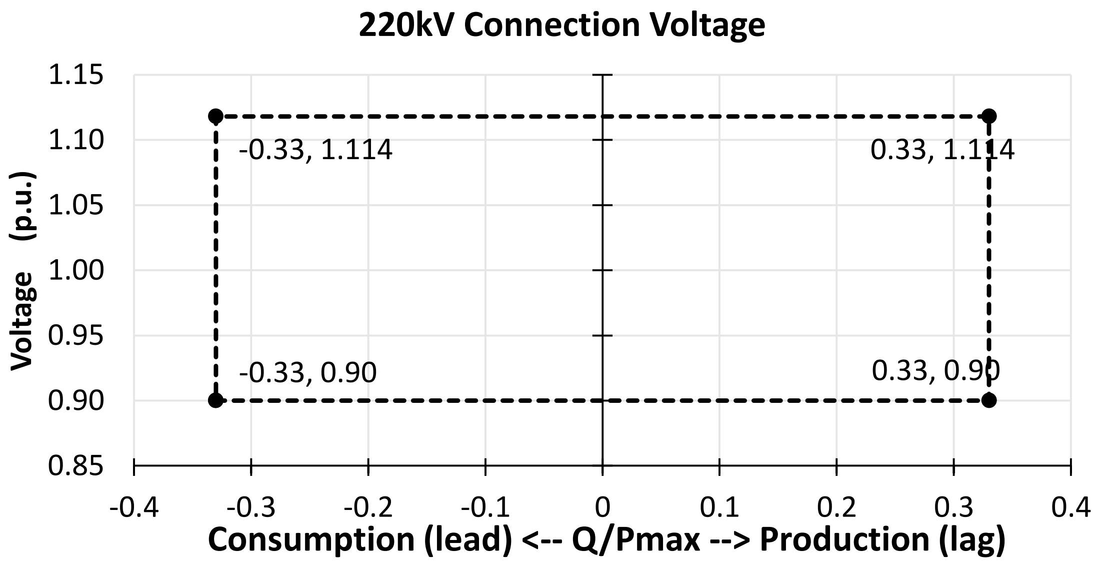
PPM1.6.3.2 For **Controllable PPMs** where the **Connection Point** is remote from the **Grid Connected Transformer**, any supplementary **Reactive Power** compensation required to offset the **Reactive Power** demand of the HV line, or cable, between the **Connection Point** and the **Controllable PPM** shall be identified during the **TSO's Connection Offer** process.

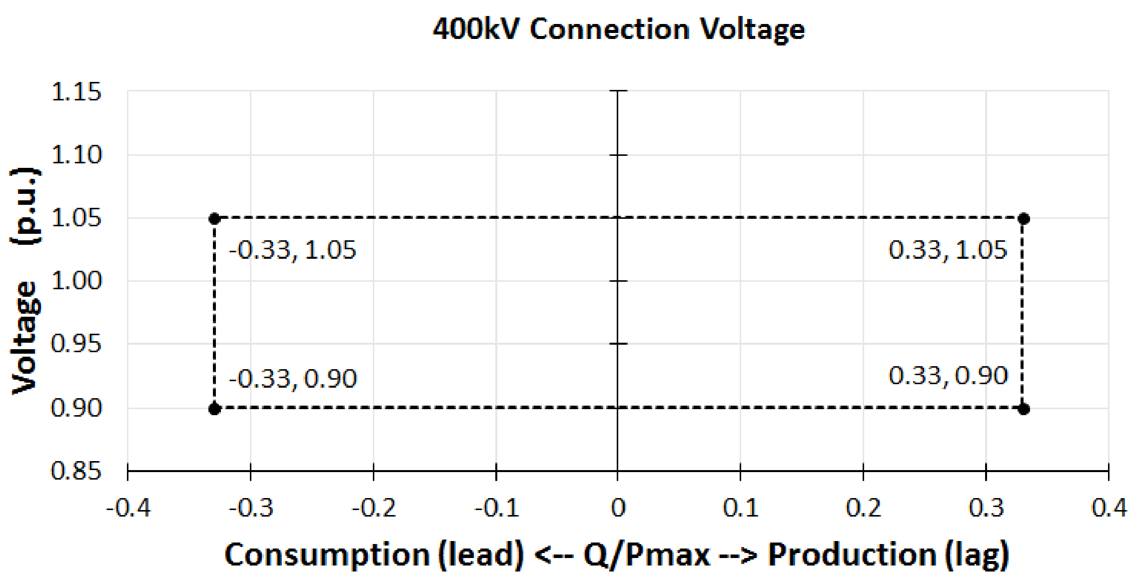
PPM1.6.3.3 The total charging of the **Controllable PPM Collector Network** during low load operation (below 12%) shall be examined during the **TSO's Connection Offer** process. If during this examination it is identified that this charging may cause the voltage on the **Transmission System** to be outside the **Transmission System Voltage** ranges, as specified in PPM1.6.1, then the **Reactive Power** requirements will need to be altered.

○

PPM1.6.3.4 Without prejudice to PPM1.6.3.1, **Controllable PPMs** shall comply with the following **Reactive Power** requirements at **Registered Capacity** at the **Connection Point**;



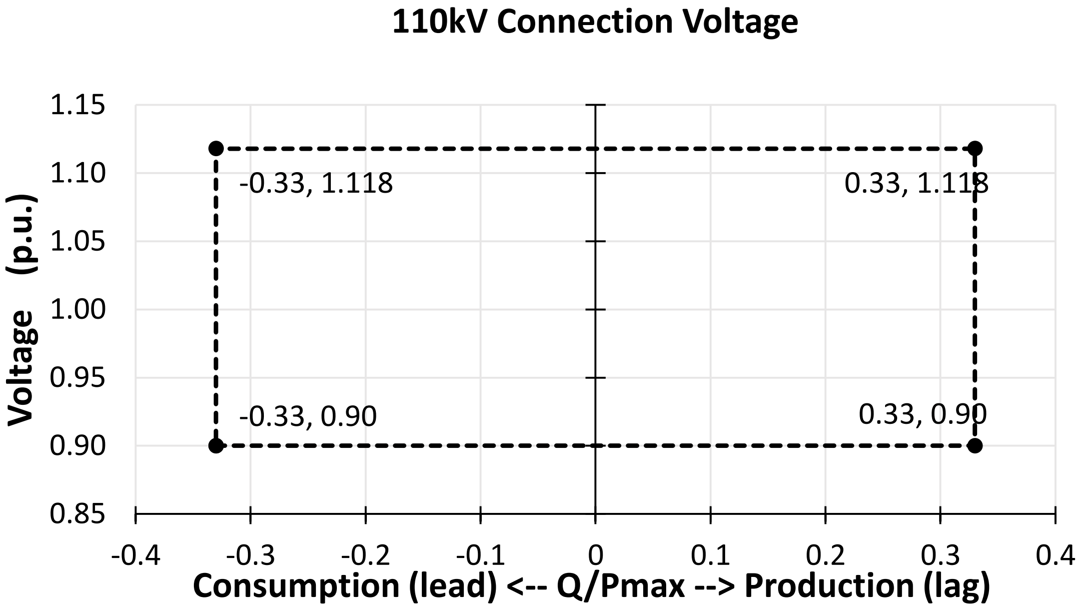


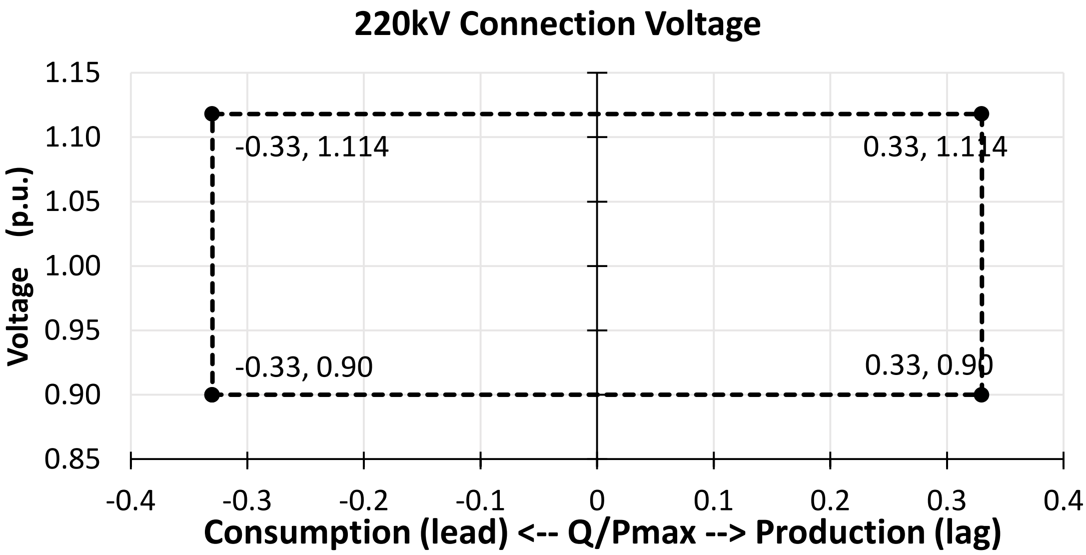


In the event of power oscillations, **Controllable PPMs** shall retain steady-state stability when operating at any operating point of the **Reactive Power** capability.

PPM1.6.3.5 Without prejudice to PPM1.6.3.1, **Controllable PPMs** shall comply with the following **Reactive Power** requirements at **Registered Capacity** at the **Connection Point**;

○


110kV Connection Voltage
Voltage (p.u.)
1.15
1.10
1.05
1.00
0.95
0.90
0.85
-0.33, 1.118
0.33, 1.118
-0.33, 0.90
0.33, 0.90
-0.4
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
0.4
Consumption (lead) <-- Q/Pmax --> Production (lag)


220kV Connection Voltage
Voltage (p.u.)
1.15
1.10
1.05
1.00
0.95
0.90
0.85
-0.33, 1.114
0.33, 1.114
-0.33, 0.90
0.33, 0.90
-0.4
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
0.4
Consumption (lead) <-- Q/Pmax --> Production (lag)

PPM1.6.3.6 DC connected **Controllable PPMs** shall comply with the reactive power capability requirements as given in the diagrams in PPM1.6.3.4 at maximum Interconnector active power transmission capacity.

PPM1.6.3.7 For DC connected **Controllable PPMs**, the **TSO** may specify supplementary reactive power to be provided if the connection point of a DC connected **Controllable PPM** is neither located at the high **Voltage** terminals of the step-up transformer to the **Voltage** level of the connectionpoint not at the alternator terminals, if no step-up transformer exists. This supplementary reactive power shall compensate the reactive power exchange of the high **Voltage** line or cable between the high **Voltage** terminals of the step-up transformer of the DC connected **Controllable PPM** or its alternator terminals, if no step-up transformer exists, and the connection point and shall be provided by the responsible owner of that line or cable.

PPM1.6.4 **VOLTAGE STEP EMISSIONS**

Emission limits for **Voltage** changes are defined in CC.10.13.1. This standard shall also apply to **Controllable PPMs**.

During synchronisation of a DC connected **Controllable PPM** to the AC collection network, the DC connected **Controllable PPM** shall have the capability to limit any **Voltage** changes to a steady-state level specified by the relevant system operator. The maximum magnitude, duration and measurement window of the **Voltag**e transient shall be specified on a site specific basis and shall not exceed 5 per cent of the pre-synchronisation **Voltage**.

PPM1.6.5 **CONTROLLABLE PPM'S GRID CONNECTED TRANSFORMER**

PPM1.6.5.1 **Controllable PPMs** shall provide on-load tap-changing (OLTC) facilities for all **Grid Connected Transformers**. All **Controllable PPMs** shall liaise with the **TSO** on the design specification for the performance of the tap-changing facility of the **Grid Connected Transformer**.

PPM1.6.5.2 The **Controllable PPM's Grid Connected Transformers** may be connected either:

(a) in delta on the lower voltage side and in star (with the star point or neutral brought out) on the HV side; or

(b) in star on both HV and lower voltage sides with a delta tertiary winding provided.

PPM1.7 Signals, Communication & Control

PPM1.7.1 **SIGNALS FROM THE CONTROLLABLE PPM TO THE TSO**

Signals from **Controllable PPMs** to the **TSO** shall be broken up into a number of logical groups. There shall be different requirements for **Controllable PPMs** depending on the **Controllable PPM's MEC**. The following groups shall apply:

- ***Signals List #1*** - applies to all **Controllable PPMs**;

In addition, **Controllable PPMs** shall be required to provide signals from *Signals Lists 2, 3, 4 and/or 5*. These lists relate to:

- ***Signals List #2*** - Meteorological Data;
- ***Signals List #3*** - **Availability** Data;
- ***Signals List #4*** - **Active Power Control** Data;
- ***Signals List #5*** - **Frequency Response System** Data.

PPM1.7.1.1 ***Signals List #1***

The **Controllable PPM** shall make the following signals available at the designated **TSO Telecommunication Interface Cabinet** for that **Controllable PPM**:

(a) **Active Power** output (MW) at the lower voltage side of the **Grid Connected Transformer**;

(b) **Reactive Power** output/demand (+/-Mvar) at the lower voltage side of the **Grid Connected Transformer**;

(c) Voltage (in kV) at the lower voltage side of the **Grid Connected Transformer**;

(d) **Available Active Power** (MW) at the lower voltage side of the **Grid Connected Transformer**;

(e) **Grid Connected Transformer** tap positions;

(f)

i. **Power Factor** control mode status feedback (ON/OFF);

ii. **Power Factor** set-point feedback (degrees)

iii. **Reactive Power** control code status feedback (ON/OFF);

iv. **Reactive Power** set-point feedback (Mvar);

v. **Voltage Regulation** control mode status feedback (ON/OFF)

vi. **Voltage Regulation Set-point** feedback (kV);

(g) On/off status indications for all **Reactive Power** devices exceeding 5 Mvar[1];

(h) Circuit-breaker and disconnect position indication shall be required. These may include indications from MV circuit-breakers on individual **Generation Unit** circuits. Signals from individual **Generation Unit** circuit-breakers shall not be required. The actual circuit-breaker and disconnect signals required shall be specified by the **TSO** at least 120 **Business Days** prior to the **Controllable PPM's** scheduled **Operational Date**;

(i) A minimum of four sets of normally open potential free auxiliary contacts in each **Grid Connected Transformer** lower voltage bay for fault indications; and

(j) On/off status of **TSO** remote control enable switch, which disables the ability of the **TSO** to send commands to the **Controllable PPM**.

For the **Controllable PPM's** where the **Connection Point** is at the HV side of the **Grid Connected Transformer**, signals a), b) and c) above will also be required from the HV side of the **Grid Connected Transformer**.

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

PPM1.7.1.2 ***Signals List #2***

PPM1.7.1.2.1 **Controllable PPMs** with a **MEC** in excess of 10 MW shall make the following meteorological data signals available at the designated **TSO Telecommunication Interface Cabinet** for that **Controllable PPM**:

		<u>[Units, Range]</u>
(a)	Wind speed (at hub height or as agreed with the **TSO**) - measurand signal;	[m/s, 0-70]
(b)	Wind direction (at hub height or as agreed with the **TSO**) - measurand signal;	[deg, 0-360]
(c)	Air temperature- measurand signal;	[deg C, -40-70]
(d)	Air pressure- measurand signal.	[mBar, 735-1060]

PPM1.7.1.2.2 The meteorological data signals shall be provided by a dedicated **Meteorological Mast** located at the **Controllable PPMs** site or, where possible and preferable to do so, data from a means of the same or better accuracy. For **Controllable PPMs** where the **WTG** are widely dispersed over a large geographical area and rather different weather patterns are expected for different sections of the **Controllable PPM**, the meteorological data shall be provided from a number of individual **Meteorological Masts**, or where possible and preferable to do so, data from a source of the same or better reliability for groups of **WTG** (e.g. 1 set of meteorological data for each group of XX **WTG** within the **Controllable PPM**). It is expected that **WTG** 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** at least 120 **Business Days** prior to the **Controllable PPM's** scheduled **Operational Date.**

PPM1.7.1.2.3 **Controllable PPMs**, in excess of 5 MW, with the exception of **Controllable PPMs**, shall make relevant meteorological data signals available, which may include but are not limited to solar irradiance and tidal streams, at the designated **TSO Telecommunication Interface Cabinet** for that **Controllable PPM** as agreed with the **TSO.**

The actual signals required shall be specified by the **TSO** at least 120 **Business Days** prior to the **Controllable PPM's** scheduled **Operational Date.**

PPM1.7.1.2.4 The meteorological data signals shall be provided by a measurement device located at the **Controllable PPM** site, the exception of **Controllable PPM** sites, as defined by the **TSO.** All meteorological data signals shall at a minimum meet accuracy levels defined by the **TSO**.

For **Controllable PPMs**, with the exception of **Controllable PPMs,** where the **Generation Units** are widely dispersed over a large geographical area and rather different weather patterns are expected for different sections of the **Controllable PPM**, the meteorological data shall be provided from a number of individual sources. It is expected that **Generation Units** 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** at least 120 **Business Days** prior to the **Controllable PPM's** scheduled **Operational Date.**

PPM1.7.1.3 ***Signals List #3***

PPM1.7.1.3.1 **Controllable PPMs** with a **MEC** in excess of 10 MW shall make the following signals available at the designated **TSO Telecommunication Interface Cabinet** for that **Controllable PPM**:

a) **Controllable PPM Availability** (0-100 % signal);

b) Percentage of **WTG** shutdown due to high wind-speed conditions (0-100 %);

c) Percentage of **WTG** not generating due low wind-speed shutdown (0-100 %).

PPM1.7.1.3.2 For **Controllable PPMs** with a **MEC** in excess of 10 MW, where the **WTG** are widely dispersed over a large geographical area and rather different weather patterns are expected for different sections of the **Controllable PPM**, the above data set (ref. PPM1.7.1.3.1) shall be provided for a number of groups of **WTG** (e.g. 1 signal for each group of XX **WTG** within the **Controllable PPM**). It is expected that **WTG** 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** at least 120 **Business Days** prior to the **Controllable PPM's** scheduled **Operational Date.**

PPM1.7.1.3.3 **Controllable PPMs**, with a **MEC** in excess of 5 MW, with the exception of **Controllable PPMs,** shall make the following signals available at the designated **TSO Telecommunication Interface Cabinet** for that **Controllable PPM**:

a) **Controllable PPM Availability** (0-100 % signal);

b) Percentage of **Generation Unit** shutdown due to high resource conditions (0-100 %);

c) Percentage of **Generation Unit** not generating due to low resource conditions (0-100 %).

PPM1.7.1.3.4 For **Controllable PPMs**, with an **MEC** in excess of 5 MW, with the exception of **Controllable PPMs,** where the **Generation Units** are widely dispersed over a large geographical area and rather different weather patterns are expected for different sections of the **Controllable PPM**, the above data set (ref. PPM 1.7.1.3.3) shall be provided for a number of groups of **Generation Units** (e.g. 1 signal for each group of XX **Generation Units** within the **Controllable PPM**). It is expected that **Generation Units** 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** at least 120 **Business Days** prior to the **Controllable PPM's** scheduled **Operational Date.**

PPM1.7.1.4 ***Signals List #4***

The **Controllable PPM** shall make the following signals available at the designated **TSO Telecommunication Interface Cabinet** for that **Controllable PPM**:

a) **Active Power Control Set-point** feedback (MW);

b) **Active Power Control** status feedback (ON/OFF).

PPM1.7.1.5 ***Signals List #5***

The **Controllable PPM** shall make the following signals available at the designated **TSO Telecommunication Interface Cabinet** for that **Controllable PPM**:

a) Frequency Response Curve (i.e. *Power-Frequency Response Curve 1 or 2*);

b) **Frequency Response System** status feedback (ON/OFF);

c) **Frequency Response System Governor Droop** feedback (%).

○

With regard to real-time monitoring of **Frequency Sensitive Mode**, as described in PPM1.5.3.13, the **Controllable PPM** 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) actual parameter settings for **Active Power** frequency response; and

c) **Governor Droop** and **Frequency Response Deadband**.

The **TSO** shall specify additional signals to be provided by the **Generator** by monitoring and recording devices in order to verify the performance of the active power frequency response provision of participating **Controllable PPMs**.

PPM1.7.1.6 ***Time Delays and Data Quality***

Digital signal changes from the **Controllable PPM** shall be relayed to the **TSO Telecommunication Interface Cabinet** within 1 second of the associated change of state event. Analogue signal changes shall be relayed within 5 seconds and with an error of 0.5% or less, with the exception of the Meteorological Data required as per **PPM1.7.1.2**, which shall be updated within 5 seconds and with an error of 2.5% or less.

PPM1.7.2 **CONTROL SIGNALS FROM THE TSO TO CONTROLLABLE PPM**

PPM1.7.2.1 The control signals described in PPM1.7.2 shall be sent from the **TSO** to the **Controllable PPM**. The **Controllable PPM** shall be capable of receiving these signals and acting accordingly.

PPM1.7.2.2 **Active Power Control**

An **Active Power Control Set-point** signal shall be sent by the **TSO** to the **PPM Control System**. This set-point shall define the maximum **Active Power** output permitted from the **Controllable PPM**. The **PPM Control System** shall be capable of receiving this signal and acting accordingly to achieve the desired change in **Active Power** output. This signal shall be in the form of a single analogue value and a strobe pulse to enable.

The **Controllable 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 PPM1.7.1.4.

PPM1.7.2.3 **Frequency Response**

The Frequency Response Curve signal shall be sent by the **TSO** to the **Controllable 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 **Controllable PPM** is required to make it possible for the **TSO** to remotely enable/ disable the **Frequency Response System**. The associated status indication is described in PPM1.7.1.5.

The **Controllable PPM** shall make it possible for the **TSO** to set the **Governor Droop** value of the **Frequency Response System** in values from 2% to 10%.

PPM1.7.2.4 **Voltage Regulation**

The following signals shall allow the **TSO** to select **Reactive Power** control mode and send **Reactive Power** control set-points to the **Voltage Regulation System**. Set-point signals shall be in the form of a single analogue value and a strobe pulse to enable.

- **Power Factor** control mode with **Power Factor** set-point (PF set-point)
- **Reactive Power** control mode with **Reactive Power** set-point (Q set-point)
- **Automatic Voltage Regulation** control mode with **Voltage Regulation Set-point** (kV set-point)

PPM1.7.2.5 **Black Start Shutdown**

Means shall be provided by the **Controllable PPM** to facilitate the disconnection of the **Controllable PPM** by the **TSO** and to also prevent re-connection in the event of **Black Start**. The **TSO** shall send a **Black Start Shutdown** signal and upon receipt, the **Controllable PPM** shall be required to trip the circuit-breaker(s) at the **Controllable PPM's Connection Point** and shutdown the **Controllable PPM** in a controlled manner. The precise circuit-breakers for which this facility shall be provided shall be specified by the **TSO** at least 120 **Business Days** prior to the **Controllable PPM's** scheduled **Operational Date. Controllable PPMs** may only be reconnected (i.e. made live) when the **Network** is fully restored following instruction from the **TSO**[2] and only earlier if the **TSO** deems it acceptable to do so.

PPM1.7.2.6 **Time Delays and Data Quality**

PPM1.7.2.6.1 Digital output commands from the **TSO Telecommunication Interface Cabinet** shall be relayed to the **Controllable PPM** equipment within 1 second. Set-point output signals shall be relayed within 5 seconds and with an error of 0.5% or less.

PPM1.7.3 **RESPONSIBLE OPERATOR**

A designated **Responsible Operator** shall be contactable by the **TSO** at all times to discuss operational matters without undue delay and in any case within 15 minutes. Following a request from the **TSO**, the **Responsible Operator** shall be present at the **Controllable PPM's Connection Point** without undue delay and in any case within one 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.

[2] Typically this instruction will be in the form of a Blackstart Shutdown OFF command

PPM1.7.4 **DATA AND COMMUNICATIONS SPECIFICATIONS**

PPM1.7.4.1 The location of the **TSO Telecommunication Interface Cabinet** shall be agreed between the **TSO** and the **Controllable PPM** at least 120 **Business Days** prior to the **Controllable PPM's** scheduled **Operational Date**. A standard interface for signals will be made available to the **Controllable PPM** by the **TSO**.

PPM1.7.4.2 The necessary communications links, communications protocol and an individual **Controllable PPM** signal list shall be specified by the **TSO** at least 120 **Business Days** prior to the **Controllable 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.

PPM1.7.4.3 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 **TSO**.

PPM1.7.4.4 If **Active Power Control**, **Frequency Response** or **Voltage Regulation** facilities for the **Controllable PPM** become unavailable, the **Controllable PPM** shall contact the **TSO** without undue delay.

PPM1.7.4.5 Where signals or indications required to be provided by the **Controllable PPM** under PPM1.7.1 and PPM 1.7.2 become unavailable or do not comply with applicable standards due to failure of the **Controllable PPM's** technical equipment or any other reason under the control of the **Controllable PPM**, the **Controllable PPM** shall, acting in accordance with **Good Industry Practice**, restore or correct the signals and/or indications as soon as possible.

PPM1.7.5 **PPM RESOURCE FORECASTS**

PPM1.7.5.1 Should the **TSO** determine that resource forecasts as produced by the **Controllable PPM** are required, the **TSO** shall inform the **Controllable PPM** and the resource forecasts shall be provided by the **Controllable PPMs**. These forecasts, if required, shall be provided in a format and timescale as specified by the **TSO**, and by means of an **Electronic Interface** in accordance with the reasonable requirements of the **TSO's** data system.

PPM1.7.5.2 **Controllable PPMs** shall engage fully with the **TSO** to ensure that the necessary information is available to the **TSO** for the production of resource generation forecasts with the appropriate level of accuracy by the **TSO**. Where this engagement involves the provision of data by the **Controllable PPM** to the **TSO**, this data must be provided as soon as reasonably practicable, or in any event, within 60 business days of the date of the request.

PPM1.7.6 **CONTROLLABLE PPM MW AVAILABILITY DECLARATIONS**

Controllable PPMs shall submit **Controllable PPM MW Availability Declarations** whenever changes in **Controllable 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 the **TSO**'s data system.

Glossary

Acronyms

AC	Alternating Current
ACER	Agency for the Cooperations of Energy Regulators
AFR	Automatic Frequency Restoration
AGC	Automatic Generator Control
AHDL	Allocated Harmonic Distortion Limit
ALVDD	Automatic Low Voltage Demand Disconnection
AVR/AVC	Automatic Voltage Regulation / Automatic Voltage Control
BGE	Bord Gais Éireann
BS	British Standard
BSP	Bulk Supply Point
CB	Circuit Breaker
CCGT	Combined Cycle Gas Turbine
CDGU	Centrally Dispatched Generation Unit
CENELEC	Comité Européan de Normalisation Electrotechnique
CO_2	Carbon Dioxide
COP	Committed Outage Programme
CRU	Commission for Regulation of Utilities
DC	Direct Current
DCC	Distribution Control Centre
DI	Dispatch Instruction
DMOL	Design Minimum Operating Level
DSO	Distribution System Operator
ECC	Emergency Control Centre
ESB	Electricity Supply Board

EON	Energisation Operational Notification
ESO	External System Operator
ESPS	Energy Storage Power Station
ESU	Energy Storage Unit
ETSO	European Transmission System Operators
FON	Final Operational Notification
GC	General Conditions
GCRP	Grid Code Review Panel
GS	Generation Schedule
GT	Gas Turbine
HV	High Voltage
HVDC	High Voltage Direct Current
IEC	International Electrotechnical Committee
ION	Interim Operational Notification
IOP	Indicative Outage Programme
ITU	International Telecommunications Union
JGCRP	Joint Grid Code Review Panel
LON	Limited Operational Notification
LV	Low Voltage
MEC	Maximum Export Capacity
MIC	Maximum Import Capacity
MO	Market Operator
MV	Medium Voltage
NCC	National Control Centre
NCDGU	Non-Centrally Dispatched Generating Unit
NIAUR	Northern Ireland Authority for Utility Regulation
NIE	Northern Ireland Electricity

OC	Operating Code
OLTC	On load Tap Changer
POP	Provisional Outage Programme
POR	Primary Operating Reserve
PPM	Power Park Module
PSP	Pumped Storage Plant
RMS	Root Mean Square
RTU	Remote Terminal Unit
SCADA	Supervisory Control and Data Acquisition
SDC	Scheduling and Dispatch Code
SEM	Single Electricity Market
THD	Total Harmonic Voltage Distortion
TSC	Trading and Settlement Code
SLR	Special Load Reading
SONI	System Operator Northern Ireland
SOR	Secondary Operating Reserve
SVC	Static Var Compensator
TAO	Transmission Asset Owner
TRM	Transmission Reliability Margin
TOR	Tertiary Operating Reserve
TSO	Transmission System Operator
TTC	Total Transfer Capacity
UFR	Under Frequency Relay
Un	Nominal Voltage
VO	Voluntary Outage
WTG	Wind Turbine Generator

Units

A	Amp(s)
°C	Degrees Celsius
GW	Giga Watt
GWh	Giga Watt hour
hPa	hecto Pascal
Hz	Hertz
kA	kilo Ampere
kW	kilo Watt
kWh	kilo Watt hour
kV	Kilo Volt
MWh	Mega Watt hour
MW	Mega Watt
TWh	Tera Watt hour
MVA	Mega Volt Ampere
Mvar	Mega Volt Ampere reactive / Megavar
Mvarh	Megavar hour
var	Volt Ampere reactive

Definitions

Act	The Electricity Regulation Act 1999.
Active Energy	The electrical energy produced, flowing or supplied by an electric circuit during a time interval, being the integral with respect to time of the instantaneous **Active Power**, measured in units of Watt-hours or standard multiples thereof, i.e.: 1000 Watt-hours = 1 Kilo Watt-hour (kWh) 1000 Kilo Watt-hour = 1 Mega Watt-hour (MWh) 1000 Mega Watt-hour = 1 Giga Watt-hour (GWh) 1000 Giga Watt-hour = 1 Tera Watt-hour (TWh)
Active Power	The product of the components of alternating current and voltage that equate to true power which is measured in units of watts and standard multiples thereof, for example: 1000 Watts = 1 kW; 1000 kW = 1 MW; 1000 MW = 1 GW.
Active Power Control	The automatic change in **Active Power** output from a **Controllable 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** 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 **Controllable 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.
Additional Grid Code Availability Notice	A notice submitted by a **User** to the **TSO** pursuant to SDC1.4.2 relating to additional data on **Availability**.
Additional Grid Code Characteristics Notice	A notice to be submitted to the **TSO** pursuant to SDC1.4.4.2 relating to additional technical data.
AGC Control Range	The range of loads over which **AGC** may be applied.
AGC Maximum Load	The upper limit of the **AGC Control Range.**
AGC Minimum Load	The lower limit of the **AGC Control Range.**
Aggregate Interconnector Ramp Rate	The maximum **Ramp Up Rate** for an **Interconnector** or maximum **Ramp Down Rate** as determined by the **TSO**.

Aggregated Demand Site	A group of **Individual Demand Sites** represented by a **Demand Side Unit Operator**, which together are capable of a **Demand Side Unit MW Capacity** 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 and shall have a **Demand Side Unit MW Capacity** of no greater than **10 MW**. Unless otherwise specified, information submitted in respect of an **Aggregated Demand Site** shall always be at an aggregated level.
Aggregated Generating Unit	A group of **Generating Units** represented by a **Generator Aggregator**, each of which must not have a **Registered Capacity** greater than 10 MW. An **Aggregated Generating Unit** with a total **Registered Capacity** of 4 MW or more shall be subject to Central Dispatch, but one with a total Registered Capacity of less than 4 MW may be subject to **Central Dispatch** subject to agreement with the **TSO**. Unless otherwise specified by the TSO or otherwise in the **Grid Code**, information submitted in respect of an **Aggregated Generating Unit** shall always be at an aggregated level.
Aggregated Maximum Export Capacity	In the case of a **Generator Aggregator**, the aggregated value (in **MW,** MVA, kW and/or kVA) provided in each **Connection Agreement** (or connection agreement to the **Distribution System**, as the case may be) for the **Generating Units** for which the **Generator Aggregator** is responsible.
Aggregator	Either a **Generator Aggregator** or a **Demand Side Unit Operator** in respect of an **Aggregated Demand Site**.
Alert	A **Red Alert**, an **Amber Alert** or a **Blue Alert** or other Alert warning as agreed pursuant to OC9 (Emergency Control and Power System Restoration)
Allocated Harmonic Distortion Limit (AHDL)	The **Allocated Harmonic Distortion Limit** to a **User's** connection is the maximum **Incremental Harmonic Voltage Distortion Level** that the **User's** facility is allowed to introduce in the **Transmission System Voltage**. The **AHDL** is assessed at the **Connection Point** and it is expressed as a percentage of the **RMS** value of the fundamental **Frequency Voltage**. The **AHDL** applies to the **THD** and to each individual harmonic order from the 2^{nd} up to, and including, the 40^{th}.
Amber Alert	An alert issued by the **TSO** to the **Users** when a single **Event** would give rise to a reasonable possibility of failure to meet the **Power System Demand**, or of **Frequency** or **Voltage** departing significantly from normal or if multiple **Events** are probable due to prevailing weather conditions.
Ancillary Service	A service, other than the production of electricity, which is used to operate a stable and secure **Power System** including. **Reactive Power, Operating Reserve, Frequency Control** and **Blackstart Capability**.
Ancillary Service Agreement	The bilateral agreement between the **TSO** and the **User,** which contains the detail specific to the **User's** provision of **Ancillary Services.**

Annual Maintenance Outage	A transmission outage that is scheduled with reasonable notice to the relevant **Generator**(s) in advance of the start of the outage for planned maintenance of equipment that is part of an **Outturn Availability Connection Asset.**
Annual SLR Conditions	12.30 and 18.00 on the second Tuesday of January or any other day nominated by **DSO**.
Apparatus	An item of equipment in which electrical conductors are used, supported or of which they may form part and includes meters, lines, cables and appliances used or intended to be used for carrying electricity for the purpose of supplying or using electricity.
Apparent Power	The product of voltage and of alternating current measured in units of volt-amperes and standard multiples thereof.
Automatic Frequency Restoration	A system for reconnecting **Demand Customers** automatically following a **Low Frequency Event** on the **Transmission System**, once the **Frequency** has recovered.
Automatic Generator Control (AGC)	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**
Automatic Low Voltage Demand Disconnection (ALVDD)	The automatic disconnection of **Demand Customers** when the Voltage or the rate of change of voltage has violated acceptable limits as determined by the **TSO.**
Automatic Mains Failure Mode	The operation of **Generation Unit(s)** at an **Individual Demand Site** of a **Demand Side Unit** where in the event of **Disconnection**, the **Generation Unit(s)** is(are) enabled and supplies(y) the **Demand Customer's** or **DSO Demand 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)**.
Automatic Voltage Regulation	Automatic maintenance of a **Generation Unit's** terminal voltage or **Interconnector's Reactive Power** output at a desired setpoint
Automatic Voltage Regulator	A continuously acting automatic closed loop control system acting on the excitation system so as to maintain a **Generation Unit's** terminal voltage at a desired setpoint.
Autoproducer	Persons to whom electrical **Energy** is provided and by whom the electrical **Energy** is generated essentially for their own use, by means of a direct connection to the **Transmission System**.
Auxiliaries	Any item of **Plant** and/or **Apparatus** not directly a part of the boiler plant or **Generating Unit**, but required for the boiler plant's or **Generating Unit's** functional operation. 'Auxiliary' shall be defined accordingly.
Auxiliary Diesel Engine	A diesel engine driving a **Generating Unit** which can supply a **Unit Board** or **Station Board**, which can start without an electrical power supply from outside the **Power Station** within which it is situated.

Auxiliary Fuel	A fuel other than a **Primary Fuel** which may be used for start up purposes or for support of combustion or **Maximisation** when the **Generation Unit** is producing **Energy**
Auxiliary Load	The electrical **Demand** of the **Generation Unit's Auxiliary Plant** required for the operation of the **Generation Unit**.
Auxiliary Plant	Any item of **Plant** and/or **Apparatus** not directly a part of the boiler plant or **Generation Unit**, but required for the boiler plant's or **Generation Unit's** functional operation.
Availability	At any given time the measure of **Active Power** a **Generation Unit(s)** is capable of delivering to the **Connection Point** and the term "**Availabilities**" shall be construed accordingly. This can be calculated as a gross figure. In terms of a **Demand Side Unit**, the **Demand Side Unit MW Capacity** as the measure at any given time of the capability of the **Demand Side Unit** to reduce **Demand.** At any given time the measure of **Active Power** an **Interconnector** is capable of importing to or exporting from the **Connection Point** and the term **"Availabilities"** shall be constructed accordingly. This can be calculated as a gross figure.
Availability Factor	The ratio of the **Energy** that could have been produced during a specified period of time by a **Generation Unit** operating in accordance with its **Availability**, and the **Energy** that could have been produced during the same period by that **Generation Unit** operating at its **Registered Capacity**. **Availability Factor** can alternatively be reported in gross terms.
Availability Notice	A notice to be submitted to the **TSO** pursuant to SDC1.4.1.1.
Available Active Power	The amount of **Active Power** that the **Controllable PPM** could produce based on current resource conditions. The **Available Active Power** shall only differ from the actual **Active Power** if the **Controllable PPM** has been curtailed, constrained or is operating in a restrictive **Frequency Response** mode.
Black Start	The procedure necessary for a recovery from a **Total Shutdown** or **Partial Shutdown**.
Black Start Capability	Ability in respect of a **Black Start Station**, for at least one of its **Centrally Dispatched Generation Units** or **Interconnector** to start-up from **Shutdown**, without importing energy from the **Transmission System**, and to energise a part of the **Transmission System** and be **Synchronised** or energised (for **Interconnectors**) to the **Transmission System** upon instruction from the **TSO.**
Black Start Shutdown	In the event of a **Partial Shutdown** or **Total Shutdown** of the **Transmission System**, the **Controllable PPM** shall be sent a **Black Start Shutdown** signal by the **TSO** and upon receipt of the signal, the **Controllable PPM** shall trip the circuit breaker(s) at the **Connection Point** and shutdown the **Controllable PPM** in a controlled manner.

Black Start Station	A **Power Station** and/or **Interconnector** which is registered pursuant to **Grid Code** as having a **Black Start Capability**
Block Load	The level of output that a **Generating Unit** immediately produces following **Synchronisation**. For avoidance of doubt, **Block Load** can equal 0 MW.
Block Load Cold	**Block Load** during a **Cold Start**.
Block Load for an Interconnector	The level of output, in either flow direction, that an **Interconnector** immediately produces following energisation. For avoidance of doubt, **Block Load** can equal 0 **MW** and can be different in either flow direction.
Block Load Hot	**Block Load** during a **Hot Start**.
Block Load Warm	**Block Load** during a **Warm Start**.
Blue Alert	An alert issued by the **TSO** signifying that either a **Partial Shutdown** or a **Total Shutdown** of the **Power System** has taken place.
Business Day	Monday through Friday excluding public holidays and holidays observed by the **TSO**.
Cancelled Start	A response by a **Generator** to an instruction from the **TSO** cancelling a previous instruction to **Synchronise** to the **Transmission System**.
Capacity	The rated continuous load-carrying ability, expressed in megawatts (MW) or megavolt-amperes (MVA) of generation, transmission, or other electrical equipment.
Capacity Adequacy	When there is sufficient **Generation Capacity** to meet the **Demand** and **Reserve** requirements.
Capacity Adequacy Indicator	An indication issued by the **TSO** for each weekly peak of the year based on **Availability** and **Demand** forecasts whether or not there is sufficient **Generation Capacity** to meet **Demand.**
Capacity Shortfall Warning	A warning issued by the **TSO** that based on **Availability** and **Demand** forecasts there is insufficient **Generation Capacity** to meet the peak **Demand.**
CCGT Installation	A collection of **Generation 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 Units** is passed to the water/steam system of the associated **Steam Unit** or **Steam Units** and where the component **Generation 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 Installation Matrix	The matrix which must be submitted by a **Generator** under the **Planning Code** and which is used by the **TSOs** for **Scheduling** and **Dispatch** purposes under the **SDCs** as a "look up" table determining which **CCGT Units** will be operating at any given **MW Dispatch** level subject to any updated **Availability** information submitted by a **Generator** to a **TSO** under **SDC1**.
CCGT Unit	A **Generation Unit** within a **CCGT Installation**

Central Dispatch	The process of Scheduling and issuing Dispatch Instructions directly to a Control Facility by the TSO pursuant to the Grid Code. All Dispatchable PPMs, Interconnectors, Pumped Storage Plant Demand, Energy Storage Power Station Demand, Demand Side Units, and Aggregated Generating Units are subject to Central Dispatch. In relation to all other Generation Units, thresholds apply as follows: • all other Generation Units with a Registered Capacity of 10 MW or more are subject to Central Dispatch; • all other Generation Units with a Registered Capacity of 5 MW or more and less than 10 MW are not subject to Central Dispatch unless required by the TSO; however, such Generation Units can elect to be subject to Central Dispatch; • all other Generation Units with a Registered Capacity of less than 5 MW are not subject to Central Dispatch unless required by the TSO; • any Power Station, which has an aggregate Registered Capacity of 10 MW or more, consisting of more than one Generation Unit that is not otherwise subject to Central Dispatch, is subject to Central Dispatch as an Aggregated Generating Unit; • all Generation Units with a Registered Capacity of less than 10 MW can elect whether to comply with SDC1.4.4.5 relating to the submission of Commercial Offer Data.
Centrally Dispatched Generating Unit	A Generating Unit within a Power Station subject to Central Dispatch, which comprises, unless specified otherwise in relation to a particular use of the term, a Thermal Plant including a CCGT Installation, a Dispatchable PPM, Hydro Unit and Pumped Storage Plant in respect of its Pumped Storage Generation.
Charging Capacity	The maximum amount of Energy consumed by Energy Storage Power Station when acting as an Energy Storage Power Station Demand.
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**. This is a separate system to the **Distribution System**.
Closed Distribution Systems Operator	An entity which is responsible for, amongst other things, the planning, development, operation and maintenance of a **Closed Distribution System.**
Cold Start	Any Synchronisation of a Generating Unit that has previously not been Synchronised for a period of time longer than its submitted Warm Cooling Boundary.

Collector Network	The network of cables and overhead lines within a Controllable PPM used to convey electricity from individual Generation Units to the Connection Point.
Combustion Turbine Unit	A Generation 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.
Commercial Energy Metering	Metering which is utilised to measure Energy for Tariff charging purposes.
Commercial Offer Data	The commercial offer data submitted to the MO pursuant to the TSC.
Commissioning	Activities involved in undertaking the Commissioning Test or implementing the Commissioning Instructions pursuant to the terms of the Connection Agreement or as the context requires the testing of any item of users equipment required pursuant to this Grid Code prior to connection or re-connection in order to determine that it meets all requirements and standards for connection to the Transmission System. It also includes activities that determine the new values of parameters that apply to it following a material alteration or modification and in addition those activities involved in undertaking the Commissioning Tests or implementing the Commissioning Instructions as the context requires.
Commissioning Instructions	A step-by-step test procedure for a Commissioning Test.
Commissioning Test	Testing of a CDGU, Controllable PPM, Pumped Storage Plant Demand, Demand Side Units, Aggregated Generating Units, Interconnector or an item of User's Equipment required pursuant to the Connection Conditions prior to connection or re-connection in order to determine whether or not it is suitable for connection to the System and also to determine the new values of parameters to apply to it following a material alteration or modification of a CDGU, Controllable PPM, Pumped Storage Plant Demand, Demand Side Units, Aggregated Generating Units, Interconnector or of an item of User's Equipment and the term “Commissioning Testing” shall be construed accordingly.
Committed Outage Programme	A programme of Outages of the Generator’s Generation Units and of Interconnectors prepared by the TSO pursuant to Section OC2 and covering year 1.
Committed Project Planning Data	Data relating to a User Development once the offer for a Connection, Use of System Agreement and/or supplemental agreements are accepted.
Communications and Control Room	The communications and control room to be provided by the User in accordance with the Connection Agreement
Connection Agreement	The bilateral agreement between the TSO and the User, which contains the detail specific to the User's connection to the Transmission System.
Connection Conditions	The section of this Grid Code which is identified as the Connection Conditions.

Connection Date	The date on which the Commissioning Instructions have to the TSO's satisfaction been properly implemented in respect of every part of the User's Equipment, following which the TSO shall, as soon as reasonably practicable notify the User to that effect, specifying the date of completion of such implementation
Connection Offer	A quotation letter together with the unsigned **Connection Agreement** which forms the **TSO's** offer for connection of the **Facility** to the **Transmission System** as the result of an application for connection of the **Facility**.
Connection Point	The physical point where the **User's Plant Apparatus** or **System** is joined to the **Transmission System** or the **Distribution System**.
Connection Site	The site at which the **Plant** and **Apparatus** of the **User** at the **User's** side of the **Connection Point** is to be installed including the land, spaces, roads and any surfaces.
Constrained Group	A group of **Generating Units** located within a constrained part of the **System** as determined by the **TSO**.
Contingency	The unexpected failure or **Outage** of a system component, such as a **Generation Unit**, transmission line, circuit breaker, switch, or other electrical element. A **Contingency** also may include multiple components, which are related by situations leading to simultaneous component outages.
Contingency Reserve	The margin of available **Generation Capacity** over forecast **System Demand** which is required in the period of 24 hours ahead down to real time, to cover against uncertainties in availability of **Generation Capacity** and against **Demand** forecast errors or variations
Continuous Parallel Mode	Unrestricted periods of **Synchronised** operation of **Generation Unit(s)** to the **Transmission System** or **Distribution System** at an **Individual Demand Site** of a **Demand Side Unit**, subject to **Connection Agreement** or **DSO Connection Agreement** conditions.
Control Action	An action, such as switching, whereby the **Transmission System** is operated.
Control Centre	A location used for the purpose of monitoring, control and operation of the **Transmission System** or a **User System** other than a **Generator's System**.
Control Facility	A location used for the purpose of **Monitoring**, control and operation of the **User 's Plant** and **Apparatus** and for accepting **Dispatch Instructions** via **Electronic Interface**.
Control Phase	The **Control Phase** follows on from the **Programming Phase** and starts with the issue of the **Generation Schedule** for the next day and covers the period down to the real time
Control Synchronising	The coupling (by manual or automatic closing of the circuit breaker) of two asynchronous **Systems** by means of synchroscope.
Controllable PPM	A site containing at least one **PPM** 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 output which can be produced by a **Controllable PPM** given favourable resource conditions. Account shall be taken of partial and/or full outages of individual **Generation Units** within the **Controllable PPM**.
Controllable PPM Operator	The operator of the **Controllable PPM**.
Controlled Active Power	The amount of **Active Power** that a **Controllable PPM** is permitted to export based on the **Active Power Control Set-point** signal sent by the **TSO**.
Critical Fault Clearance Time	The longest fault duration not leading to out-of-step conditions such as pole-slipping in a **Generating Unit** following a **Fault Disturbance**. **Critical Fault Clearance Time** will vary according to the active and reactive power output of the **Generating Unit**. The minimum **Critical Fault Clearance Time** for a particular **Fault Disturbance** is likely to occur when the **Generating Unit** is at maximum **Active Power** output and maximum leading **Reactive Power** output.
Current Source Technology	Current source inverters include all static devices generating an AC current from a rectified DC current source. The intermediate DC current is kept constant with a controlled rectifier and high inductance reactors, while the AC output is of variable **Frequency** and **Voltage**.
Customer	A person to whom electrical power is provided (whether or not this is the same person who provides the electrical power).
Customer Demand Management	Reducing the supply of electricity to a **Customer** or disconnecting a **Customer** in a manner agreed for commercial purposes between a **Supplier** and its **Customers**
Cycle Operating Mode	The **Open Cycle Mode** or combine cycle **Operating Mode** of a **CCGT Installation** which may need to be specified pursuant to a **Dispatch Instruction** under SDC2.4.2.4(j).
DCC Unit	A **Demand Facility**, **Closed Distribution System** or **Distribution System** that is not a **Non-DCC Unit.** A **Pumped Storage Unit** which only operates as **Pumped Storage Plant Demand**, and does not meet **Non-DCC Unit** criteria, is classified as a **DCC Unit**.
Declaration	A notice prepared by the **User** in respect of a **User's Plant** submitted to the **TSO** in accordance with the requirements of SDC1 and setting out the values (and times applicable to those values) of **Availability**, **Ancillary Services** capabilities, **Operating Characteristics**, and "**Declared**" shall be construed accordingly.
Declared Operating Characteristics	The **Operating Characteristics** which the **Generator** or **Demand Side Unit Operator** shall have informed the **TSO** under the provisions of **SDC1** and which shall reasonably reflect the true **Operating Characteristics** of the **Generation Unit** or **Demand Side Unit.**
De-energise	Disconnect from the **Transmission System** utilising circuit switches etc to isolate the **Plant** and/or **Apparatus**, and "**De-**

	energised” and “**De-energising**” shall be construed accordingly.
Deload Break Point	The point at which due to technical reason a **Generating Unit** may need to pause during its **MW Output** reduction process.
De-Loading Rate	The rate at which a **Generation Unit** reduces **MW Output** from **Minimum Generation** to zero when it is instructed to cease output. There are up to two possible deloading rates, which shall be named accordingly: **De-Loading Rate** 1 and **De-Loading Rate** 2.
Demand	The amount of electrical power consumed by the **Power System** comprising of both **Active** and **Reactive Power**, unless otherwise stated.
Demand Control	All or any of the methods of achieving a **Demand** reduction or an increase in **Demand** as set out in OC5.
Demand Control Alert	A warning issued by the **TSO** when the **TSO** anticipates that it will or may instruct the **DSO** to implement **Demand** reduction.
Demand Customer	An person to whom electrical **Energy** is provided by means of a direct connection to the **Transmission System**. **Autoproducers** are to be considered both **Generators** and **Demand Customers**. **Demand Facilities** are a type of **Demand Customer.**
Demand Disconnection	Disconnection of **Demand Customers.**
Demand Facility(ies)	A facility which consumes electrical energy and is connected at one or more **Connection Points** to the **Transmission System**. The **Distribution System** and/or auxiliary supplies of a **Generation Unit** do not constitute a **Demand Facility**.
Demand Facility Owner	A person who owns a **Demand Facility**.
Demand Side Unit	An **Individual Demand Site** or **Aggregated Demand Site** with a **Demand Side Unit MW Capacity** of at least 4 MW. The **Demand Side Unit** shall be subject to **Central Dispatch**.
Demand Side Unit Best Correlated Profile	The four **Demand Side Unit Profiles** from one day to eighty-four days prior to the **Dispatch Instruction**, offset to minimise the average absolute error across all the **Meter** periods comprising the **Demand Side Unit Profile** when compared to the **Demand Side Unit Profile** which finishes with the **Dispatch** period, resulting in the four smallest average absolute errors, averaged.
Demand Side Unit Energy Profile	The estimated total **Energy** requirement for an **Individual Demand Site** or aggregated consumption for each **Individual Demand Site** which form part of an **Aggregated Demand Site** for each **Imbalance Settlement Period** in the following **Trading Day** and which must be submitted to the **TSO** in the **Availability Notice** under SDC1.4.4.2.
Demand Side Unit Calculated MWh Response	The value of the quarter-hour **Demand Side Unit Performance Monitoring Baseline** less the sum of the quarter-hour **Meter** readings of all the **Individual Demand Sites** that comprise the **Demand Side Unit** aligned to a quarter-hour **Meter** period.

Demand Side Unit MW Availability	The forecasted change in **Active Power** which can be achieved in one currency zone by a **Demand Side Unit** for each **Imbalance Settlement Period** in the following **Trading Day** period and which must be submitted by the User to the **TSO** in an **Availability Notice** under SDC1.4.1.2.
Demand Side Unit MW Capacity	The maximum change in **Active Power** that can be achieved by a **Demand Side Unit** on a sustained basis for the duration of the **Demand Side Unit's Maximum Down Time** by totalling the potential increase in on-site **Active Power Generation** and the potential decrease in on-site **Active Power Demand** at each **Individual Demand Site.**
Demand Side Unit MW Response	The proportion (in **MW**) of the **Demand Side Unit MW Capacity** that is delivered at a given time following a **Dispatch Instruction** from the **TSO**. This value will be zero unless dispatched by the **TSO**.
Demand Side Unit MW Response Time	The time as specified by the **Demand Side Unit Operator** in the **Technical Parameter** and is the time it takes for the **Demand Side Unit Operator** to be able to implement the **Demand Side Unit MW Response** from receipt of the **Dispatch Instruction** from the **TSO.**
Demand Side Unit MWh Response	The equivalent **Energy** in a quarter-hour **Meter** period of a **Demand Side Unit MW Response** requested in a **Dispatch Instruction**.
Demand Side Unit Notice Time	The time as specified by the **Demand Side Unit Operator** in the **Technical Parameter** and is the time it takes for the **Demand Side Unit** to begin ramping to the **Demand Side Unit MW Response** from receipt of the **Dispatch Instruction** from the **TSO**.
Demand Side Unit Operator	A person who operates a **Demand Side Unit**, with an aggregated **Demand Side Unit MW Capacity** not less than 4 MW.
Demand Side Unit Performance Monitoring Baseline	An **Energy** value for each quarter-hour **Meter** period while a **Demand Side Unit** is **Dispatched**. It is the **Demand Side Unit Best Correlated Profile** excluding the first forty-eight quarter-hour **Meter** periods.
Demand Side Unit Performance Monitoring Error	The absolute value of the **Demand Side Unit Calculated MWh Response** less the **Demand Side Unit MWh Response**.
Demand Side Unit Performance Monitoring Percentage Error	The absolute value of the **Demand Side Unit Calculated MWh Response** less the **Demand Side Unit MWh Response** divided by the **Demand Side Unit MWh Response**.
Demand Side Unit Profile	Consecutive aggregated **Meter** readings of all **Individual Demand Sites** that comprise a **Demand Side Unit** for each of the full quarter-hour **Meter** periods in a twelve-hour period plus the duration of **Dispatch**. If the **Demand Side Unit** was **Dispatched** during the period the **Demand Side Unit Calculated MWh Response** in the same quarter-hour **Meter** periods are added, except in the case of the **Dispatch** being monitored. In this case the accumulated **Energy** calculated from **Demand Side Unit MW Response** from **Generation** operating in **Continuous Parallel Mode** or **Shaving Mode** signal (CC.12.2 (l)) plus the **Demand Side Unit MW Response**

	from avoided **Demand** consumption and **Generation** operating in **Lopping Mode**, **Standby Mode** or **Automatic Mains Failure Mode** signal (CC.12.2 (m)) are added.
Demand Side Unit Ramp Time	The time it takes for a **Demand Side Unit** to ramp to the **Demand Side Unit MW Response.** It is equal to the **Demand Side Unit MW Response Time** less the **Demand Side Unit Notice Time.**
Demand Side Unit SCADA Error	The **Demand Side Unit Calculated MWh Response** less the accumulated **Energy** calculated from **Demand Side Unit MW Response** from **Generation** operating in **Continuous Parallel Mode** or **Shaving Mode** signal (CC.12.2 (l) plus the **Demand Side Unit MW Response** from avoided **Demand** consumption and **Generation** operating in **Lopping Mode, Standby Mode** or **Automatic Mains Failure Mode** signal (CC.12.2 (m)) in the same quarter-hour **Meter** period.
Demand Side Unit SCADA Percentage Error	The **Demand Side Unit Calculated MWh Response** less the accumulated **Energy** calculated from **Demand Side Unit MW Response** from **Generation** operating in **Continuous Parallel Mode** or **Shaving Mode** signal (CC.12.2 (l) plus the **Demand Side Unit MW Response** from avoided **Demand** consumption and **Generation** operating in **Lopping Mode**, **Standby Mode** or **Automatic Mains Failure Mode** signal (CC.12.2 (m)) divided by **Demand Side Unit Calculated MWh Response** the in the same quarter-hour **Meter** period.
De-maximisation Instruction	An instruction issued by the **TSO** to **Generators** to cease **Maximisation**.
Design Minimum Operating Level (DMOL):	The minimum **Active Power** output of **Controllable PPM** where all **Generation Units** are generating electricity and capable of ramping upwards at any of the specified ramp rates (given available resource), and shall not be greater than 12% of **Registered Capacity**.
Designated Operator	The operators approved in writing by the relevant **User** as competent to carry out the procedures in the agreed **Operation Instructions** for parties connecting to the **Transmission System**
De-Synchronise	The act of taking a **Generation Unit** which is **Synchronised** to the **Transmission System** off the **Transmission System** to which it has been Synchronised and the term "**De-Synchronised**", and other like terms, shall be construed accordingly.
De-Synchronising	The act of taking a **Generating Unit** off the **Network**, to which it has been **Synchronised**, and like terms shall be construed accordingly.
Disconnection	The physical separation of **Users** (or **Customers**) from the **Transmission System** or a **User System** as the case may be.
Dispatch	The issue by the **TSO** of instructions to a **Generator, Pumped Storage Generator**, **Interconnector Owner**, **Interconnector Operator**, **Demand Side Unit Operator** or **Generator Aggregator** in respect of its **CDGU**, **Pumped Storage Plant Demand**, **Demand Side Unit, Aggregated Generating Units**, or **Interconnector** pursuant to **SDC2** and the term "**Dispatched**" shall be construed accordingly.

Dispatch Instruction	An instruction given by the **TSO** to a **CDGU**, **Demand Side Unit, Interconnector** and/or **Pumped Storage Plant Demand** to that **User's** approved **Control Facility** to change the output, fuel or manner of operation of the **CDGU**, **Demand Side Unit, Interconnector** and/or **Pumped Storage Plant Demand**. "**Instruct**" and "**Instructed**" shall be construed accordingly.
Dispatch Instruction Test Flag	The flag indicating that a **Dispatch Instruction** will not be deemed to be a **Dispatch Instruction** for settlement purposes, used when the **TSO** approves new or amended test proposals submitted by a **User** after **Gate Closure 2** (or there is insufficient time for the **TSO** to evaluate and approve the test proposal before **Gate Closure 2**) and as a result, the **Dispatch Instructions** issued by the **TSO** diverge from the **Final Physical Notifications**.
Dispatchable PPM	A **Controllable PPM** which must have a **Control Facility** in order to be dispatched via an **Electronic Interface** by the **TSO**.
Disputes Resolution Procedure	The procedures described in the **Connection Agreement**, **Use of System Agreement** and **Ancillary Services Agreement** relating to disputes resolution.
Distribution Control Centre	**Control Centre** of the **Distribution System Operator**
Distribution Facility(ies)	A **Closed Distribution System** or **Distribution System** connection, or the electrical plant and equipment used at the **Connection Point,** to the **Transmission System**.
Distribution System	The system consisting (wholly or mainly) of electric circuits, transformers and switchgear which are operated by and used for the distribution of electricity from **Grid Supply Points** or **Generating Units** or other entry points to the point of delivery to **Customers** or other **Users** and any **Plant** and **Apparatus** and meters used in connection with the distribution of electricity, but not including any part of the **Transmission System**.
Distribution System Operator (DSO)	An entity unit within **ESB** which is responsible for, amongst other things, the planning, development, operation and maintenance of the **Distribution System**.
Disturbance	An unplanned event that produces an abnormal **System** condition.
Disturbing Loads	A load on the **System** that adversely affects **Power Quality**.
DSO Connection Agreement	The bilateral agreement between the **DSO** and the **DSO Demand Customer**, which contains the detail specific to the **DSO Demand Customer's** connection to the **Distribution System**.
DSO Demand Customer	A person to whom electrical **Energy** is provided by means of a direct connection to the **Distribution System**.
Dwell Time Down	The duration for which the **Generating Unit** must remain at the **Dwell Time Down Trigger Point** during a change in its **MW Output** while ramping down between instructed **MW Output** and **Minimum Generation**.
Dwell Time Down Trigger Point	A constant MW level at which a **Generating Unit** must remain while ramping down between instructed **MW Output** and **Minimum Generation**. There may be circumstances where

	more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Dwell Time Up	The duration for which the **Generating Unit** must remain at the **Dwell Time Up Trigger Point** during a change in its **MW Output** while ramping up between **Minimum Generation** and instructed **MW Output**.
Dwell Time Up Trigger Point	A constant MW level at which a **Generating Unit** must remain while ramping up between **Minimum Generation** and instructed **MW Output**. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
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 being of adequate strength and capability for the intended purpose.
Effect of Parallel Flows	The effect of the flow of electricity on an electric system's transmission facilities resulting from scheduled electric power transfers between two electric systems. Electric power flows on all interconnected parallel paths in amounts inversely proportional to each paths resistance.
Electronic Alert System	The primary means by which an **Alert** is transmitted by the **TSO** to **Users** (or to certain **Users** only) in accordance with **OC9.**
Electronic Interface	A system, in accordance with the requirements of the **TSO's** data system, at the **Control Facility**, providing an electronic interface between the **TSO** and a **User**, for issuing and receiving instructions, including **Dispatch Instructions** as provided for in the **Grid Code** and established pursuant to an agreement between the **TSO** and the **User**.
Embedded Generation	**Generation Units** within a **Power Station** which are directly connected to a **Distribution System** or the system of any other **User** , such connection being either a direct connection or a connection via a busbar of another **User** but with no other **Connection** to the **Transmission System**
Embedded Generator Interface Protection	Protection designed to disconnect **Generation Units** from the **Distribution System** during abnormal system conditions by tripping a dedicated circuit breaker or recloser located as close as practically possible to the interface between the **DSO Demand Customer** equipment and the **Distribution System**.
Emergency	Any abnormal system condition that requires automatic or immediate manual action to prevent or limit loss of transmission facilities or generation supply that could adversely affect the reliability of the **Transmission System**
Emergency Control Centre (ECC)	A site, remote from the **National Control Centre**, providing at least the minimum level of control capabilities necessary for secure operation of the **Power System,** to be utilised in the event that an emergency situation or major failure of facilities at the **National Control Centre** prevents operation from the **National Control Centre,** or otherwise as determined by the **TSO** (e.g. for **NCC** maintenance, testing or training).

Emergency Instruction	A **Dispatch** instruction issued by the **TSO,** pursuant to SDC2.11 to a **CDGU** or an **Interconnector** which may require an action or response which is outside the limits implied by the then current **Declarations.**
End of Restricted Range	The end point in MW of a **Forbidden Zone**. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
End Point of Start-up Period	The time after which the rate of change of the **Generating Unit Output** is not dependent upon the initial **Warmth** of the **Generating Unit.**
Energise	The movement of any isolator, breaker or switch so as to enable active power and reactive power to be transferred to and from the Facility through the **Generator's Plant** and **Apparatus** and "**Energised**" and "**Energising**" shall be construed accordingly.
Energy	The electrical energy produced, flowing or supplied by an electrical circuit during a time interval and being the integral with respect to time of the instantaneous **Active Power**, measured in units of Watt-hours or standard multiples thereof.
Energy Limit	The forecasted maximum amount of **Energy** that can be generated by an **Energy Limited Generating Unit** within the **Trading Day**.
Energy Limited Generating Unit	A **Generating Unit** with a limit on the **Energy** it can deliver in a specified time period.
Energy Storage Generator	A **Generator** which owns and/or operates any **Energy Storage Power Station.**
Energy Storage Power Station (ESPS)	A site containing at least one **ESU** can automatically act upon a remote signal from the **TSO** to change its **Active Power** output.
Energy Storage Power Station (ESPS) Demand	An **Energy Storage Power Station** in its operation of consuming **Energy.**
Energy Storage Unit (ESU)	A **Generation Unit(s)** using storage devices to generate and consume electricity as, or as part of, a **PPM**.
ESB Networks Electrical Safety Rules	The current version of the document prepared by **ESB** and entitled "ESB Networks Electrical Safety Rules"
ESB Power Generation Electrical Safety Rules	The current version of the document prepared by **ESB** and entitled "ESB Power Generation Electrical Safety Rules".
Estimated Registered Data	Those items of **Planning Data** which either upon connection will become **Registered Data**, or which for the purposes of the **Plant** and/or **Apparatus** concerned as at the date of submission are **Registered Data**, but in each case which for the seven succeeding the **TSO** financial years will be an estimate of what is expected.
Event	An unscheduled or unplanned occurrence on, or relating to either the **Transmission System** or a **User's System**, including faults, incidents and breakdowns.
External Interconnection	**Apparatus** for the transmission of electricity to (from) the **Transmission System** or the **Other Transmission System** from (to) a transmission or distribution system located outside the island of Ireland.
External System	In relation to an **External System Operator** means the

	transmission or distribution system which it operates which is located outside the island of Ireland and any **Apparatus** or **Plant** which connects that system to the **External Interconnection** and which is owned or operated by such **External System Operator**.
External System Operator	A person who operates an **External System** which is connected to the **Transmission System** or the **Other Transmission System** by an **External Interconnection.**
Externally Interconnected Party	The operator of an electrical transmission or distribution system outside the island of Ireland which is connected to the **Transmission System** by an **External Interconnection**.
Extraordinary AVR Response	Any response to a **Voltage Dip** that requires an extraordinary response from normal behaviour of the **Automatic Voltage Regulator** of a **Generation Unit.** For the avoidance of doubt any action of an **Automatic Voltage Regulator,** which results in anything other than an adjustment of the excitation field current is deemed to be an **Extraordinary AVR Response**. Where such schemes, including fast valving, are being considered by a **Generator** they need to be formally agreed with the **TSO** before implementation, such agreement not to be unreasonably withheld.
Extraordinary Governor Response	Any response to a **Voltage Dip** that requires an extraordinary response from normal behaviour of the **Governor Control System** of a **Generation Unit.** For the avoidance of doubt any action other than **Governor Control System** with respect to **Frequency** dips is deemed to be an **Extraordinary Governor Response**. Where such schemes, including fast valving, are being considered by a **Generator** they need to be formally agreed with the **TSO** before implementation, such agreement not to be unreasonably withheld.
Facility	The **User's** facility located at the **Connection Site** including the **User's Plant** and **Apparatus** plus the **Plant** and **Apparatus** to be installed at the **User's** side of the **Connection Point** necessary to effect the connection.
Failure to Follow Notice to Synchronise Instruction	An instruction given by the **TSO** to a **Generator** in respect of its **CDGU** confirming that it has failed to **Synchronise** more than 15 minutes after the time specified in the **Notice to Synchronise**.
Failure to Reach Minimum Generation Instruction	An instruction given by the **TSO** to a **Generator** in respect of its **CDGU** confirming that it has **De-Synchronised** where it has tripped before reaching **Minimum Generation**.
Fault 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.
Fault Inception	The point in time at which the **Transmission System Voltage** at the **Connection Point** goes outside the range as defined in

	CC.8.3.2, on any or all phases. At nominal voltages less than 110 kV, this shall be the point in time at which the **Voltage** under construction is less than 0.9pu of the nominal **Voltage**.
Fault Ride-Through	The ability of a **Generating Unit** to stay **Synchronised** to the **Transmission System** during and following a **Fault Disturbance**.
Fault Ride-Through Time	The required fault duration that a **Generating Unit** shall ride through for a particular **Fault Disturbance**, and is equivalent to the **Critical Fault Clearance Time.**
Final Physical Notification	In respect of **Users** and the **Physical Notification** submitted in accordance with SDC1.4.4.6 for an **Imbalance Settlement Period**, the last **Physical Notification** received before **Gate Closure 2** for that **Imbalance Settlement Period**.
Flexible Outage	An **Outage** scheduled in the **Committed Outage Programme** as a **Flexible Outage** which is not within four **Business Days** of the scheduled start date and time
Forbidden Zone	A **MW** range within which a **Generator** or **Interconnector** cannot operate in a stable manner due to an inherent technical limitation of the machine.
Forced Outage Probability	The probability, in percentage terms, of a **Generation Unit** or an **Interconnector** not being available to provide **Energy** or **Ancillary Services.**
Forecast Minimum Generation Profile	The **User's** forecast of the average level of **Minimum Generation**, in **MW**, for the **User's Plant** for each **Imbalance Settlement Period** in the **Trading Day**.
Forecast Minimum Output Profile	The **User's** forecast of the average level of minimum **MW Output**, in **MW**, for the **Pumped Storage Plant** for each **Imbalance Settlement Period** in the **Trading Day.**
Forecast Statement	A statement as defined in Section 38 of the **Act**
Frequency	The number of alternating current cycles per second (expressed in Hertz) at which a **System** is running.
Frequency Control	The control of the **Frequency** on the **Power System.**
Frequency Deadband	A **Frequency** range within which the **Governor Control System** is not expected to respond to changes in **Transmission System Frequency**. The purpose of the **Frequency Deadband** is to filter out noise and not to restrict the normal **Frequency** response of the **Governor Control System**.
Frequency Demand Disconnection	**Disconnection** of **Demand Customers** when **Frequency** falls to a particular threshold.
Frequency Regulation	The automatic adjustment of **Active Power** output by a **Generation Unit**, initiated by free governor action in response to continuous minor fluctuations of **Frequency** on the **Power System**.
Frequency Response	The automatic adjustment of **Active Power** output from a **Generation Unit(s) or Interconnector** in response to **Frequency** changes
Frequency Response Deadband	**Frequency Response Deadband** means an interval used intentionally to make the **Frequency** control unresponsive.
Frequency Response Insensitivity	**Frequency Response Insensitivity** means the inherent feature

	of the control system, specified as the minimum magnitude of change in the **Frequency** or input signal that results in a change of output power or output signal.
Frequency Response Ramp Rate	The minimum rate of increase or decrease of **Active Power** output of a **Controllable PPM** when acting to control **Transmission System Frequency**.
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 Sensitive Mode	The operation of a **Generating Unit or Interconnector** whereby its generation level or **Active Power** transmission level is varied automatically to compensate for variations in the **Frequency** of the **System**.
Gas Turbine Unit	A **Generation Unit** driven by gas**.**.
Gate Closure 1	In respect of a **Trading Day** is 13.30 hours on the **Trading Day** prior to that **Trading Day**.
Gate Closure 2	In respect of an **Imbalance Settlement Period**, 1 hour before the start of that **Imbalance Settlement Period.**
General Conditions	The part of **Grid Code** which is defined as the **General Conditions**
Generating Plant	A **Power Station** subject to **Central Dispatch**.
Generating Unit	Has the same meaning as **Generation Unit**.
Generation	The process of producing electrical energy from other forms of energy; also, the amount of electric energy produced, usually expressed in megawatthours (MWh).
Generation Outage Programme	Any or all of the **Indicative Outage Programme**, the **Provisional Outage Programme** and the **Committed Outage Programme.**
Generation Unit	Any apparatus which produces electricity and, for the purpose of **SDC1** and **SDC2**, shall include a **CCGT Installation** or a **CCGT Unit**, where running arrangements and/or **System** conditions apply.
Generation Unit Output	The **Active Power and Reactive Power** produced by a **Generation Unit** net of **Generation Unit Auxiliary Load**
Generator	A person or **Power Station** as the case may be who generates electricity and is subject to the **Grid Code** pursuant to any agreement with the **TSO** or otherwise. **Autoproducers** are to be considered both **Generators** and **Demand Customers**.
Generator Aggregator	A person who represents several **Generating Units**, each of which does not have a **Registered Capacity** greater than 10 MW and the combined **Registered Capacity** of which is equal to or greater than 4 **MW**, by in particular preparing notices under SDC1, in relation to those **Generating Units** and receiving **Dispatch Instructions** in relation to those **Generating Units** under SDC2. For the avoidance of doubt, a **Generator Aggregator** cannot aggregate a **Generating Unit** with an output equal to or above 10 MW.

Generator Declared Inflexibilities	The inflexibilities declared by a **Generator** to the **TSO** under SDC1 and which the **TSO** must take into account under SDC1.4.5.3 when compiling the **Indicative Operations Schedule**.
Generator Site	The site owned (or occupied pursuant to a lease, licence or other agreement) by the **Generator** which contains the **Connection Point**.
Generator Terminal	The stator terminals of a **Generating Unit**.
Generator Transformer	A transformer whose principal function is to provide the interconnection between the **Generation Unit** and the Network and to transform the **Generation Unit** voltage to the Network voltage. In the case of **Controllable PPM**s, this shall be interpreted to mean the **Controllable PPM's Grid Connected Transformer** rather than the individual **WTG** transformers.
Good Industry Practice	Those standards, practices, methods and procedures conforming to safety and legal requirements which are attained by exercising that degree of skill, diligence, prudence and foresight which would reasonably and ordinarily be expected from a skilled and experienced person engaged in the same type of undertaking under the same or similar circumstances.
Governor Control System	A system which will result in **Active Power** output of a **Generation Unit** changing, in response to a change in **System Frequency**, in a direction which assists in the recovery to **Target Frequency**
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	This code prepared by the **TSO** pursuant to section 33 of the **Act**, and approved by the **CRU**, as from time to time revised, amended, supplemented or replaced with the approval of or at the instance of the **CRU**.
Grid Code Review Panel	The panel as set out in GC5 of the **General Conditions**
Grid Code Test	A test that is to be mutually agreed, with agreement not to be unreasonably withheld, and conducted in accordance with **Grid Code**.
Grid Connected	Connected to the **Transmission System**
Grid Connected Transformer	Any transformer directly connected to the **Transmission System**. In the case of **Controllable PPMs** where the **Connection Point** is remote from the **Controllable PPM**, this shall be interpreted to mean the HV transformer located at the **Controllable PPM.**
Grid Connection Point	The point at which a **Generating Unit**, **Interconnector** or a **CCGT Installation** or a **CCGT Unit** or a **Customer** or an **External System**, is directly connected to the **Transmission System**.
Grid Supply Point or GSP	A point of connection between the **Transmission System** and the **Distribution System** or a **Demand Customer** or other network operator.

Harmonic Voltage Distortion Level	The **Harmonic Voltage Distortion Level** of the h^{th} order is the **RMS** value of the steady-state sinusoidal **Voltage** waveform at a **Frequency** of (50 x *h*) Hz which is present in the **Voltage** waveform in addition to its fundamental **Frequency** component. The **Harmonic Voltage Distortion Level** is expressed as a percentage of the **RMS** value of the fundamental **Frequency Voltage**.
High Frequency Event	An event where the **Transmission System Frequency** deviates to a value above 50.2 Hz.
Hot Cooling Boundary	The period of time, following **De-Synchronisation** of a **Generating Unit** after which the **Warmth State** transfers from being hot to being warm.
Hot Start	Any **Synchronisation** of a **Generating Unit** that has previously not been **Synchronised** for a period of time shorter than or equal to its submitted **Hot Cooling Boundary**.
HVDC Unit	An **Interconnector** or DC-connected **PPM** that is not a **Non-HVDC Unit.** In addition, **HVDC Units**, which are comprised of: a) embedded **Interconnectors** within one control area and connected to the **Transmission System**, and/or b) embedded **Interconnectors** within one control area and connected to the **Distribution System** when a cross-border impact is demonstrated to the **TSO**. The relevant **TSO** shall consider the long-term development of the network in this assessment shall not be subject to Grid Code clauses CC.15.16 to CC.15.19.6, if one or more of the following conditions apply: 1) the **Interconnector** has at least one **Interconnector Converter Station** owned by the **TSO**; 2) the **Interconnector** is owned by an entity which exercises control over the **TSO**; or 3) the **Interconnector** is owned by an entity directly or indirectly controlled by an entity which also exercises control over the **TSO**.
Non- HVDC Unit	An **Interconnector** or DC-connected **PPM** with a signed **Connection Agreement**: a) Connected to the **Network** on or before the 15th September 2018; or b) Whose owner has concluded a final and binding contract for the purchase of the main **Plant** on or before the 15th September 2018 and provides evidence of same, as acknowledged by the **TSO**, on or before 15th of March 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.

	A **Non-HVDC** that under goes modernisation, refurbishment or replacement of equipment which drives a modification to its **Connection Agreement**, and had concluded a final and binding contract for the purchase of the **Plant** being modified after the 15th September 2018 will be deemed a **HVDC Unit**.
Hydro Unit	A **Generating Unit** which generates electricity from the movement of water excluding **Pumped Storage Generation.**
Imbalance Settlement Period	A thirty minute period beginning on the hour or the half-hour.
Impedance Loci	A set of diagrams characterising the **Transmission System** impedance vector for a range of frequencies at the **Connection Point** from the 2^{nd} up to, and including, the 40^{th} harmonic. These diagrams will contain polygons, whose envelopes outline the bounds of the T**ransmission System** impedance under intact network and appropriate single contingency conditions.
In Writing	This includes typewriting, printing, lithography, electronic mail, facsimile and other modes of reproducing words in a legible and non-transitory form;
Incremental Harmonic Voltage Distortion Level	The incremental change in magnitude of the **Harmonic Voltage Distortion Level** attributed to the **User's** facility as measured at the **Connection Point** which is solely caused by the connection of the **User's** facility. The **Incremental Harmonic Voltage Distortion Level** is a combination of: (a) Distortion caused by harmonic **Voltages** or currents generated by the **User's** facility and (b) Amplification of the existing **Harmonic Voltage Distortion Level** caused by an interaction between the **User's** facility and the **Transmission System** harmonic impedance (for example due to resonances).
Independent Sector Users	A person who has been authorised by the **TSO** to use the interconnector pursuant to a valid Use of System Agreement.
Indicative Operations Schedule	A schedule prepared by the **TSO** in conjunction with the **Other TSO** pursuant to SDC1.4.8.1.
Indicative Outage Programme	A programme of **Outages** of the **Generator's Generation Units** or **Interconnectors** prepared by the **TSO** pursuant to OC2 and covering years 4-7 ahead.
Individual Demand Site	A single premises of a **Demand Customer** connected to the **Transmission System** or a **DSO Demand Customer** connected to the **Distribution System** with a **Demand Side Unit MW Capacity**.
Initial Symmetrical Short-Circuit Current	RMS value of the AC symmetrical component of a prospective (available) short-circuit current applicable at the instant of short circuit if the impedance remains at the zero time value.
Installed Plant	The size, nature and name plate rating of each fundamental constituent part of the **Generation Unit**. For a conventional **Generation Unit** this should include, at a minimum, information on each constituent part of the alternator, excitation system and turbine. For a windfarm this should, at a minimum, include the individual **Wind Turbine Generator** size,

	make and model and the number of **Wind Turbine Generator(s)** installed. Relevant, additional information should also be included, such as **Power System Stabilisers**. Where a **User** is not clear on the requirements, clarification must be sought from the **TSO**.
Interconnection Agreement	An agreement between the **TSO** and an **External System Operator**, which may include agreement with the **Interconnector Owner** and/or **Interconnector Operator**.
Interconnector	A **HVDC** electrical transmission system as a means for the bulk transmission of electrical power to or from the **Transmission System or Other Transmission System** to or from an **External Transmission System**. An **Interconnector** comprises at least two **Interconnector Converter Stations** with DC transmission lines or cable between the **Interconnector Converter Stations**.
Interconnector Converter Station	Part of an **Interconnector** with one or more HVDC converter units installed in a single location together with buildings, filters, **Reactive Power** devices, control, monitoring, protective, measuring and auxiliary equipment.
Interconnector Converter Station Owner	A person who owns an **Interconnector Converter Station**. For the avoidance of doubt the **Interconnector Converter Station Owner** shall be responsible for all **Grid Code** requirements in relation to the **Interconnector Converter Station**.
Interconnector Filter	A tuned device within an **Interconnector** which prevents the transmission of harmonics to the **Transmission System** to which that **Interconnector** is connected and which also provides a means of controlling the **Mvar** flow to and from that **Interconnector**.
Interconnector Frequency Droop	In relation to an **Interconnector** transferring power into the **Transmission System,** it is the percentage drop in the **Frequency** that would, under the action of the **Interconnector Frequency Control** system, cause a change in the **Interconnector's** output from zero to its full **Interconnector Registered Import Capacity**. In relation to an **Interconnector** transferring power to an **External System,** it is the percentage drop in the **Frequency** that would, under the action of the **Interconnector Frequency Control** system, cause a change in the **Interconnector's** output from its full **Interconnector Registered Export Capacity** to zero. In both cases, it is assumed that the **Frequency Control** system is regulating the **Frequency** in the **Transmission System**.
Interconnector Minimum Export Load	Minimum **MW** output an **Interconnector** can export continuously to a remote network while maintaining stability.
Interconnector Minimum Import Load	Minimum **MW** output an **Interconnector** can import continuously from a remote network while maintaining stability.
Interconnector Minimum Load	Absolute sum of the **Interconnector Minimum Export Load** and **Interconnector Minimum Import Load** representing the minimum range of bi-directional power transfer.
Interconnector Operating Protocol	The **Interconnector Operating Protocol** is a protocol for specific operating conditions of the **Interconnector** which may exist between the **Interconnector Operator,** the **TSO** and the

	External TSO. The **Interconnector Operating Protocol** shall be agreed as appropriate by all parties before operation of the **Interconnector.** The **Interconnector Operating Protocol** shall include but is not limited by the following; planned outage coordination, Operating Procedures, Interconnector Instructions, Interconnector Faults, Emergency Power Functionality, Operational Liaison, System Testing, Operational and Safety Switching.
Interconnector Operator	A person who operates an **Interconnector** and is subject to the **Grid Code** pursuant to any agreement with the **TSO** or otherwise.
Interconnector Owner	A person who owns an **Interconnector**. For the avoidance of doubt the **Interconnector Owner** shall be responsible for all **Grid Code** requirements concerning the **Interconnector Operator** in relation to the **Interconnector**.
Interconnector Ramp Rate	The maximum rate of increase or decrease of the power transferred, in either flow direction, by an **Interconnector.**
Interconnector Ramp-down Capability	The rate of decrease of an **Interconnector. Ramp-down Capabilities** apply over the bi-directional range from its **Interconnector Registered Import Capacity** to its **Interconnector Registered Export Capacity.**
Interconnector Ramp-up Capability	The rate of increase of an **Interconnector. Ramp-up Capabilities** apply over the bi-directional range from its **Interconnector Registered Export Capacity** to its **Interconnector Registered Import Capacity.**
Interconnector Registered Capacity	The maximum **Capacity**, in either flow direction, expressed in whole **MW**, that an **Interconnector** can deliver on a sustained basis, without accelerated loss of equipment life, at the **Connection Point**. This figure shall include transmission power losses for the **Interconnector**.
Interconnector Registered Export Capacity	The maximum **Capacity**, expressed in whole **MW** that an **Interconnector** may export (transfer energy from the **Power System** to a remote network) on a sustained basis, without accelerated loss of equipment life, as registered with the **TSO**.
Interconnector Registered Import Capacity	The maximum **Capacity**, expressed in whole **MW** that an **Interconnector** may import (transfer energy from a remote network into the **Power System**) on a sustained basis, without accelerated loss of equipment life, as registered with the **TSO**.
Interconnector Schedule Quantities	The quantities of **Active Power** which have been scheduled on an **Interconnector** as a result of trading in day ahead and/or intraday markets and submitted by a **Scheduling Agent**.
Interconnector Transformer	A transformer whose principal function is to provide the interconnection between the **Interconnector** and the Network and to transform the **Interconnector** voltage to the Network voltage.
Interconnector's Plant	An **Interconnector** subject to **Central Dispatch** which will include appropriate control and response of each converter station and **Apparatus** upon **Dispatch Instruction** issued by the **TSO.** It shall consist of all aspects of the technology including, converter station, DC cable filter banks etc. up to the **Connection Point**.

Inter-jurisdictional Tie Line	The lines, facilities and equipment that connect the transmission system of the Republic of Ireland to the transmission system of Northern Ireland.
Intermediary	The person representing a **Generating Unit** for the purposes provided for in the **TSC**.
Interruptible Tariff	Special tariff paid for **Energy** due to the arrangement that the **Customer** is automatically interruptible by use of **Under Frequency Relay** or other means in accordance with arrangements made between the **Customer** [and **Supplier**].
Interruptible Tariff Customers	**Customers** who purchase electricity under an **Interruptible Tariff**.
Investigation	Investigation carried out by the **TSO** under OC10, and "Investigate" shall be construed accordingly.
Joint Grid Code Review Panel	The panel as set out in GC.6 of the General Conditions
Licence	An electricity generation licence or an electricity supply licence, as the context requires, granted pursuant to Section 14 of the **Act.**
Licence Standards	The standards set out or referred to in the **TSO Licence.**
Load	The **Active Power** or **Reactive Power**, as the context requires, generated, transmitted or distributed and all like terms shall be construed accordingly.
Load Factor	The ratio of the actual electrical **Energy** produced by a **Generation Unit** to the possible maximum electrical **Energy** that could be produced by that **Generation Unit** in any defined period
Load Up Break Point Cold	The break point which defines the shared MW boundary between the two **Loading Rates Cold**. The first **Loading Rate Cold** applies from **Block Load** to the first **Load Up Break Point Cold**, the second **Loading Rate Cold** applies from the first **Load Up Break Point Cold** to the second **Load Up Break Point Cold**, the third **Loading Rate Cold** applies from the second **Load Up Break Point Cold** to the end point of the **Start Up** period, which should be set equal to the **Minimum Generation**.
Load Up Break Point Hot	The break point which defines the shared MW boundary between the **Loading Rates Hot**. The first **Loading Rate Hot** applies from **Block Load** to the first **Load Up Break Point Hot**, the second **Loading Rate Hot** applies from the first **Load Up Break Point Hot** to the second **Load Up Break Point Hot,** the third **Loading Rate Hot** applies from the second **Load Up Break Point Hot** to the end point of the **Start Up** period, which should be set equal to the **Minimum Generation**.
Load Up Break Point Warm	The break point which defines the shared MW boundary between the **Loading Rates Warm**. The first **Loading** rate applies from **Block Load** to the first **Load Up Break Point Warm**, the second **Loading Rate Warm** applies from the first **Load Up Break Point Warm** to the second **Load Up Break Point Warm**, the third **Loading Rate Warm** applies from the second **Load Up Break Point Warm** to the end point of the **Start Up** period, which should be set equal to the **Minimum**

	Generation.
Loading Rate	The **Loading Rate Cold**, **Loading Rate Hot** or **Loading Rate Warm** as the case may be.
Loading Rate Cold	The rate at which a **Generating Unit** increases **Output** from **Block Load** to **Minimum Generation** when it is instructed to
	Cold Start. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Loading Rate Hot	The rate at which a **Generating Unit** increases **Output** from **Block Load** to **Minimum Generation** when it is instructed to **Hot Start**. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Loading Rate Warm	The rate at which a **Generating Unit** increases **Output** from **Block Load** to **Minimum Generation** when it is instructed to **Warm Start**. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Lopping Mode	The operation of **Generation Unit(s)** at an **Individual Demand Site** of a **Demand Side Unit** where the **Generation Unit(s)** supplies the **Demand Customer's** or **DSO Demand Customer's Load** 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.
Low Frequency Event	An event where the **Transmission System Frequency** deviates to a value below 49.5Hz.
Low Frequency Relay	An electrical measuring relay intended to operate when its characteristic quantity (**Frequency**) reaches the relay settings by decrease in **Frequency**.
Margin	The difference between maximum **Active Power** (net of **Auxiliary Loads**) from **Available Generation Units** and net **System Demand** expressed in MW.
Market Operator	Shall have the meaning set out in the **TSC.**
Maximisation	An increase in **MW Output** above the **Registered Capacity** up to the level of the **Short Term Maximisation Capability**, and the terms "**Maximise**" and "**Maximised**" shall be construed accordingly.
Maximisation Instruction	An instruction issued by the **TSO** to the **Generator** to **Maximise** the **MW Output** of a **Generation Unit**.
Maximum Charge Capacity	The maximum amount of **Energy** that can be produced from the storage of an **Energy Storage Generator** for a **Trading Day**.
Maximum Continuous Rating	The maximum capacity (MW) (or effective rating), modified for ambient limitations, that a **Generation Unit** can sustain indefinitely without loss of equipment life, less the capacity used to supply the **Auxiliary Load**.
Maximum Down Time	In the case of a **Demand Side Unit**, the maximum period of time

	during which **Demand Side Unit MW Response** can be greater than zero.
Maximum Export Capacity	The value (in MW, MVA, kW and/or kVA) provided in accordance with the **User's Connection Agreement** or **DSO Demand Customer's DSO Connection Agreement**.
Maximum Import Capacity	The values (kW and/ or kVA) provided in accordance with the **User's Connection Agreement** or **DSO Demand Customer's DSO Connection Agreement**.
Maximum On Time	The maximum time that a **Generating Unit** can run following **Start Up**.
Maximum 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**.
Maximum 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**.
Maximum Storage Capacity	The maximum amount of **Energy** that can be produced from the reservoir of a **Pumped Storage Generator** for a **Trading Day.**
Measurement Point	The **Measurement Point** shall be the **Connection Point** to the **Transmission System** or such other point or points as may be agreed between the **TSO** and the **User**.
Merit Order	An order, compiled by the **TSO** in conjunction with the **Other TSO** pursuant to SDC1 of **Commercial Offer Data** sorted in price order.
Meshed Transmission Station	A **Transmission Station** which is looped into the **Transmission System.**
Meteorological Mast	A device erected at the **Controllable PPM** 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.
Meter	A device for measuring and recording units of electrical energy.
Metering Code	The code that specifies the minimum technical design and operational criteria to be complied with for metering and data collection equipment and associated procedures as required under the **Trading and Settlement Code**.
Metering Equipment	**Meters**, time switches, measurement transformers, metering protection and isolation equipment, circuitry and their associated data storage and data communications equipment and wiring which are part of the **Active Energy** and **Reactive Energy** measuring equipment at or related to a **Site**.
Minimum Charge Capacity	The minimum amount of **Energy** that must be produced from the storage of an **Energy Storage Generator** for a **Trading Day**.
Minimum Demand Regulation (MDR)	That minimum margin of **Active Power** to provide a sufficient regulating margin for adequate **Frequency Control**.
Minimum Down Time	In the case of **Demand Side Units**, the minimum period of time during which **Demand Side Unit MW Response** at a **Demand**

	Side Unit can be greater than zero.
Minimum Generation	The minimum **MW Output** which a **Generating Unit** can generate continuously, registered with the **TSO** under SDC1 as a **Technical Parameter.**
Minimum Load	Minimum **MW Output** a **Generator** can maintain on a continuous basis, whilst providing **System Services**.
Minimum off time	The minimum time that must elapse from the time of a **Generation Unit De-synchronises** before it can be instructed to **Start-up.** In the case of **Demand Side Units**, the minimum time that must elapse while the **Demand Side Unit MW Response** is at zero until the next delivery of **Demand Side Unit MW Response**.
Minimum on time	The minimum time that must elapse from the time of a **Generation Unit Start-up** before it can be instructed to **Shutdown**.
Minimum Storage Capacity	The minimum amount of **Energy** that must be produced from the reservoir of a **Pumped Storage Generator** for a **Trading Day.**
Minimum Up Time	The minimum time that must elapse from the time of a **Generation Unit Start-up** before it can be instructed to **Shutdown.**
Minor Test	An **Operational Test** with a total duration of less than 6 hours in any **Trading Day** or were the active energy produced during the total duration of the test is less than: (i) 3 times the **Active Energy** which would be produced by the **Test Proposer's Plant** during 1 hour of operation at the **Plant's Registered Capacity**; and (ii) 500 MWh
Model(s)	A software representation(s) of a **User System** and/or **Plant** provided to the **TSO** for the purposes of **Power System** simulation.
Modification	Any actual or proposed replacement, renovation, modification, alteration or construction by or on behalf of a **User** or the **TSO** to either that **User's Plant** or **Apparatus** or the **TSO's Plant** or **Apparatus** or the **TAO's Plant** or **Apparatus**, as the case may be, or the manner of its operation which has or may have a material effect on a **User** or the **TSO**, as the case may be, at a particular **Connection Site**.
Monitoring	Monitoring carried out by the **TSO** under OC10, and "**Monitor**" shall be construed accordingly.
Mvar Output	The **Reactive Power** produced or absorbed by a **Generation Unit** net of **Generation Unit Auxiliary Load**
MW Dispatch Instruction	An instruction given by the **TSO** from its **National Control Centre** to the **Generator's** approved contact person or location regarding the **MW Output** of the **Generation Unit**.
MW Output	The actual **Active Power** output in MW of a **Generation Unit** at the **Connection Point**.
National Control Centre	The **TSO's** National Control Centre, as notified by the **TSO** to the **Generator** from time to time.

Network	The **Transmission System** and the **Distribution System** taken together.
Network Control	Network switching and **Control Actions** that the **TSO** needs to carry out in implementing the **Transmission Outage Programme**, in routine operation of the **Transmission System** and in responding to emergency and fault situations on the **Transmission System**, which may from time to time affect the operations of **Users** or security of supply to **Users**.
NI System	Together, the **Other Transmission System** and the distribution system in Northern Ireland.
No Load Cost	A price which forms part of **Commercial Offer Data** expressed in € or £/hour and which is invariant in the level of **MW Output** and which applies at all times when the level of **MW Output** is greater than zero.
Non-Centrally Dispatched Generation Unit (NCDGU)	A **Generating Unit** not subject to **Central Dispatch**.
Non-DCC Unit	A **Demand Facility**, **Closed Distribution System** or **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 **TSO**, 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 is a **Non-DCC Unit** such as a **Pumped Storage Unit** that has both generating and pumping operation mode. An existing **Demand Facility**, **Closed Distribution System** or **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. If an existing **Demand Facility** undergoes modernisation, refurbishment or replacement of equipment, part or all of the DCC requirements will apply to the appropriate item of **Plant** or **Apparatus**.

	If an existing **Closed Distribution System** or **Distribution System** undergoes modernisation, refurbishment or replacement of equipment, part or all of the DCC requirements will apply to the appropriate item of **Plant** or **Apparatus** at the **Facility.**
Non-RfG Generation Unit	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 provides evidence of same, as acknowledged by the **TSO**, 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 system state; or (ii) No permanent **Connection Point** and is used by the **TSO** to temporarily provide power when normal system capacity is partly or completely unavailable; or (iii) **Energy Storage Units** except for **Pumped Storage Plant**. A **Non-RfG Generation Unit** that undergoes modernisation, refurbishment or replacement of equipment which drives a modification to its **Connection Agreement,** and had concluded a final and binding contract for the purchase of the **Plant** being modified after the 30th November 2018 will be deemed an **RfG Generation Unit**, unless the **Plant** being modified is one of the exceptions listed in c) above.
Normal Dispatch Condition	The condition of the **Generation Unit** at the **End of the Start-up Period**.
Notice to Synchronise	A **Dispatch Instruction** given by the **TSO** from its **National Control Centre** to the **Generator's** approved contact person or location to **Synchronise** the **Generation Unit**.
Off-Site Storage Location	The site in close vicinity to the **Generator Site** where (pursuant to a lease, licence or other agreement) the **User** stores stocks of **Primary Fuel** and/or **Secondary Fuel**. A dedicated pipeline with a dedicated pump must be in place on this site between the dedicated fuel tank off-site and the **Generating Plant**. As a maximum, this **Off-Site Storage Location** should be no more than 6 km from the **Generating Plant**.

Open Cycle Gas Turbine Unit	A **Generation Unit** driven by a gas turbine other than a **CCGT Installation** or **CCGT Unit**.
Open Cycle Mode	The mode of operation of a **CCGT Installation** where only the **Gas Turbine Unit** is operational (i.e. without operation of any associated **Steam Turbine Units**).
Operating Characteristics	The technical capabilities, flexibilities and limitations for the operation of a **Generation Unit** or **Demand Side Unit** as registered or declared in accordance with the provisions of the **Grid Code**.
Operating Code (OC)	The part of **Grid Code** which is identified as the **Operating Code**
Operating Margin	**Contingency Reserve** and **Operational Reserve.**
Operating Mode	An **Operating Mode** of a **Generating Unit** is a pre-defined method of operating that **Generating Unit,** as agreed between the **TSO** and the **User.**
Operating Reserve	The additional **MW Output** required from **Generation Units** or **Interconnector** import or **Interconnector** export adjustment or **Demand** reduction which must be realisable in real time operation to contain and correct any potential **Power 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 relating to the operation of a **System** (including an **Embedded Independent Generating Plant**).
Operation Instructions	Management instructions and procedures, both in support of the **Safety Rules** and for the local and remote operation of **Plant** and **Apparatus**, issued in connection with the actual operation of **Plant** and/or **Apparatus** at or from a **Connection Site**.
Operational Control Phase	The period from real time to one week ahead of real time.
Operational Data	Data required under the **Operating Codes** and/or **Scheduling** and **Dispatch Codes**.
Operational Date	When the **TSO** is satisfied that all of the **Grid Code Tests** have been carried out correctly and satisfactorily completed the **TSO** will as soon as is practicable notify the **User**, specifying the time and date of such completion.
Operational Effect	Any effect on the operation of the relevant other system that causes the **Transmission System** or the **User's System** to operate (or be at a materially increased risk of operating) differently to the way in which they would or may have normally operated in the absence of that effect. **Operationally Effected** shall be construed accordingly.
Operational Planning Phase	The period from 1 week to the end of the 7^{th} year ahead of real time
Operational Tests	**Tests** carried out by the **TSO** in order to maintain and develop operational procedures, to train staff and to acquire information in respect of **Transmission System** behaviour under abnormal **System** conditions, and also tests carried out

	by other **Users** for similar purposes in respect of their **Plant**.
OPTEL	The operational telephony system owned by **ESB** and used by the **TSO** for voice communication with **Users**.
Other Grid Code	The code prepared pursuant to the licence to carry out electricity transmission activities granted to the **Other TSO** pursuant to Article 10(1)(b) of the **Electricity (Northern Ireland) Order 1992** in Northern Ireland, as from time to time revised in accordance with such licence.
Other Relevant Data	The data referred to in SDC1.4.4.4.
Other Transmission System	The transmission system operated by the **Other TSO** in Northern Ireland.
Other TSO	The holder of a licence granted pursuant to Article 10(1)(b) of the Electricity (Northern Ireland) Order 1992 in Northern Ireland to participate in the transmission of electricity in the capacity of co-ordinating and directing the flow of electricity onto and over the **Other Transmission System**.
Outage	In relation to a **Generation Unit**, a total or partial reduction in **Availability** such that the **Generation Unit** is unavailable to achieve its full **Registered Capacity** in accordance with its **Registered Operating Characteristics.** In relation to a **Demand Side Unit**, a total or partial change in **Availability** such that the **Demand Side Unit** is unavailable to achieve its full **Demand Side Unit MW Capacity** in accordance with its submitted **Technical Parameters**. In relation to an **Interconnector**, a total or partial reduction in **Availability** such that the **Interconnector** is unavailable to achieve its full **Interconnector Registered Capacity** in accordance with its **Registered Operating Characteristics.**
Outturn Availability	The set of **Availability** data for the relevant **CDGU**, **Controllable PPM**, **Aggregated Generating Unit**, **Pumped Storage Plant Demand** or **Demand Side Unit** as declared pursuant to SDC1.4 and submitted by the **TSO** to **SEM** after the end of the **Trading Day.**
Outturn Availability Connection Asset	Any equipment that is part of the **Transmission System** between and including the **Connection Point** and the busbar clamps at the **Meshed Transmission Station** for which the **TSO** Schedules outages.
Partial Shutdown	The situation existing when all generation has ceased in part of the **Power System** and there is no electricity supply from **External Interconnection** or any other part of the **System.**
Phase Voltage	**Voltage** measured between the line and **System** neutral.
Physical Notifications	A declaration submitted by certain **Users** in accordance with SDC1.4.4.6 and the **TSC** indicating expected **MW Output** profile or **Active Power Demand** profile based on trading in day ahead and intraday markets.
Planned Rota Load Shedding	Planned **De-Energisation** of **Customers** on a rota basis where there is a significant shortfall of **Generation** required to meet the **Total Demand** for a protracted period.

Planning Code	That part of **Grid Code** which is identified as the **Planning Code**
Plant	Fixed and movable items used in the generation and/or consumption of and/or supply and/or transmission of electricity other than **Apparatus**.
Post Control Phase	The days following the **Control Phase**
Post Event Notice	A notice issued by the **TSO** in accordance with OC10
Power Factor	The ratio of **Active Power** to **Apparent Power**.
Power Park Module (PPM)	A **Generation Unit** or ensemble of **Generation Units** generating electricity which; • Is connected to the **Network** non-synchronously or through power electronics, • Has a single **Connection Point** onshore to a **Transmission System**, **Distribution System** or **HVDC System.**
Power Quality	Target conditions for power quality and the variation in power quality that can be expected at **Grid Connection Points.**
Power Station	An installation consisting of **Generation Unit(s).**
Power System	The **Transmission System** and all **User System's** within the Republic of Ireland.
Power System Restoration	The restoration of the **Power System** or part of the **Power System** to a state of normal operation from a state of **Total Shutdown** or **Partial Shutdown** as the context requires.
Power System Restoration Plan	A plan, prepared and maintained by the **TSO** pursuant to OC9 setting out guidelines assisting those involved in **Power System Restoration** to achieve **Power System Restoration** as safely and as quickly as possible.
Power System Stabiliser	Device that injects a supplementary signal into the **AVR** (**Automatic Voltage Regulator**) in order to improve **Power System** damping.
PPM Control System	The control system at the **Controllable PPM** which provides for **Active Power Control**, **Frequency Response**, ramp rate control and other **Generation Unit** control features.
PPM Extension	An increase to the **Registered Capacity** of any **Controllable PPM**.
Pre-Incident Frequency	The value is the average **Transmission System Frequency** between 60 and 30 seconds prior to the occurrence of a significant **Frequency** disturbance.
Preliminary Project Planning Data	Data relating to a proposed **User Development** at the time the **User** applies for a **Connection** and **Use of System Agreement** and/or a supplemental **Agreement** but before an offer is made and accepted.
Price Quantity Pairs	**Prices** and their respective quantity ranges for **Generating Units**, **Demand Side Units** and **Aggregated Generating Units** as part of **Commercial Offer Data** indicating the price of dispatching away from the relevant **Physical Notifications** profile.
Price Sets	The **Price Quantity Pairs**, **Start-up Costs, Shutdown Costs** and **No Load Costs** submitted by a **User** under SDC1.

Primary Frequency Control	**Primary Frequency Control** takes place in the period of up to 30 seconds after a change in **Frequency** and is achieved by automatic corrective responses to **Frequency** deviations occurring on the **Transmission System**. This automatic correction arises from: (a) natural frequency demand relief of motor load; (b) automatic MW output adjustment of **Generation Units** initiated by **Governor Droop** or other responses including peaking of **Combustion Turbine Unit**s, condensate stop or frequency triggered response of pumped storage units; and (c) automatic load shedding.
Primary Fuel	The fuel or fuels registered in accordance with the **Grid Code** as the principal fuel(s) authorised for **Energy** production by the **Generation Unit**
Primary Fuel Switch Over Output	The **MW Output**, not lower than **Minimum Load** at which a **Generation Unit** can achieve a switch over from **Primary Fuel** to **Secondary Fuel.**
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**), which is fully available and sustainable between 5 seconds and 15 seconds after an **Event** and where the nadir occurs between 5 and 15 seconds after the **Event**. If the actual **Frequency** nadir occurs less than 5 seconds or more than 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.
Priority Customers	**Customers** which are either: • exempt from load shedding under the rota load shedding scheme or • exempt from load shedding under the technical under-frequency load shedding scheme or • prioritised for supply under the technical under-frequency load shedding scheme.
Priority Dispatch	The **Dispatch** given priority as afforded under governing legislation in either jurisdiction.
Programming Phase	The period between **Operational Planning Phase** and the **Control Phase**. It starts at the 1 week ahead stage and finishes with the issue of the **Generation Schedule** for the day ahead
Provisional Outage Programme	An **Outage** programme of the **Generator's Generation Units** and of **Interconnectors**, as prepared by the **TSO** pursuant to OC2 and covering years 2-3 ahead.
Provisional Running Orders	A statement prepared and issued by the **TSO** to the **Generator** pursuant to SDC1, which indicates for each **Generation Unit** owned or controlled by the **Generator**, the expected load pattern, the required fuel or fuels and **Synchronising** and **De-Synchronising** times for the following day.
Prudent Utility Practice	Those standards, practices, methods and procedures conforming to safety and legal requirements which are attained by exercising that degree of skill, diligence, prudence

	and foresight which would reasonably and ordinarily be expected from skilled and experienced operatives engaged in the same type of undertaking under the same or similar circumstances.
Pumped Storage Generation	A **Pumped Storage Plant** in its operation of producing **Energy** by releasing water from an upper reservoir.
Pumped Storage Generator	A **Generator** which owns and/or operates any **Pumped Storage Plant.**
Pumped Storage Mode	A mode of operation of a **Pumped Storage Unit** including
Pumped Storage Plant	A **Generation Plant** that produces **Active Energy** using water from an upper reservoir and takes energy by pumping water up to the same reservoir.
Pumped Storage Plant Demand	A **Pumped Storage Plant** in its operation of consuming **Energy** by pumping water to an upper reservoir.
Pumped Storage Unit	A **Generation Unit** within a **Pumped Storage Plant**.
Ramp Down Break Point	The MW level at which the **Ramp Down Rate** changes. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Ramp Down Rate	The maximum rate of decrease in a **Generating Unit's Output** after the **End Of Start-up Period**. The **Ramp Down Rate** applies over the output range from its **Registered Capacity** to **Minimum Generation**. The rate of change is not dependent upon the initial **Warmth** of the plant but may depend on the **MW Output**. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Ramp Up Break Point	The MW level at which the **Ramp Up Rate** changes. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Ramp Up Rate	The maximum rate of increase in a **Generating Unit's Output** after the **End Of Start-up Period**. This rate of increase continues until the **Generating Unit** reaches the level of output instructed by the control room operator of its **Registered Capacity**. The rate of increase is not dependent upon the initial **Warmth** of the plant but may depend on the **MW Output**. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Ramp-down Capability	The rate of decrease in a **Generation Unit' Output** after the **End Of Start-up Period. Ramp-down Capabilities** apply over the output range from its **Registered Capacity** to **Minimum generation**. The rate of change is not dependent upon the initial warmth of the plant but may depend on the **MW Output.**
Ramp-up Capability	The rate of increase in a **Generation Unit' Output** after the **End Of Start-up Period**. This rate of increase continues until the **Generation Unit** reaches the level of output instructed by the control room operator or its **Registered Capacity.**

	Following the **End Of Start-up Period**, the rate of increase is not dependent upon the initial warmth of the plant but may depend on the **MW Output.**
Rate of Change of Frequency (ROCOF)	The rate of increase or decrease of **Frequency** as measured at the **User's Connection Point** over the time period as set out in CC.7.3.1.1(d) and PPM1.5.1(d).
Reactive Power	Means the product of voltage and current and the sine of the phase angle between them measured in units of volt-amperes reactive and standard multiples thereof.
Red Alert	An **Alert** issued by the **TSO** to the **User** in the circumstances set out in OC9
Re-declaration	Notification to the **TSO** by the **User** of any revisions to data, pursuant to SDC1.4.5.
Registered Capacity	The maximum **Capacity**, expressed in whole MW, that a **Generation Unit** can deliver on a sustained basis, without accelerated loss of equipment life, at the **Connection Point** which is under the dispatch (or control of a **Controllable PPM**) of the **TSO**. This shall be the value at 10°C, 70 % relative humidity and 1013 hPa. The values of an **Interconnector's Operating Characteristics** for operation of the **Interconnector** pursuant to the **Grid Code** registered under the **Connection Conditions**.
Registered Data	Those items of **Standard Planning Data** and **Detailed Planning Data** that upon connection become fixed (subject to any subsequent changes).
Registered Fuel	The fuel(s) registered under the **Planning Code** of the **Grid Code**
Registered Operating Characteristics	The values of a **Generation Unit's Operating Characteristics** for operation of the **Generation Unit** pursuant to the **Grid Code** registered under the **Connection Conditions**. The values of an **Interconnector's Operating Characteristics** for operation of the **Interconnector** pursuant to the **Grid Code** registered under the **Connection Conditions**.
Regulating Margin	The margin of generating **Capacity** that is **Synchronised** over **Demand** which is required in order to maintain **Frequency Control**.
Regulatory Authorities	Each **Regulatory Authority** taken together.
Regulatory Authority	The authority appointed under legislation to regulate the electricity industry in the respective jurisdiction. In the Republic of Ireland it is the **CRU** and in Northern Ireland it is NIAUR (Northern Ireland Authority for Utility Regulation).
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. **RTUs** are equipped with input channels for sensing or metering, output channels for control, indication or alarms and a communications port.
Remote Transmission Assets	Any **Plant** and **Apparatus** or meters owned by the **TAO** which: a) are **Embedded** in a **User System** and which are not

	directly connected by **Plant** and/or **Apparatus** owned by the **TAO** to a sub-station owned by the **TAO**; and b) are by agreement between the **TAO** and such **User** operated under the direction and control of such **User**.
Replacement Reserve	**Replacement Reserve** is the additional **MW Output** (and/or reduction in **Demand**) required compared to the pre-incident output (or **Demand**) which is fully available and sustainable over the period from 20 minutes to 4 hours following an **Event**.
Reserve Characteristics	The MW level of reserve available at any given MW **Output** of a **CDGU** or **Interconnector** as set out in the available **Ancillary Service Agreement**.
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 resource availability.
Responsible Manager	A manager who has been duly authorised by a **User** or the **TSO** to deal with issues including matters related to the **Grid Code** on behalf of that **User** or the **TSO**, as the case may be.
Responsible Operator	A person nominated by a **User** to be responsible for control of **Plant** and **Apparatus** related to the **User's System**
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.
Rota Load Shedding Plan	A plan that provides for disconnection and reconnection of defined blocks of demand on instruction from the **TSO**
Safety Rules	**ESB Networks Electrical Safety Rules, ESB Power Generation Electrical Safety Rules** or the rules of a **User,** compliance with which ensures that persons working on **Plant** and/or **Apparatus** to which the rules apply are safeguarded from hazards arising from the **System**.
Scheduled Operational Date	Has the meaning set out in the **Connection Agreement.**
Scheduled Outage	Any **Fixed Outage**, **Flexible Outage** or **Short Term Scheduled Outage**.
Scheduling Agent	In relation to an **Interconnector**, a person nominated to provide **Interconnector Schedule Quantities** to the **TSO.**
Scheduling and Dispatch Code (SDC)	The parts of the **Grid Code** which specify the scheduling and **Dispatch** process.
Secondary Frequency Control	**Secondary Frequency Control** takes place in the time scale from 5 seconds up to 10 minutes after the change in **Frequency**. It is

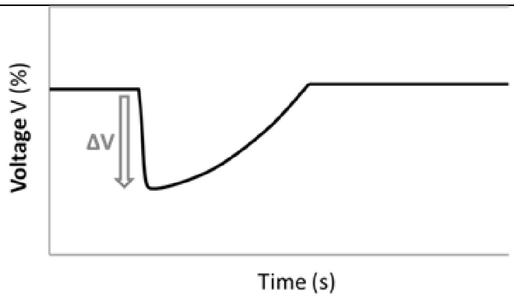
	provided by a combination of automatic and manual actions. These include: (a) a contribution from automatic governor action and other control systems on **Generation Units**; (b) manual action by **Generation Unit** operators altering the **MW Output** of **Generation Units** in response to **Dispatch Instructions** issued by the **TSO** in accordance with SDC2.
Secondary Fuel	The fuel or fuels registered in accordance with the **Grid Code** as the secondary or back-up fuel(s) authorised for **Energy** production by the **Generation Unit.**
Secondary Fuel Switchover Output	The **MW** output, not lower than **Minimum Load** at which a **Generation Unit** can achieve a switch over from **Secondary Fuel** to **Primary Fuel.**
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.**
Sections Under Common Governance	In order to support the efficient running of the **SEM**, certain sections of the **Grid Code** are under common governance. Modifications and derogations to these sections of the **Grid Code** will effectively require agreement and direction from both **Regulatory Authorities**. SDC1 and SDC2 are the **Sections Under Common Governance**.
Settlement Day	The period from 0000 to 2400 hours in each day.
Settling Time	In relation to reactive current response from **Controllable PPM** and **Interconnector Converter Station**, it is the length of time from **Fault Inception** for reactive current to settle within +/-10% of its steady-state value.
Shaving Mode	The **Synchronised** operation of **Generation Unit(s)** to the **Distribution System** at an **Individual Demand Site** of a **Demand Side Unit** where the **Generation Unit(s)** supplies part of, or, the **DSO Demand Customer's** entire **Load**. Normally the **Generation Unit(s)** would operate for 2 hours per day as agreed with the **DSO**.
Short Notice Re-declaration	A **Re-declaration** where changes apply to values relating to **Imbalance Settlement Periods** occurring within 4 hours of receipt by the **TSO** of the **Re-declaration.**
Short-Term Maximisation Capability	The capability of a **Generating Unit** to deliver, for a limited duration of time, **MW Output** greater than its **Registered Capacity.**
Short-Term Maximisation Time	The time that the **Short-Term Maximisation Capability** could be maintained.
Shutdown	The condition of a **Generation Unit** where the generator rotor is at rest or on barring.
Shutdown Costs	The costs associated with shutting down a **Demand Side Unit.**
Significant System Incident (SSI)	**Events** which have had or might have had or might have an operational effect on the **Transmission System** or a **User's**

	System.
Significant Test	An **Operational Test** with a total duration of equal to or greater than 6 hours, or where the **Active Energy** produced during the total duration of the test is equal to or greater than: (i) 3 times the **Active Energy** which would be produced by the **Test Proposer's Plant** during 1 hour of operation at the **Plant's Registered Capacity**; or (ii) 500 MWh;
Simultaneous Tap Change	A tap change implemented on the generator step-up transformers of **CDGU**s, effected by **Generators** in response to a **Dispatch Instruction** from the **TSO** issued simultaneously to the relevant **Power Station**s. The **Dispatch Instruction**, which is normally preceded by advance warning, must be effected within 1 minute of receipt from the **TSO** of the **Dispatch Instruction**.
Single Electricity Market (SEM)	The wholesale all-island single electricity market established and governed pursuant to the relevant legislation and the **TSC**.
Site	A **TSO Site**, **TAO Site** or **User Site**, as the case may be.
Small Scale Generators	(i) **Generators** with **Registered Capacity** of 2MW or less (on a single **Site**); and (ii) **Generators** with **Registered Capacity** less than 5MW (on a single **Site**) and greater than 2MW (on a site basis) where the **TSO** consider that the **Generator** is in a location that does not make its operation particularly critical to the operation of the **Transmission System**.
Soak Time Cold	The duration of time for which the **Generating Unit** must remain at the **Soak Time Trigger Point Cold** during a **Cold Start**. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Soak Time Hot	The duration of time for which the **Generating Unit** must remain at the **Soak Time Trigger Point Hot** during a **Hot Start**. . There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Soak Time Trigger Point Cold	A constant **MW** level at which a **Generating Unit** must remain while loading up between **Block Load** and **Minimum Generation** after a **Cold Start**. . There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Soak Time Trigger Point Hot	A constant **MW** level at which a **Generating Unit** must remain while loading up between **Block Load** and **Minimum Generation** after a **Hot Start**. . There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Soak Time Trigger Point Warm	A constant **MW** level at which a **Generating Unit** must remain while loading up between **Block Load** and **Minimum Generation** after a **Warm Start**. . There may be circumstances where more than one parameter applies and this is indicated

	by adding a number at the end of the parameter.
Soak Time Warm	The duration of time for which the **Generating Unit** must remain at that **Soak Time Trigger Point Warm** during a **Warm Start**. . There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Special Action	Those actions referred to in SDC2.4.3.
Special Protection Scheme	A control or protection scheme to facilitate **System** operation by the intertripping of circuit breakers or other **Control Actions**.
Spin Generation	A mode of operation of a **Pumped Storage Unit** where it is spinning in air in the same direction as it would if it was generating **Active Power**
Spin Pump	A mode of operation of a **Pumped Storage Unit** which is intermediate between the **Unit** being at standstill and pumping.
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 **Transmission System**.
Standard Planning Data	The general data required by the **TSO** under the **PC**. It is generally also the data that the **TSO** requires from a new **User** in applications for **Connection** and **Use of System Agreements.**
Standby Mode	The operation of **Generation Unit(s)** at an **Individual Demand Site** of a **Demand Side Unit** where the **Generation Unit(s)** supplies the **Demand Customer's** or **DSO Demand Customer's Load** while not **Synchronised** to the **Transmission System** or **Distribution System**. The **Generation Unit(s)** is(are) never **Synchronised** to the **Transmission System** or **Distribution System**.
Standing Technical Offer Data	Technical offer data provided on registration to the **TSC**, and updated in accordance with the **TSC**, by a **User** of each of its **Units** in accordance with the **TSC**. For **CDGUs** with a **Registered Capacity** of 10 MW or less, this data shall be advised directly to the **TSO**.
Start of Restricted Range	The start point in MW of a **Forbidden Zone**. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.
Start-Up	The action of bringing a **Generation Unit** from **Shutdown** to **Synchronous Speed**.
Start-Up Cost	The costs associated with **Start-Ups**.
Station Board	A switchboard through which electrical power is supplied to the **Auxiliaries** of a **Power Station**, and which is supplied by a **Station Transformer**. It may be interconnected with a **Unit Board.**

Station Transformer	A transformer supplying electrical power to the **Auxiliaries** of a **Power Station**, which is not directly connected to the **Generating Unit** terminals.
Steam Unit	A **Generation 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. **Transmission System** step changes can occur due to switching in and out of capacitors, lines, cables, transformers and other plant.
Substitute Reserve	The additional MW output (and/or reduction in **Demand**) required compared to the pre-incident output (or **Demand**) which is fully available and sustainable over the period from 4 hours to 24 hours following an **Event**.
Supplier	The holder of a **Supply Licence**.
Supply	The process of delivering electrical energy by a **Supplier**; also, the amount of electric energy delivered, usually expressed in megawatthours (MWh).
Synchronise	The condition where an incoming **Generation Unit** or system is connected to another **System** so that the frequencies and phase relationships of that **Generation Unit** or **System**, as the case may be, and the **System** to which it is connected are identical and the terms "**Synchronise**", "**Synchronising**" and "**Synchronisation**" shall be construed accordingly.
Synchronous Compensation	The operation of rotating synchronous **Apparatus** for the specific purpose of either the **Generation** or absorption of **Reactive Power**.
Synchronous Start-Up Time Cold	The time taken to bring a **Generating Unit** to a **Synchronised** state from a **Cold** (**De-Synchronised**) state.
Synchronous Start-Up Time Hot	The time taken to bring a **Generating Unit** to a **Synchronised** state from a **Hot** (**De-Synchronised**) state.
Synchronous Start-Up Time Warm	The time taken to bring a **Generating Unit** to a **Synchronised** state from a **Warm** (**De-Synchronised**) state.
System	Any **User System** and/or the **Transmission System** as the case may be.
System Capacity Shortfall Warning	A warning issued by the **TSO** if, the **Availability** forecast and **Demand** forecast indicate that there will be a deficit in any week,
System Emergency Condition	A **Partial Shutdown** or **Total Shutdown** or any other physical or operational condition and/or occurrence on the **Power System** which, in the **TSO's** opinion, is (i) imminently likely to endanger or is endangering life or property; or (ii) is imminently likely to impair or is impairing: (a) the **TSO**'s ability to discharge any statutory, regulatory or other legal obligation and/or (b) the safety and/or reliability of the **Power System**.
System Model	A software representation of the **Transmission System** developed and maintained by the **TSO** for the purposes of **Power System** simulation. The **System Model** contains all data relating to the **Transmission System** network, **User Registered**

	Operating Characteristics and **User Models**.
System Planning	The process by which the performance of the **System** is evaluated and future changes and additions to the **System** are determined.
System Planning Data	Data that must be submitted at regular periods by all **Users,** or other such data or information as requested by the **TSO** under **PC.6**
System Services	Services which are required for **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 Support Agreement	A bilateral agreement between the **TSO** and a **User** for services which are required for **System** reasons and which exclude those which must be provided by **Users** in accordance with the **Connection Conditions.**
System Support Services	Those services defined as **System Support Services** in Condition 1 of the **TSO Licence** granted to the **Other TSO**.
System Test	**Tests** which involve simulating conditions, or the controlled application of irregular, unusual or extreme conditions, on the **System**, or any part of the **System**, but which do not include **Commissioning** or recommissioning tests or any other tests of a minor nature.
Target Charge Level Percentage	As defined in the **TSC**.
Target Charge Levels	Part of the **Commercial Offer Data** for an **Energy Storage Power Station Generator** and means the target level of the storage for the end of the **Trading Day**.
Target Frequency	That **Frequency** determined by the **TSO**, in its reasonable opinion, as the desired operating **Frequency** of the **Power System**.
Technical Parameters	The technical capabilities, flexibilities and limitations for the operation of a **User's Plant** as registered or declared in accordance with the provisions of the **Grid Code** including those parameters listed in Appendix A to SDC1.
Technical Parameters Notice	**A notification as submitted under SDC1.4.4.1.**
Temporary Voltage Depression	A rapid change in fundamental **Frequency RMS** or peak **Voltage** over several cycles and remaining within the normal operating voltage range. This form of disturbance can manifest as an **RMS Voltage** depression with a slow recovery to nominal **Voltage**. The **RMS Voltage** depression is attributable to starting motors or the energisation of transformers or reactors and is characterised by the following diagram:

	
Tertiary Operating Reserve	**Tertiary Operating Reserve band 1** and **Tertiary Operating Reserve band 2**
Tertiary Operating Reserve band 1	The additional **MW Output** (and/or reduction in **Demand**) required compared to the pre-incident output (or **Demand**) which is fully available and sustainable over the period from 90 seconds to 5 minutes following an event.
Tertiary Operating Reserve band 2	The additional **MW Output** (and/or reduction in **Demand**) required compared to the pre-incident output (or **Demand**) which is fully available and sustainable over the period from 5 minutes to 20 minutes following an event.
Test Proposer	The **User** submitting proposal for a test under OC8.
Testing	Testing carried out by the **TSO** pursuant to OC10 and/or CC and the term "**Test**" shall be construed accordingly.
Thermal Overload	A **Thermal Overload** occurs when the designed thermal rating of a transmission line or cable is exceeded. The thermal rating of a transmission line is dictated by its physical construction and varies with the ambient weather conditions, while the thermal rating of a transmission cable is dependent solely on its physical construction.
Thermal Plant	A **Generating Unit** that uses any source of thermal **Energy**.
Total Harmonic Voltage Distortion (THD)	The **Total Harmonic Voltage Distortion** is the **RMS** value of the sum of all individual **Harmonic Voltage Distortion Levels** up to a specified order *H*, where H is set to be 40.
Total Shutdown	The situation existing when all generation has ceased and there is no electricity supply from **External Interconnection**.
Total Transfer Capacity	The total amount of power that can be exchanged continuously to or from the **Transmission System** over the **Interconnector** while ensuring the safe operation of the **Transmission System**. It is set based on physical and electrical realities according to system security requirements including thermal limits (including single contingencies), voltage limits and stability limits.
Trading and Settlement Code	The **Single Electricity Market** Trading and Settlement Code which the **Market Operator** is required to administer and maintain in force under the **Market Operator** licences issued by the **Regulatory Authorities**.
Trading Day	The period commencing at 23.00 each day and ending at 23.00 the next day.
Transmission Asset Owner (TAO)	The **ESB**, acting in its capacity as the **Transmission System Owner**.

Transmission Reliability Margin	A transmission transfer capacity margin which accounts for the security margin for regulation, reserve sharing, and **Rescue Flows** between the **Transmission System** and any **External System** and may also take into account uncertainties of system conditions and other assumptions made to produce **Total Transfer Capacity** ex-ante.
Transmission Station	A node in the electricity **Transmission System** with transmission circuit/s, transformer/s, circuit breakers and their associated protection and communications systems.
Transmission System	The **System** consisting (wholly or mainly) of high **Voltage** electric lines and cables operated by the **TSO** for the purposes of transmission of electricity from one **Power Station** to a sub-station or to another **Power Station** or between sub-stations or to or from any **External Interconnection** including any **Plant** and **Apparatus** and meters owned or operated by the **TSO** or **TAO** in connection with the transmission of electricity.
Transmission System Operator (TSO)	The holder of the licence granted pursuant to Section 14 of the **Act** 1999 to operate a **Transmission System**.
Transmission System Owner	The holder of the licence granted pursuant to Section 14 of the **Act** to own the **Transmission System**.
Transmission System Security Planning Standards	**System Planning** practices and considerations that the **TSO** follows. The application of **Transmission System Security Planning Standards** may vary to match local conditions and local **System** requirements. The **Transmission System Security Planning Standards** are available on the **TSO**'s website.
Transmission Use of System Agreement	An agreement between the **TSO** and a **User** setting out the terms relating to the use of the **Transmission System.**
TSO Licence	A **Licence** authorising a **TSO** to carry out electricity transmission activities, granted either pursuant to Article 10(1)(b) of the Electricity (Northern Ireland) Order 1992 in Northern Ireland or pursuant to section 14 of the Electricity Regulation Act 1999 in the Republic of Ireland.
TSO Telecommunication Interface Cabinet	The physical interface point between the **TSO's** telecommunications equipment and the **Controllable PPM's** control equipment.
Unit Board	A switchboard through which electrical power is supplied to the **Auxiliaries** of a **Generating Unit** and which is supplied by a **Unit Transformer.** It may be interconnected with a **Station Board**.
Unit Transformer	A transformer directly connected to a **Generating Unit's** terminals, and which supplies power to the **Auxiliaries** of a **Generating Unit**.
Use of System Tariffs	Tariffs set by the **TSO** subject to approval by the **CRU** for use of the **Transmission System.**
User	A term utilised in various sections of the **Grid Code** to refer to the persons using the **Transmission System**, as more particularly identified in each section of the **Grid Code** concerned. The term means any person (other than the **TSO**) to whom the **Grid Code** applies.
User Development	In the **Planning Code** means either **User's Plant** and/or **Apparatus** to be connected to the **Transmission System**, or a

	Modification relating to a **User's Plant** and/or **Apparatus** already connected to the **Transmission System**, or a proposed new connection or **Modification** to the connection within the **User System**.
User Site	A site owned (or occupied pursuant to a lease, licence or other agreement) by a **User** in which there is a **Connection Point**.
User System	Any system owned or operated by a **User** comprising:- (i) **Generating Units**; (ii) **Interconnectors**; and/or (iii) systems consisting (wholly or mainly) of electric circuits used for the distribution of electricity from **Grid Supply Points** or **Generating Units** or other entry points to the point of delivery to **Customers**, or other **Users**; and **Plant** and/or **Apparatus** connecting:- (i) the system as described above; or (ii) **Demand Customers'** equipment; to the **Transmission System** or to the relevant other **User System**, as the case may be. The **User System** includes any **Remote Transmission Assets** operated by such **User** or other person and any **Plant** and/or **Apparatus** and meters owned or operated by the **User** or other person in connection with the distribution of electricity but does not include any part of the **Transmission System**.
User System Entry Point	A point at which a **Generation Unit**, a **CCGT Installation** or a **CCGT Unit**, as the case may be, which is **Embedded** connects to the **User System**.
Var	A single unit of **Reactive Power**.
Voltage	Voltage of relevant section of **Transmission System -** nominally 400kV, 220kV or 110kV
Voltage Control	The retention of the **Voltage** on the **System** within acceptable limits.
Voltage Dip	The is a short-duration reduction in **Voltage** on any or all phases due to a **Fault Disturbance** or other **Significant System Incident**, resulting in **Transmission System Voltages** outside the ranges as specified in CC.8.3.2, 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 Flicker	The impression of unsteadiness of visual sensation induced by a light stimulus whose luminance or spectral distribution fluctuates with time.
Voltage Regulation	The automatic adjustment of **Reactive Power** output from a **Generation Unit(s)** in response to **Voltage** changes (e.g. from a **Generation Unit**).
Voltage Regulation Set-point	The **Voltage** in kV that the **Voltage Regulation System** will act to regulate by continuous modulation of the **Interconnector's** or **Wind Farms Power Station**'s **Reactive Power**.
Voltage Regulation System	A facility providing the means to automatically adjust the **Reactive Power** output (e.g. from a **Generation Unit**)**(s)** in response to changes in **Voltage**.
Voltage Regulation System Slope Setting	The percentage change in **Transmission System Voltage** that would cause the **Reactive Power** output of the **Interconnector** to vary from maximum **Mvar** production to maximum **Mvar** absorption or vice-versa or **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 PPM1.4.
Warm Cooling Boundary	The period of time, which must be greater than that defined by the **Hot Cooling Boundary**, post **De-Synchronisation** of a **Generating Unit** after which the **Generating Unit's Warmth State** transfers from being warm to cold.
Warm Start	Any **Synchronisation** of a **Generating Unit** that has previously not been **Synchronised** for a period of time longer than its submitted **Hot Cooling Boundary** and shorter than or equal to its submitted **Warm Cooling Boundary**.
Warmth	The temperature related condition of a **CDGU** which changes according to the length of time since the **CDGU** was last **De-Synchronised**, expressed as various levels of warmth (dependent upon the design of the **CDGU**).
Warmth State	Either cold, warm or hot, as defined under the timeframes since last **De-Synchronisations** for **Cold Start**, **Warm Start** or **Hot Start** respectively.
Warning	A warning as provided for in OC10.7.1.1
Wind Turbine Generator(s) (WTG)	A **Generation Unit(s)** generating electricity from wind.