EirGrid Grid Code

Version 12

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: 13/03/2023
Demarcation of Requirements

Requirements in the **Grid Code** which are *not marked by a symbol and border* 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 *marked by a symbol and border* are applicable to the corresponding **Users** as per Table 1: Demarcation of Requirements.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Applicable to</th>
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<tbody>
<tr>
<td>○</td>
<td>RfG Generation Units</td>
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<tr>
<td>⌂</td>
<td>Non-RfG Generation Units</td>
</tr>
<tr>
<td>▲</td>
<td>DCC Units</td>
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<tr>
<td>▽</td>
<td>Non-DCC Units</td>
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GENERAL CONDITIONS

INTRODUCTION

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.

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.

OBJECTIVE

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.

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 modifications 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 modifications 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 Business Days (excluding the day of issue and the day of the meeting) 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 and DCC Units and HVDC Units and DC-Connected PPMs.

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.9.3.1  Power to Grant Derogations

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  General Provisions

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 CNCD2 and CNCD3 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

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

GC.9.3.3.1 A request for a derogation shall be filed with the TSO using form CNCD2 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.9.3.3.2 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.9.3.3.3 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.9.3.3.4 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.9.3.3.5 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.
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.

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

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

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.

Request for a Derogation by the TSO

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

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 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.

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.
<table>
<thead>
<tr>
<th>GC.9.3.5</th>
<th>Register of Derogations</th>
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<tbody>
<tr>
<td>GC.9.3.5.1</td>
<td>The <strong>CRU</strong> 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.</td>
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<td>GC.9.3.5.2</td>
<td>The register shall contain, in particular:</td>
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<td>(a) the requirement or requirements for which the derogation is granted or refused;</td>
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<td>(b) the content of the derogation;</td>
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<td>(c) the reasons for granting or refusing the derogation;</td>
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<td>(d) the consequences resulting from granting the derogation.</td>
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<tr>
<th>GC.9.3.6</th>
<th>Monitoring of Derogations</th>
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<tr>
<td>GC.9.3.6.1</td>
<td>ACER shall monitor the procedure of granting derogations with the cooperation of the <strong>CRU</strong>. The <strong>CRU</strong> shall provide ACER with all the information necessary for that purpose.</td>
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<tr>
<td>GC.9.3.6.2</td>
<td>ACER may issue a reasoned recommendation to the <strong>CRU</strong> to revoke a derogation due to a lack of justification. The European Commission may issue a reasoned recommendation to the <strong>CRU</strong> to revoke a derogation due to a lack of justification.</td>
</tr>
<tr>
<td>GC.9.3.6.3</td>
<td>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.</td>
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</table>
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.
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.

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.

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**.

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**.
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.

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.

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

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

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.9.5 Interconnector and DC-connected PPM Derogation Procedure

GC.9.5.1 Power to Grant Derogations
CRU may, at the request of an Interconnector Owner, Generator, or the TSO, grant an Interconnector, DC-connected PPM or the TSO, derogations from one or more HVDC clauses in the Grid Code for HVDC Units and Non-HVDC Units in accordance with GC.9.5.3 and GC.9.5.4. Derogations may be granted and revoked in accordance with GC.9.5.2, GC.9.5.3, GC.9.5.4 and GC.9.5.5 by authorities other than the CRU.

GC.9.5.2 General Provisions
GC.9.5.2.1 The criteria specified by CRU to assess derogations pursuant to GC.9.5.3 and GC.9.5.4 are specified in form CNCD2 and CNCD3 respectively.

GC.9.5.2.2 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.9.5.2.1. Any changes to the criteria shall not apply to derogations, for which a request has already been made.

GC.9.5.2.3 The CRU may decide, that Interconnectors or DC-connected PPMs for which a request for a derogation has been filed, pursuant to GC.9.5.3 or GC.9.5.4, do not need to comply with HVDC 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.9.5.3 Request for a Derogation by an Interconnector Owner or a Generator:
GC.9.5.3.1 An Interconnector Owner or a Generator may request a derogation from one, or several, relevant clauses in the Grid Code, for an Interconnector or a DC-connected PPM.

GC.9.5.3.2 A request for a derogation shall be filed with the TSO, using form CNCD2 and include:

(a) an identification of Interconnector Owner or Generator and a contact person for any communications;

(b) a description of the Interconnector or DC-connected PPM for which a derogation is requested;

(c) a reference to the relevant 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;
(f) In the case of a DC-connected PPM connected to one or more remote-end Interconnector Converter Stations, evidence that the converter station will not be affected by the derogation or; alternatively, agreement from the converter station owner to the proposed derogation.

In the case where a DC-connected PPM has, or will only have, a single connection to a single synchronous area (e) above will not apply. Within two weeks of receipt of a request for a derogation, the TSO shall confirm to the Interconnector Owner or Generator whether the request is complete. If the TSO considers that the request is incomplete, the Interconnector Owner or Generator shall submit the additional required information within one month, from the receipt of the request for additional information. If the Interconnector Owner or Generator, does not supply the requested information within that time limit, the request for derogation shall be deemed withdrawn.

**GC.9.5.3.3** 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.9.5.2.

**GC.9.5.3.4** 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.9.5.3.3. That period may be extended by one month where the TSO seeks further information from the Interconnector Owner or Generator.

**GC.9.5.3.5** 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 Interconnector Owner or Generator, or from any other interested parties. The additional period shall begin when the complete information has been received.

**GC.9.5.3.6** The Interconnector Owner or Generator shall submit any additional information requested by the CRU within two months of such a request. If the Interconnector Owner or 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 Interconnector Owner or Generator informs the CRU by means of a reasoned submission that the request for a derogation is complete.

However, the CRU may attach conditions to the derogation including a condition that if the DC-connected PPM undergoes a development of a connection into a multi-terminal network or the connection of a further PPM at the same point this will cause the derogation to be re-evaluated by the CRU or to expire. The CRU shall take into account the need to optimise the configuration between the DC-connected PPM and the remote-end Interconnector Converter Station, as well as the legitimate expectations of the Generator when adopting a decision concerning a request for a derogation.

GC.9.5.3.7 The CRU shall issue a reasoned decision concerning a request for derogation. Where the CRU grants a derogation, it shall specify its duration.

GC.9.5.3.8 The CRU shall notify its decision to the relevant Interconnector Owner or Generator and the TSO.

GC.9.5.3.9 The CRU may revoke a decision granting a derogation, if the circumstances and underlying reasons no longer apply, or upon a reasoned recommendation of the European Commission, or reasoned recommendation by ACER, pursuant to GC.9.5.6.2.

GC.9.5.4 Request for a Derogation by the TSO

GC.9.5.4.1 The TSO may request derogations for classes of Interconnectors or DC-connected PPMs connected, or to be connected, to their Network.

GC.9.5.4.2 The TSO shall submit its 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 Interconnectors or DC-connected PPMs, for which a derogation is requested and the total installed capacity and number of Interconnectors or DC-connected PPMs;
(c) the relevant 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.9.5.4.3 The CRU shall adopt a decision concerning a request for derogation within six months, from the day after it receives the request.

GC.9.5.4.4 The six-month time limit referred to in GC.9.5.4.3 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.9.5.4.5 The CRU shall issue a reasoned decision concerning a request for derogation. Where the CRU grants a derogation, it shall specify its duration.

GC.9.5.4.6 The CRU shall notify its decision to the TSO and ACER.

GC.9.5.4.7 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 Interconnector Owners, Generator and stakeholders, including manufacturers.

GC.9.5.4.8 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.9.5.6.2
GC.9.5.5  Register of Derogations
GC.9.5.5.1  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.9.5.5.2  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.9.5.6  Monitoring of Derogations
GC.9.5.6.1  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.9.5.6.2  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.9.5.6.3  The European Commission may request ACER to report on the application of GC.9.5.6.1 and GC.9.5.6.2 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 timescale, 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.
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.

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

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.

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.

Preliminary Project Planning Data

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;
Status of application, for example in progress or issued;
Specific location, including grid co-ordinates;
The Registered Capacity applied for; and
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 the **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.
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.

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_______________________________________________________

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.

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. 292000 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 by the end of calendar week 9 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 8th, then the measurements should be taken on the following Tuesday, December 13th. 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, R₀, X₀, B₀) 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)
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).

Disturbing Loads

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

Grid Connected Transformer

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of windings</td>
<td></td>
</tr>
<tr>
<td>Vector Group</td>
<td></td>
</tr>
<tr>
<td>Rated current of each winding</td>
<td>A</td>
</tr>
<tr>
<td>Transformer Rating</td>
<td>MVA\textsubscript{Trans}</td>
</tr>
<tr>
<td>Transformer nominal LV voltage</td>
<td>kV</td>
</tr>
<tr>
<td>Transformer nominal HV voltage</td>
<td>kV</td>
</tr>
<tr>
<td>Tapped winding</td>
<td></td>
</tr>
<tr>
<td>Transformer Ratio at all transformer taps</td>
<td></td>
</tr>
</tbody>
</table>
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.

\[ Z_{HV:LV1} \quad \% \text{ on rating MVA}_{\text{Trans}} \]
\[ Z_{HV:LV2} \quad \% \text{ on rating MVA}_{\text{Trans}} \]
\[ Z_{LV1:LV2} \quad \% \text{ on rating MVA}_{\text{Trans}} \]

**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.

\[ Z_{HT0} \quad \text{Ohm} \]

Zero Phase Sequence impedance measured between the HV terminals (shorted) and the neutral terminal, with the LV terminals short-circuited to the neutral.

\[ Z_{HL0} \quad \text{Ohm} \]

Zero Phase Sequence impedance measured between the LV terminals (shorted) and the neutral terminal, with the HV terminals open-circuit.

\[ Z_{LT0} \quad \text{Ohm} \]

Zero Phase Sequence impedance measured between the LV terminals (shorted) and the neutral terminal, with the HV terminals short-circuited to the neutral.

\[ Z_{LH0} \quad \text{Ohm} \]

Zero Phase Sequence leakage impedance measured between the HV terminals (shorted) and the LV terminals (shorted), with the Delta winding closed.

\[ Z_{L0} \quad \text{Ohm} \]

**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
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Normal Maximum Continuous Generation Capacity:</td>
<td>MW</td>
</tr>
<tr>
<td>* Normal Maximum Continuous Export Capacity</td>
<td>MW</td>
</tr>
<tr>
<td><strong>Primary Fuel Switchover Output</strong></td>
<td>MW</td>
</tr>
<tr>
<td><strong>Secondary Fuel Switchover Output</strong></td>
<td>MW</td>
</tr>
<tr>
<td>* Power Station Auxiliary Load</td>
<td>MW</td>
</tr>
<tr>
<td>§ <strong>Power Station Auxiliary Load</strong></td>
<td>Mvar</td>
</tr>
<tr>
<td>* Maximum (Peaking) Generating Capacity</td>
<td>MW</td>
</tr>
<tr>
<td>* Maximum (Peaking) Export Capacity</td>
<td>MW</td>
</tr>
<tr>
<td>* Normal Minimum Continuous Generating Capacity</td>
<td>MW</td>
</tr>
<tr>
<td>* Normal Minimum Continuous Export Capacity</td>
<td>MW</td>
</tr>
<tr>
<td>* Generator Rating:</td>
<td>Mbase MVA</td>
</tr>
<tr>
<td>* Normal Maximum Lagging Power Factor</td>
<td>Mvar</td>
</tr>
<tr>
<td>* Normal Maximum Leading Power Factor</td>
<td>Mvar</td>
</tr>
<tr>
<td>§ <strong>Governor Droop</strong></td>
<td>R</td>
</tr>
<tr>
<td>§ <strong>Forbidden Zones</strong></td>
<td>MW</td>
</tr>
<tr>
<td>§ Terminal Voltage adjustment range</td>
<td>kV</td>
</tr>
<tr>
<td>§ Short Circuit Ratio</td>
<td></td>
</tr>
<tr>
<td>§ Rated Stator Current</td>
<td>Amps</td>
</tr>
<tr>
<td>* Number of available hours of running at Registered</td>
<td></td>
</tr>
</tbody>
</table>
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.

§ Open Circuit Magnetisation Curves

§ Short Circuit characteristic

§ Zero power factor curve

§ V curves

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

§ Time to synchronise from warm

§ Time to synchronise from cold

§ Minimum Up Time

§ Minimum Down Time

§ Normal loading rate

§ Normal deloading rate

§ Can the Generator 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

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 SDCs 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:

<table>
<thead>
<tr>
<th>MW Range</th>
<th>Units Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 MW to 50 MW</td>
<td>GT1</td>
</tr>
<tr>
<td>50 MW to 170 MW</td>
<td>GT1 and ST</td>
</tr>
<tr>
<td>170 MW to 400 MW</td>
<td>GT1 and GT2 and ST</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>CCGT INSTALLATION</th>
<th>CCGT UNIT AVAILABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTPUT USABLE</td>
<td>1st GT</td>
</tr>
<tr>
<td>OUTPUT USABLE</td>
<td>Unit MW Capacity</td>
</tr>
<tr>
<td>Total MW Output Range</td>
<td>[ ] MW to [ ] MW</td>
</tr>
</tbody>
</table>
### Generator Parameters

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>( X_d )</td>
<td>% on rating</td>
</tr>
<tr>
<td>( X_{d\text{ sat}} )</td>
<td>% on rating</td>
</tr>
<tr>
<td>( X_{d\text{ unsat}} )</td>
<td>% on rating</td>
</tr>
<tr>
<td>( X_{d} = X_{q}^* )</td>
<td>% on rating</td>
</tr>
<tr>
<td>( X_q )</td>
<td>% on rating</td>
</tr>
<tr>
<td>( X_{q\text{ unsat}} )</td>
<td>% on rating</td>
</tr>
<tr>
<td>( X_2 )</td>
<td>% on rating</td>
</tr>
<tr>
<td>( X_0 )</td>
<td>% on rating</td>
</tr>
<tr>
<td>( H )</td>
<td>MW s/MVA</td>
</tr>
</tbody>
</table>

### Generator Time Constants

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>( R_a )</td>
<td>% on rating</td>
</tr>
<tr>
<td>( X_L )</td>
<td>% on rating</td>
</tr>
<tr>
<td>( X_P )</td>
<td>% on rating</td>
</tr>
<tr>
<td>Symbol</td>
<td>Units</td>
</tr>
<tr>
<td>--------</td>
<td>-------</td>
</tr>
<tr>
<td>$T_{do}'$</td>
<td>sec</td>
</tr>
<tr>
<td>$T_{do}''$</td>
<td>sec</td>
</tr>
<tr>
<td>$T_{qo}'$</td>
<td>sec</td>
</tr>
<tr>
<td>$T_{qo}''$</td>
<td>sec</td>
</tr>
<tr>
<td>$T_{d}'$</td>
<td>sec</td>
</tr>
<tr>
<td>$T_{d}''$</td>
<td>sec</td>
</tr>
<tr>
<td>$T_{q}'$</td>
<td>sec</td>
</tr>
<tr>
<td>$T_{q}''$</td>
<td>sec</td>
</tr>
</tbody>
</table>

**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:
<table>
<thead>
<tr>
<th>Description</th>
<th>Symbol</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excitation system type (AC or DC)</td>
<td>Text</td>
<td></td>
</tr>
<tr>
<td>Excitation feeding arrangement (solid or shunt)</td>
<td>Text</td>
<td></td>
</tr>
<tr>
<td>Excitation system Filter time constant</td>
<td>$Tr$</td>
<td>sec</td>
</tr>
<tr>
<td>Excitation system Lead time constant</td>
<td>$Tc$</td>
<td>sec</td>
</tr>
<tr>
<td>Excitation system Lag time constant</td>
<td>$Tb$</td>
<td>sec</td>
</tr>
<tr>
<td>Excitation system Controller gain</td>
<td>$Ka$</td>
<td></td>
</tr>
<tr>
<td>Excitation system controller lag time constant</td>
<td>$Ta$</td>
<td>sec</td>
</tr>
<tr>
<td>Excitation system Maximum controller output</td>
<td>$V_{\text{max}}$</td>
<td>p.u.</td>
</tr>
<tr>
<td>Excitation system minimum controller output</td>
<td>$V_{\text{min}}$</td>
<td>p.u.</td>
</tr>
<tr>
<td>Excitation system regulation factor</td>
<td>$K_c$</td>
<td></td>
</tr>
<tr>
<td>Excitation system rate feedback gain</td>
<td>$K_f$</td>
<td></td>
</tr>
<tr>
<td>Excitation system rate feedback time constant</td>
<td>$T_f$</td>
<td>sec</td>
</tr>
</tbody>
</table>

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.
### § Environmental Impact

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Unit Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂</td>
<td>tonne CO₂ / tonne fuel</td>
</tr>
<tr>
<td></td>
<td>Unit CO₂ removal efficiency</td>
</tr>
<tr>
<td>SO₂</td>
<td>tonne SO₂ / tonne fuel</td>
</tr>
<tr>
<td></td>
<td>Unit SO₂ removal efficiency</td>
</tr>
<tr>
<td>NOₓ</td>
<td>tonne NOₓ / exported MWh curve</td>
</tr>
</tbody>
</table>

### § Pumped Storage

<table>
<thead>
<tr>
<th>Reservoir Capacity</th>
<th>Unit Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reservoir Capacity</td>
<td>MWh pumping</td>
</tr>
<tr>
<td>Max Pumping Capacity</td>
<td>MW</td>
</tr>
<tr>
<td>Min Pumping Capacity</td>
<td>MW</td>
</tr>
<tr>
<td>Efficiency (generating / pumping ratio)</td>
<td>%</td>
</tr>
</tbody>
</table>
### § Generator Transformer

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of windings</td>
<td></td>
</tr>
<tr>
<td>Vector Group</td>
<td></td>
</tr>
<tr>
<td>Rated current of each winding</td>
<td>Amps</td>
</tr>
<tr>
<td>Transformer Rating</td>
<td>$MVA_{\text{Trans}}$</td>
</tr>
<tr>
<td>Transformer nominal LV voltage</td>
<td>kV</td>
</tr>
<tr>
<td>Transformer nominal HV voltage</td>
<td>kV</td>
</tr>
<tr>
<td>Tapped winding</td>
<td></td>
</tr>
<tr>
<td>Transformer Ratio at all transformer taps</td>
<td></td>
</tr>
<tr>
<td>Transformer Impedance at all taps$^1$</td>
<td>% on rating $MVA_{\text{Trans}}$</td>
</tr>
<tr>
<td>Transformer zero sequence impedance at nominal tap</td>
<td>$Z_0$</td>
</tr>
<tr>
<td>Earthing Arrangement including neutral earthing resistance &amp; reactance</td>
<td></td>
</tr>
<tr>
<td>Core construction (number of limbs, shell or core type)</td>
<td></td>
</tr>
<tr>
<td>Open circuit characteristic</td>
<td>Graph</td>
</tr>
</tbody>
</table>

$^1$ 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

<table>
<thead>
<tr>
<th>Availability of Registered Capacity</th>
<th>Reason</th>
<th>Available Exported MW</th>
<th>Time %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registered Capacity</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Restricted Rating

Forced Outage Probability

<table>
<thead>
<tr>
<th>Total</th>
<th>100%</th>
</tr>
</thead>
</table>

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

PC.A4.12.3 § Energy Limitations

<table>
<thead>
<tr>
<th>Daily</th>
<th>GWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly</td>
<td>GWh</td>
</tr>
<tr>
<td>Monthly</td>
<td>GWh</td>
</tr>
<tr>
<td>Annual</td>
<td>GWh</td>
</tr>
</tbody>
</table>
PC.A4.12.4 § Hydro Expected Monthly GWh

<table>
<thead>
<tr>
<th>Month</th>
<th>GWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td></td>
</tr>
<tr>
<td>February</td>
<td></td>
</tr>
<tr>
<td>March</td>
<td></td>
</tr>
<tr>
<td>April</td>
<td></td>
</tr>
<tr>
<td>May</td>
<td></td>
</tr>
<tr>
<td>June</td>
<td></td>
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<tr>
<td>July</td>
<td></td>
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<tr>
<td>August</td>
<td></td>
</tr>
<tr>
<td>September</td>
<td></td>
</tr>
<tr>
<td>October</td>
<td></td>
</tr>
<tr>
<td>November</td>
<td></td>
</tr>
<tr>
<td>December</td>
<td></td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>How the generator is run up to synchronous speed</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnitude of inrush / starting current</td>
<td>Amps</td>
</tr>
<tr>
<td>Duration of inrush / starting current</td>
<td>ms</td>
</tr>
<tr>
<td>Starting / paralleling frequency</td>
<td>Hz</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Type</th>
<th>Table as Extend</th>
<th>Total length (m)</th>
<th>Conductor cross section area per core (mm)</th>
<th>Conductor type (Al, Cu, etc)</th>
<th>Type of insulation</th>
<th>Charging capacitance (µF/km)</th>
<th>Charging current (Ampere/km)</th>
<th>Positive sequence</th>
</tr>
</thead>
</table>
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.
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.

<table>
<thead>
<tr>
<th>(vi) Interconnector Transformer;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symbol</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td>number of windings</td>
</tr>
<tr>
<td>vector Group</td>
</tr>
<tr>
<td>rated current of each winding</td>
</tr>
<tr>
<td>transformer rating</td>
</tr>
<tr>
<td>transformer nominal LV voltage</td>
</tr>
<tr>
<td>transformer nominal HV voltage</td>
</tr>
<tr>
<td>tapped winding</td>
</tr>
<tr>
<td>transformer ratio at all transformer taps</td>
</tr>
</tbody>
</table>
transformer impedance at all taps\(^1\) % on rating MVA\(_{\text{Trans}}\)

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);
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;

proposed effective date in Single Electricity Market for first-time applicants; and

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 TSOs or DSOs 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 TSOs or DSOs 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.
The Connection Conditions define the normal Transmission System performance standards at the Connection Point.

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

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

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.

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.

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 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 supplying both the **Generation Unit** and the **Power Station** auxiliaries from the HV busbar) at 220 kV; ST2001, ST2002 etc.
    at 110 kV; ST101, ST102 etc.
(e) Unit transformers: UT1, UT2 etc.

(i.e. transformers supplying auxiliaries of a **Generation Unit**)

(f) Load transformers: for 400/110 kV; T4101, T4102 etc.

for 220/110 kV; T2101, T2102 etc.

for 110/38 kV; T141, T142 etc.

for 110/20 kV; T121, T122 etc.

for 110/11 kV 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.
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 disconnects 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):

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

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 liaise with the TSO on the design specification for the performance of the tap-changing facility on Grid Connected Transformers.

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

(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.
For the avoidance of doubt, the curves shown are for the two separate cases: 5% retained voltage (solid line) and 50% retained voltage (dashed line). The dashed line is slightly offset for illustrative purposes. Generating units must remain synchronized for voltage dips within the shaded regions. This applies across the full operating range of the generating units.

The Transmission System Voltage ranges following a disturbance are given in CC.8.3.2 and are not shown on this graphic.

(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**

(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**

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Time Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>47 – 47.5 Hz</td>
<td>20 seconds</td>
</tr>
<tr>
<td>47.5 – 48.5 Hz</td>
<td>90 minutes</td>
</tr>
<tr>
<td>48.5 – 49 Hz</td>
<td>90 minutes</td>
</tr>
<tr>
<td>49 – 51 Hz</td>
<td>Unlimited</td>
</tr>
<tr>
<td>51 – 51.5 Hz</td>
<td>90 minutes</td>
</tr>
<tr>
<td>51.5 – 52 Hz</td>
<td>60 minutes</td>
</tr>
</tbody>
</table>

(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.)
(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*.

![Voltage-against-time profile](image)

*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.


(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:

<table>
<thead>
<tr>
<th>Voltage Range</th>
<th>Connected at:</th>
<th>At Registered Capacity between:</th>
<th>At 35% of Registered Capacity between:</th>
</tr>
</thead>
<tbody>
<tr>
<td>$99kV \leq V \leq 123kV$</td>
<td>110kV</td>
<td>0.93 power factor leading to 0.85 power factor lagging</td>
<td>0.7 power factor leading to 0.4 power factor lagging</td>
</tr>
<tr>
<td>$200kV \leq V \leq 245kV$</td>
<td>220kV</td>
<td>0.93 power factor leading to 0.85 power factor lagging</td>
<td>0.7 power factor leading to 0.4 power factor lagging</td>
</tr>
<tr>
<td>$360kV \leq V \leq 420kV$</td>
<td>400kV</td>
<td>0.93 power factor leading to 0.85 power factor lagging</td>
<td>0.7 power factor leading to 0.4 power factor lagging</td>
</tr>
<tr>
<td>$350kV \leq V &lt; 360kV$</td>
<td></td>
<td>Unity power factor to 0.85 power factor lagging</td>
<td>0.7 power factor leading to 0.4 power factor lagging</td>
</tr>
</tbody>
</table>

**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 \((P_{\text{max}})\) at the Connection Point;

### 110kV Connection Voltage

- Consumption (lead) \(\leftarrow Q/P_{\text{max}} \rightarrow\) Production (lag)

### 220kV Connection Voltage

- Consumption (lead) \(\leftarrow Q/P_{\text{max}} \rightarrow\) Production (lag)
The Generation Unit shall be capable of moving to any operating point with its U-Q/\( P_{\text{max}} \) 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%.

**CC.7.3.8**

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

**CC.7.3.9**

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**.
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;
Demand Facilities, Closed Distribution Systems and Distribution Systems shall:

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

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Time Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>47 – 47.5 Hz</td>
<td>20 seconds</td>
</tr>
<tr>
<td>47.5 – 48.5 Hz</td>
<td>90 minutes</td>
</tr>
<tr>
<td>48.5 – 49 Hz</td>
<td>90 minutes</td>
</tr>
<tr>
<td>49 – 51 Hz</td>
<td>Unlimited</td>
</tr>
<tr>
<td>51 – 51.5 Hz</td>
<td>90 minutes</td>
</tr>
<tr>
<td>51.5 – 52 Hz</td>
<td>60 minutes</td>
</tr>
</tbody>
</table>

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.)

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

Reactive Power

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 \( \frac{Q_{\text{max}}}{P_{\text{MIC}}} \) equal to a power factor of 1 to 0.9 lagging.

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 \( \frac{Q_{\text{min}}}{\max\{P_{\text{MEC}},P_{\text{MIC}}\}} \) to 0.48 \( \frac{Q_{\text{max}}}{P_{\text{MEC}}} \) which is equal to a power factor of 0.9
lagging to 0.9 leading.

CC.7.4.2.4.2. The Distribution System shall be capable of maintaining steady-state operation at the Connection Point within a Reactive Power range of $-0.48 \frac{Q_{\text{min}}}{\max[P_{\text{MEC}}, P_{\text{MIC}}]}$ during Reactive Power import/consumption, and $0.48 \frac{Q_{\text{max}}}{P_{\text{MEC}}}$ 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.7.4.2.4.3. 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.7.4.2.4.4. 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.7.4.2.4.5. 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**

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 times in any given twelve months;

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

(m) **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;

(n) **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;

(o) **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.

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

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

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

(s) The TSO may request Interconnectors to have the capacity to operate under AGC at all loads between AGC Minimum Load and AGC Maximum Load.
(t) remain connected to the Transmission System and operate within the Frequency ranges and time periods 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

<table>
<thead>
<tr>
<th>Frequency range</th>
<th>Time period for operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>47 – 47.5 Hz</td>
<td>60 seconds</td>
</tr>
<tr>
<td>47.5 – 48.5 Hz</td>
<td>90 minutes</td>
</tr>
<tr>
<td>48.5 – 49 Hz</td>
<td>90 minutes</td>
</tr>
<tr>
<td>49 – 51 Hz</td>
<td>Unlimited</td>
</tr>
<tr>
<td>51 – 51.5 Hz</td>
<td>90 minutes</td>
</tr>
<tr>
<td>51.5 – 52 Hz</td>
<td>60 minutes</td>
</tr>
</tbody>
</table>

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.

(u) 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.

(v) 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.)

(w) 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 Voltage 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.

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

(y) 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).

(z) 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.

(aa) 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.

(bb) 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 Convertor Stations or other plant and equipment are in close electrical proximity, the TSO may specify control interaction studies on site specific basis with defined scope and extent in order to demonstrate no adverse interaction 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 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 individual 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 specific 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) \( 48\text{Hz} \leq f_1 \leq 50\text{Hz} \)

(iii) \( 48\text{Hz} \leq f_1 \leq 50\text{Hz} \)

(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).
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.

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.

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.

Automatic Voltage Regulation

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 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

**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.
operated with or without a deadband selectable in a range from zero to ±5% of reference 1 p.u. **Transmission System Voltage**, 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 **Voltage** 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.

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**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 providing 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 $U$-$Q/P_{\text{max}}$ profile, without undue delay, and shall be capable of moving from its minimum Reactive Power capability $Q_{\text{min}}/P_{\text{max}}$ (Import/Lead) to its maximum Reactive Power capability $Q_{\text{max}}/P_{\text{max}}$ (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 transmission capacity ($P_{\text{max}}$) 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.

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:

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

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**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**.

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
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.

**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).
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).

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.
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.

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).

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.
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.

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.
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.

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 Mode** 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**

<table>
<thead>
<tr>
<th>Type of rapid Voltage change</th>
<th>$\frac{\Delta U}{U_N}$ Limit (%)</th>
<th>Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporary Voltage Depression</td>
<td>5</td>
<td>Must recover to nominal Voltage in 3 seconds</td>
</tr>
<tr>
<td>Step Change</td>
<td>3</td>
<td>One cycle</td>
</tr>
</tbody>
</table>

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 ongoing 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

(i) 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 Voltage 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.(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**. |
The Interconnector Owner shall demonstrate to the TSO that it has complied with Interconnector requirements by successfully completing the Operational Notification Procedure for connection of each Interconnector.

Operational Notification Procedure

The Operational Notification Procedure for connection of each Interconnector requires the completion of three sequential processes, consisting of:

- Energisation Operational Notification (EON);
- Interim Operational Notification (ION); and
- Final Operational Notification (FON).

Energisation Operational Notification

The TSO will issue an EON to the Interconnector Owner for an Interconnector, 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, an Interconnector Owner may energise its internal network and auxiliaries for the associated Interconnector by using the grid connection that is specified for the Connection Point.

Interim Operational Notification

The TSO will issue an ION to the Interconnector Owner for an Interconnector, subject to completion of the ION checklist.

Upon receipt of the ION, an Interconnector Owner may operate the associated Interconnector 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.9.5, if the Interconnector Owner can demonstrate sufficient progress towards full compliance and outstanding issues are clearly identified.
CC.15.17.3 Final Operational Notification

CC.15.17.3.1 The TSO will issue a FON to the Interconnector Owner for an Interconnector, subject to completion of the FON checklist.

Upon receipt of the FON, an Interconnector Owner may operate the associated Interconnector and generate power by using the grid connection that is specified for the Connection Point.

CC.15.17.3.2 If the TSO identifies a reason not to issue a FON, the Interconnector Owner may seek a derogation via the process described in GC.9.5.

Where a request for a derogation is rejected, the TSO shall have the right to refuse to allow the operation of the Interconnector until the Interconnector Owner and the TSO resolve the incompatibility and the TSO considers that the Interconnector is compliant with Grid Code.

If the TSO and the Interconnector Owner 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.15.18 A Interconnector Owner 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.15.19  **Limited Operational Notification**

CC.15.19.1  An **Interconnector Owner** shall apply to the relevant system operator for a Limited Operational Notification (LON), if the **Interconnector Owner** reasonably expects the circumstances described in CC.15.18 to persist for more than three months.

CC.15.19.2  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.15.19.3  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.15.19.4  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.9.5, made to the **TSO** before the expiry of that period.

CC.15.19.5  The **TSO** shall have the right to refuse to allow the operation of the **Interconnector**, once the LON is no longer valid. In such cases, the FON shall automatically become invalid.

CC.15.19.6  If the **TSO** does not grant an extension of the period of validity of the LON in accordance with CC.15.19.4 or if it refuses to allow the operation of the **Interconnector** once the LON is no longer valid in accordance with CC.15.19.5, the **Interconnector Owner** may refer the issue for decision to the **CRU** within six months after the notification of the decision of the **TSO**.
Sections CC.15.21 to CC.15.24 apply DC-connected PPMs only.

CC.15.21 The Generator shall demonstrate to the TSO that it has complied with DC-connected PPM requirements by successfully completing the Operational Notification Procedure for connection of each DC-connected PPM.

CC.15.22 Operational Notification Procedure
The Operational Notification Procedure for connection of each DC-connected PPM requires the completion of three sequential processes, consisting of:

- Energisation Operational Notification (EON);
- Interim Operational Notification (ION); and
- Final Operational Notification (FON).

CC.15.22.1 Energisation Operational Notification
The TSO will issue an EON to the Generator for a DC-connected PPM, 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 DC-connected PPM by using the grid connection that is specified for the Connection Point.

CC.15.22.2 Interim Operational Notification
The TSO will issue an ION to the Generator for a DC-connected PPM, subject to completion of the ION checklist.

Upon receipt of the ION, a Generator may operate the associated DC-connected PPM 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. The TSO shall notify the CRU of the ION validity period.
An extension to this period of time may be granted via a derogation undertaken according to GC.9.5 if the Generator can demonstrate sufficient progress towards full compliance and outstanding issues are clearly identified.

**CC.15.22.3** Final Operational Notification

**CC.15.22.3.1** The TSO will issue a FON to the Generator for a DC-connected PPM, subject to completion of the FON checklist.

Upon receipt of the FON, a Generator may operate the associated DC-connected PPM and generate power by using the grid connection that is specified for the Connection Point.

**CC.15.22.3.2** If the TSO identifies a reason not to issue a FON, the Generator may seek a derogation via the process described in GC.9.5.

Where a request for a derogation is rejected, the TSO shall have the right to refuse to allow the operation of the DC-connected PPM until the Generator and the TSO resolve the incompatibility and the TSO considers that the DC-connected PPM is compliant with Grid Code.

**CC.15.23** 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 due to one or more modifications of significance to its performance; or

(b) equipment failure leading to non-compliance with some relevant requirements.

**CC.15.24** Limited Operational Notification

**CC.15.24.1** 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.15.23 to persist for more than three months.
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.

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.

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.9.5, made to the **TSO** before the expiry of that period.

The **TSO** shall have the right to refuse to allow the operation of the DC-Connected **PPM**, once the LON is no longer valid. In such cases, the FON shall automatically become invalid.
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.1.8 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.

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.4: 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 OC.4.3.4.1.3:

(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.

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**Figure OC.4.3.4.1.8: Limited Frequency Sensitive Mode – Over-frequency**

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**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.
**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**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Response Insensitivity (Δf)</td>
<td>15mHz</td>
</tr>
<tr>
<td>Frequency Response Insensitivity (Δf/f)</td>
<td>0.03%</td>
</tr>
</tbody>
</table>

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.

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**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 diagram 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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Power as percentage of Maximum Capacity ($\Delta P/P_{\text{max}}$)</td>
<td>$X%$</td>
</tr>
<tr>
<td>Maximum admissible initial delay $t_1$</td>
<td>0.5 seconds</td>
</tr>
<tr>
<td>Maximum admissible time for full activation $t_2$, unless longer activation times are agreed with the TSO</td>
<td>10 seconds</td>
</tr>
</tbody>
</table>

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 capable 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 capable 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 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.

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**OC.4.3.4.2.3** The **Interconnector Operator** may only restrict the action of the Frequency Control mode in such a manner as to contravene the terms of 0 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.4.3.4.8 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.
Demand shedding may be used to prevent Voltage from contravening low Voltage limits (as further provided in OC.4) at Connection Points.

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.

Network Control

Introduction

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.

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.

Objective

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.

The second objective of OC4.5 is to establish procedures whereby the TSO will:
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.4.6.1 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.4.6.2 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.4 Demand Control

OC.5.1 Introduction

OC.4.1.1 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.4.1.2 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.4 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.4, 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 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.4 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.4.1.1, 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.4 applies to the TSO and to all Users, which term in this OC.4 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.
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.

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.

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).

Automatic Low Frequency Demand Disconnection

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.

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.

**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 Facilities, 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 of 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.

**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 identifies 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 Generator 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 Operations 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.
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.

Demand Side Unit Operators

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.

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.
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.

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.

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/Facsimile
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.
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.8.3 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

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.
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.

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.

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.

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 OC.8.12.

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.

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.
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 **OC.8.12**.

### Scheduling of Operational Tests

**OC.8.9**

**Operational Tests** will usually, but not necessarily, be scheduled by the **TSO** in accordance with **SDC1**.

**OC.8.9.1**

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.8.9.2**

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**.

### Dispatching of Operational Tests

**OC.8.10**

**Dispatch Instructions** for **Operational Tests** shall be issued by the **TSO** in the normal manner for issuing **Dispatch Instructions** in accordance with **SDC2**.

**OC.8.10.1**

The **TSO** shall use reasonable endeavours to ensure that scheduled **Operational Tests** are dispatched in accordance with the agreed **Dispatch** procedures.

**OC.8.10.2**

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.8.10.3**

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 Effect 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 Effect 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.

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**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**.

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**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.10.1 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.8OC.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-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.
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
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 Black Start Test Intervals
The TSO requires a Generator or Interconnector Operator with a Black Start Station to carry out a Black Start Test at least once every three calendar years.

OC.10.5.7.3.1 Black Start Unit Test
The TSO may require a Black Start Unit Test to be carried out at any time but no 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.
OC.10.5.7.2  **Black Start Station Test**

The TSO may require a Black Start Station Test to be carried out at any time but no more than once in every two calendar years 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.

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.
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.

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.

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 Operator 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.10.5.7.4 following 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.11.5  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. **Availability**: 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. **Technical Parameters**: 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. **Commercial Offer Data**: the notification of Commercial Offer Data in accordance with the TSC;

iv. **Physical Notifications**: the declaration by a User to the TSO of Physical Notifications data in accordance with the TSC;

v. **Interconnector Schedule Quantities**: the declaration by a Scheduling Agent to the TSO of Interconnector Schedule Quantities in accordance with the TSC;
vi. **Revisions/Re-declarations:** revisions / Re-declarations of such information as provided for this in SDC1;

vii. **Indicative Operations Schedules:** the periodic production and issuing by the TSO of Indicative Operation Schedules as required under SDC1.4.7 as a statement of which:

1. CDGUs;
2. Pumped Storage Plant Demand;
3. Energy Storage Power Station Demand;
4. Interconnectors;
5. Demand Side Units;
6. Aggregated Generating Units; and/or
7. Controllable PPMs

may be required.

SDC1.3 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;
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 Units 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 Whole Numbers

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 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 Units 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 SDC1.4.3.3 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.A 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 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 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 Changes in Availability:

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 SDC1.4.1.1 at 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) Additional Grid Code Availability Notice: 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.
**SDC1.4.2 Additional Grid Code Characteristics Notice**

The following items are required to be submitted by each User 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 Units** 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.

SDC1.4.3 Not used.

SDC1.4.4 Other Relevant Data

(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 Units 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.]

(a) 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.

(b) 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.

(c) 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**; and
   - 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 CDGUs;
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 the 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 Compilation of Indicative Operations Schedules

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 Merit Order

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;
the level of **MW Output** and availability covered by **Non Centrally Dispatched Generating Units**, by **Plant** subject to **Priority Dispatch** and by **Controllable PPM**;

the **Energy Limits** for **Hydro Units**;

in respect of all **Plant**, the values of their **Technical Parameters** registered under this SDC1 and other information submitted under SDC1.4.4.4;

**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**;

the requirements, as determined by the **TSO**, for **Voltage Control** and **Mvar** reserves;

**CDGU** and/or **Controllable PPM** stability, as determined by the **TSO**;

other matters to enable the **TSO** to meet its **Licence Standards** and the **Other TSO** to meet its equivalent;

the requirements as determined by the **TSO**, for maintaining **Frequency Control**;

**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**;

**System Tests**, **Operational Tests** and **Commissioning Tests**;

the inability of any **CDGU** and/or **Controllable PPM** to meet its full reserve capability;

**Inter-jurisdictional Tie Line** limits;

other facts as may be reasonably considered by the **TSO** to be relevant to the **Indicative Operations Schedule**;

the inflexible characteristics as declared by the **Generator** and abnormal risks;

losses on the **Transmission System** and on the **Other Transmission System**;

requirements within any **Constrained Group**;

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.
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 Content of Indicative Operations Schedules

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 Issue of Indicative Operations Schedules

(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 Regulation

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 Data Requirements

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.*

<table>
<thead>
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<th>Technical Parameter</th>
<th>CGDU Control PPM</th>
<th>Hydr/En Ltd Disp. PPM</th>
<th>Pump S Gen</th>
<th>Indiv. Demand Site</th>
<th>Agg. Demand Sites</th>
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<td>DSU</td>
<td>Agg. Gen</td>
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<td>ESPS Demand</td>
<td>Pump Storage Demand</td>
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<td>CDGU &lt;10 MW</td>
<td>ESPS Demand</td>
<td>Pump Storage Demand</td>
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## Part 2. Additional data items required in an Additional Grid Code Characteristics Notice

### Table (i)

<table>
<thead>
<tr>
<th>Variable</th>
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<tbody>
<tr>
<td>Declared POR</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>Declared SOR</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>Declared TOR1</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>Declared TOR2</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>Declared Replacement Reserve</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>Minimum MW for POR</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>Minimum MW for SOR</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>Minimum MW for TOR1</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>Minimum MW for TOR2</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>Minimum MW for Replacement Reserve</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>POR Decrement Rate</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>SOR Decrement Rate</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>TOR1 Decrement Rate</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>TOR2 Decrement Rate</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>Replacement Reserve Decrement Rate</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>Governor Droop</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
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</table>

### Table (ii)

<table>
<thead>
<tr>
<th></th>
<th>Applies to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Start Capability (yes/no)</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>Declared Reactive Power (Consumption)</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>Declared Reactive Power (Production)</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>Correction Factor (Mvar consumption)</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>Correction Factor (Mvar Production)</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>Export Adjustment Factor 1</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>Export Adjustment Factor 2</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
<tr>
<td>Unit Loss Factor</td>
<td>CDGUs, excluding Dispatchable PPMs</td>
</tr>
</tbody>
</table>
**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.

<table>
<thead>
<tr>
<th>Terms used in SONI Grid Code</th>
<th>Equivalent terms used in EirGrid Grid Code (where different)</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Support Services</td>
<td>Ancillary Service(s)</td>
<td>The existing arrangements for Ancillary Services and System Support Services are continuing until further notice.</td>
</tr>
<tr>
<td>System Support Services Agreement</td>
<td>Ancillary Service(s) Agreement</td>
<td>These agreements will continue to stay in place with their existing names</td>
</tr>
<tr>
<td>CCGT Module</td>
<td>CCGT Unit</td>
<td>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.</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Provision</th>
<th>SONI Grid Code</th>
<th>EirGrid Grid Code</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDC1.4.4.2(b)</td>
<td>Reference is made to “PCA2.3.4”</td>
<td>Reference is made to “PC.A4.3 of the Planning Code Appendix”</td>
<td>These are the respective requirements for the provision of the CCGT Installation data.</td>
</tr>
<tr>
<td>SDC1.4.3.6(b)</td>
<td>Reference is made to “OC11”</td>
<td>Reference is made to “OC.10”</td>
<td>These are the respective requirements for Testing Monitoring and Investigation</td>
</tr>
<tr>
<td>SDC1.4.3.6(d)</td>
<td>Reference is made to a User acting in accordance with its obligations under “SDC1.4.3 and Appendix B to this SDC1”</td>
<td>Reference is made to a User acting in accordance with its obligations under “SDC1.4.3” only</td>
<td>SONI has separate requirements for Availability and Technical Parameter related issues in respect</td>
</tr>
<tr>
<td>SDC1.4.3.7</td>
<td>Reference is made to “the Republic of Ireland”.</td>
<td>Reference is made to “Northern Ireland”.</td>
<td>Reference is being made in each Grid Code to the other jurisdiction.</td>
</tr>
<tr>
<td>SDC1.4.7.1</td>
<td>Reference is made to “OC.3”</td>
<td>Reference is made to “OC.4.6 and CC.7.3.1.1”</td>
<td>These are the respective references to Operating Margin.</td>
</tr>
<tr>
<td>SDC1.4.7.3(iv)</td>
<td>Reference is made to “OC.11” and then to “OC11.8”</td>
<td>Reference is made to “OC.10” and then to “OC.8”</td>
<td>These are the respective references to Testing Monitoring and Investigation and Operational Testing.</td>
</tr>
<tr>
<td>SDC1.4.7.3(xiv)</td>
<td>Reference is made to “Commissioning/Acceptance Testing”</td>
<td>Reference is made to “Commissioning/Testing”</td>
<td>These are the respective terms used in each Grid</td>
</tr>
</tbody>
</table>

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”
<table>
<thead>
<tr>
<th>Provisions used in SONI Grid Code only</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDC1.1.4</td>
<td>SONI has extra requirements due to the presence of PPA Generation in Northern Ireland.</td>
</tr>
<tr>
<td>SDC1.4.3: Introductory sentence</td>
<td></td>
</tr>
<tr>
<td>SDC1.4.4: Introductory sentence</td>
<td></td>
</tr>
<tr>
<td>SDC1.4.8.3(xxiv)</td>
<td></td>
</tr>
<tr>
<td>SDC1 Appendix B</td>
<td></td>
</tr>
<tr>
<td>SDC1.4.2.2(f)</td>
<td>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.</td>
</tr>
<tr>
<td>SDC1.4.4.2(i)</td>
<td>This provision is necessary to deal with conversion factors applicable to PPA Generators in Northern Ireland.</td>
</tr>
<tr>
<td>SDC1.4.4.3</td>
<td>There are differences in how Reserve capabilities are notified to both SONI and EirGrid.</td>
</tr>
</tbody>
</table>

| 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 SEM Provisions

(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**

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;
(h) **System Tests**: an instruction in relation to the carrying out of a System Test as required under OC.8.4;

(i) **Maximisation**: 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) **Cycle Operating Mode**: 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) **Pumped Storage**: mode changes for Pumped Storage Plants, where contracted, in relation to Pumped Storage Plant Demand;

(l) **Energy Storage Power Station**: mode changes for ESPS, where contracted, in relation to Energy Storage Power Station Demand;

(m) **Dispatch Instruction Test Flags**: 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) **Gas supply emergency**: instructions relating to gas supply emergencies, where the ordinary Dispatch process may not be followed;

SDC2.4.2.5 **Form of Instruction**

(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) 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).
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.
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.

When issuing Notice to Synchronise to Generators in respect of their Generating Units, the TSO shall re-recognise 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.
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.
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.

**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.

Each Generator, in respect of its Generating Units, will operate its Synchronised CDGUs with AVR and Var limiters in service at all times (where required pursuant to CC.7.3 and SDC2.7) unless released from this obligation in respect of a particular CDGU by the TSO.

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.
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.

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.

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"

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"."

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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.

<table>
<thead>
<tr>
<th>Terms used in SONI Grid Code</th>
<th>Equivalent terms used in EirGrid Grid Code (where different)</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Support Services</td>
<td>Ancillary Service(s)</td>
<td>The existing arrangements for Ancillary Services and System Support Services are continuing until further notice.</td>
</tr>
<tr>
<td>CCGT Module</td>
<td>CCGT Unit</td>
<td>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.</td>
</tr>
<tr>
<td>Voltage</td>
<td>Voltage</td>
<td>“Voltage” is a defined term in the EirGrid Grid Code but not in the SONI Grid Code.</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>emergency</td>
<td>Emergency</td>
<td>“Emergency” is a defined term in the EirGrid Grid Code but not in the SONI Grid Code.</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Provision</th>
<th>SONI Grid Code</th>
<th>EirGrid Grid Code</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDC2.1.2(a)</td>
<td>Reference is made to “but not Pumped Storage Demand” after the words “Pumped Storage Generation”.</td>
<td></td>
<td>Reference to these words in the SONI Grid Code is made for clarity reasons.</td>
</tr>
<tr>
<td>SDC2.4.2.4(g)</td>
<td>Reference is made to “OC.11” and “OC11.8”</td>
<td>Reference is made to “OC.10” and “OC.8.5” and to the word “Acceptance” after “Commissioning”</td>
<td>These are the respective requirements in relation to testing, monitoring and investigations</td>
</tr>
<tr>
<td>SDC2.4.2.4(h)</td>
<td>Reference is made to “OC.10”</td>
<td>Reference is made to “OC.8.4”</td>
<td>These are the respective System Tests requirements</td>
</tr>
<tr>
<td>SDC2.4.2.5</td>
<td>Reference is made to “radio telephones” in the list of means of communications of a Dispatch Instruction</td>
<td>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”</td>
<td>These are respective requirements regarding the form of a Dispatch Instruction</td>
</tr>
<tr>
<td>SDC2.4.2.5(b)</td>
<td>Reference is made to “SDC3.6.1”</td>
<td>Reference is made to “OC.4.3”</td>
<td>These are the respective requirements in relation to actions required in response to high frequency</td>
</tr>
<tr>
<td>SDC2.4.2.5(c)(i)</td>
<td>Reference is made to “OC7”</td>
<td>Reference is made to “OC.9”</td>
<td>These are the respective references in respect of temporary losses at the TSOs’ Control Centres</td>
</tr>
<tr>
<td>SDC2.4.2.8(c)</td>
<td>Reference is made to “OC11.8” and “OC10.4”</td>
<td>Reference is made to “OC.8.5” and “OC8.6”</td>
<td>These are the respective requirements in respect of testing and System Tests</td>
</tr>
<tr>
<td>SDC2.4.2.8(d)</td>
<td>Reference is made to “OC11.8” and “OC10.4”</td>
<td>Reference is made to “OC8.5” and “OC.8.6”</td>
<td>These are the respective requirements in respect of testing and System Tests</td>
</tr>
<tr>
<td>SDC2.4.2.10(a)</td>
<td>Reference is made to “radio telephones” in the list of means of communication</td>
<td>No reference is made to “Radio telephones”</td>
<td>The reference to “radio telephones” is specific to the means of communication</td>
</tr>
<tr>
<td>Section</td>
<td>Reference</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>-----------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>SDC2.4.2.11(c)</td>
<td>Reference is made to “+15/-5 minutes”</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>SDC2.4.2.12</td>
<td>No reference is made to Dispatch Instructions for Mvars</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>SDC2.4.2.16</td>
<td>Reference is made to “CC.S1.5”</td>
<td>Reference is made to “CC.7.3 and SDC2.B.7” These are the respective requirements for Generating Unit Control arrangements</td>
<td></td>
</tr>
<tr>
<td>SDC2.A.2.2</td>
<td>Reference is made to “Designated Fuel” and “Declared Fuel”</td>
<td>Reference is only made to “fuel” This is due to the PPA specific fuel terminology in the SONI Grid Code</td>
<td></td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Provisions used in SONI Grid Code only</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDC2.1.3</td>
<td>This paragraph cross-refers to Appendices C and D which both deal with specific issues applicable to PPA Generation only.</td>
</tr>
<tr>
<td>SDC2.4.1.4</td>
<td>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.</td>
</tr>
<tr>
<td>SDC2.4.2.3</td>
<td>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.</td>
</tr>
<tr>
<td>SDC2.4.2.4(c) – final sentence</td>
<td>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.</td>
</tr>
<tr>
<td>SDC2.4.2.4(n)</td>
<td>This is a SONI Grid Code only requirement in respect of instructions to change Generator Transformer tap positions</td>
</tr>
<tr>
<td>SDC2.A.1 – second paragraph</td>
<td>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</td>
</tr>
<tr>
<td>Provisions used in EirGrid Grid Code only</td>
<td>Reason</td>
</tr>
<tr>
<td>----------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>SDC2.4.2.3</td>
<td>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.</td>
</tr>
<tr>
<td>SDC2.4.2.4(b)(iv)</td>
<td>This paragraph is EirGrid specific as it cross-refers to Appendix B which sets out EirGrid specific requirements for Generator Reactive Power Dispatch.</td>
</tr>
<tr>
<td>SDC2.A.5.1 – second paragraph</td>
<td>This provision deals with EirGrid specific requirements in respect of MW Output adjustment of a CDGU for System Frequency.</td>
</tr>
<tr>
<td>SDC2.A.7 iv to viii and final 2 paragraphs</td>
<td>These additional paragraphs deal with EirGrid specific Generator Reactive Power dispatch requirements</td>
</tr>
<tr>
<td>SDC2.A.11</td>
<td>This additional paragraph deals with EirGrid specific Dispatch Instructions in relation to emergencies.</td>
</tr>
<tr>
<td>SDC2 Appendix B</td>
<td>This appendix deals with the EirGrid specific requirements for the Dispatch of Generator Reactive Power</td>
</tr>
</tbody>
</table>
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

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
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.

Fault Ride Through Capability of PPMs

![Figure PPM 1.1 - Fault Ride-Through Capability of Controllable PPMs](image)

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.
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).

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:

<table>
<thead>
<tr>
<th>(a)</th>
<th>operate continuously at normal rated output at <strong>Transmission System Frequencies</strong> in the range 49.5 Hz to 50.5 Hz;</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b)</td>
<td>remain connected to the <strong>Transmission System</strong> at <strong>Transmission System Frequencies</strong> within the range 47.5 Hz to 52.0 Hz for a duration of 60 minutes;</td>
</tr>
<tr>
<td>(c)</td>
<td>remain connected to the <strong>Transmission System</strong> at <strong>Transmission System Frequencies</strong> within the range 47.0 Hz to 47.5 Hz for a duration of 20 seconds required each time the <strong>Transmission System Frequency</strong> is below 47.5 Hz;</td>
</tr>
<tr>
<td>(d)</td>
<td></td>
</tr>
<tr>
<td>(i)</td>
<td>remain connected to the <strong>Transmission System</strong> during rate of change of <strong>Transmission System Frequency</strong> of values up to and including 0.5 Hz per second.</td>
</tr>
<tr>
<td>(ii)</td>
<td>remain connected to the <strong>Transmission System</strong> for a <strong>Rate of Change of Frequency</strong> up to and including 1 Hz per second as measured over a rolling 500 milliseconds period. <strong>Voltage</strong> dips may cause localised <strong>ROCOF</strong> values in excess of 1 Hz per second for short periods, and in these cases, the <strong>Fault-Ride Through</strong> clause PPM1.4.2(f) supersedes this clause. For the avoidance of doubt, this requirement relates to the capabilities of <strong>Controllable PPMs</strong> only, and does not impose the need for <strong>Rate of Change of Frequency</strong> protection nor does it impose a specific setting for anti-islanding or loss-of-mains protection relays.</td>
</tr>
</tbody>
</table>
No additional Generation Unit shall be started while the Transmission System Frequency is above 50.2 Hz.

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

<table>
<thead>
<tr>
<th>Frequency range</th>
<th>Time period for operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>47 – 47.5 Hz</td>
<td>60 seconds</td>
</tr>
<tr>
<td>47.5 – 48.5 Hz</td>
<td>90 minutes</td>
</tr>
<tr>
<td>48.5 – 49 Hz</td>
<td>90 minutes</td>
</tr>
<tr>
<td>49 – 51 Hz</td>
<td>Unlimited</td>
</tr>
<tr>
<td>51 – 51.5 Hz</td>
<td>90 minutes</td>
</tr>
<tr>
<td>51.5 – 52 Hz</td>
<td>60 minutes</td>
</tr>
</tbody>
</table>

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.

g) Remain synchronised to the Transmission System and operate within the frequency ranges and time periods specified in Table PPM1.5.1(e).

Table PPM 1.5.1(e): Minimum Time Periods for Generation Units to Remain Operational without Disconnecting

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Time Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>47 – 47.5 Hz</td>
<td>20 seconds</td>
</tr>
<tr>
<td>47.5 – 48.5 Hz</td>
<td>90 minutes</td>
</tr>
<tr>
<td>48.5 – 49 Hz</td>
<td>90 minutes</td>
</tr>
<tr>
<td>49 – 51 Hz</td>
<td>Unlimited</td>
</tr>
<tr>
<td>51 – 51.5 Hz</td>
<td>90 minutes</td>
</tr>
<tr>
<td>51.5 – 52 Hz</td>
<td>60 minutes</td>
</tr>
</tbody>
</table>

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.

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.

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**.

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**.
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.

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.

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**.

<table>
<thead>
<tr>
<th>Point</th>
<th><strong>Transmission System Frequency</strong> (Hz)</th>
<th><strong>Controllable PPM Active Power Output</strong> (% of <strong>Available Active Power</strong>)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$F_A$</td>
<td>$P_A$</td>
</tr>
<tr>
<td>B</td>
<td>$F_B$</td>
<td>Minimum of: $P_B$ orActive Power Control Set-point (converted to a % of Available Active Power)</td>
</tr>
<tr>
<td>C</td>
<td>$F_C$</td>
<td>Minimum of: $P_C$ orActive Power Control Set-point (converted to a % of Available Active Power)</td>
</tr>
<tr>
<td>D</td>
<td>$F_D$</td>
<td>Minimum of: $P_D$ orActive Power Control Set-point (converted to a % of Available Active Power)</td>
</tr>
</tbody>
</table>
Two settings for each of \( F_A, F_B, F_C, F_D, P_A, P_B, P_C, P_D \) 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 PPM.1.5.3.15 below). The Controllable PPM shall be responsible for implementing the appropriate settings during Commissioning.

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

<table>
<thead>
<tr>
<th>( F_E )</th>
<th>( P_E = 0 % )</th>
</tr>
</thead>
</table>

Table PPM 1.2 shows the Transmission System Frequency and Active Power ranges for \( F_A, F_B, F_C, F_D, P_A, P_B, P_C, P_D \) and \( P_E \).

<table>
<thead>
<tr>
<th>Transmission System Frequency (Hz)</th>
<th>Available Active Power (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( F_A ) 47.0-49.5</td>
<td>( P_A ) 50-100</td>
</tr>
<tr>
<td>( F_B ) 49.5-50</td>
<td>( P_B )</td>
</tr>
<tr>
<td>( F_C ) 50-50.5</td>
<td>( P_C ) 15-100</td>
</tr>
<tr>
<td>( F_D ) 50-50.5</td>
<td>( P_D ) 15-100 but not less than DMOL</td>
</tr>
<tr>
<td>( F_E ) 50.5-52.0</td>
<td>( P_E ) 0</td>
</tr>
</tbody>
</table>

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, \( F_A \leq F_B \leq F_C \leq F_D \leq F_E \).

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).

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](image)
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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Response Insensitivity (Δf)</td>
<td>15mHz</td>
</tr>
<tr>
<td>Frequency Response Insensitivity (Δf/Δf)</td>
<td>0.03%</td>
</tr>
</tbody>
</table>

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 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.

PPM1.5.3.15 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. \( F_A \), \( F_B \), \( F_C \), \( F_D \), \( P_A \), \( P_B \), \( P_C \), \( P_D \) 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.

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 **Voltage** 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**

<table>
<thead>
<tr>
<th>System Voltage</th>
<th>Voltage Range</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 kV</td>
<td>340 kV to 360 kV (0.85 p.u. – 0.9 p.u.)</td>
<td>60 minutes</td>
</tr>
<tr>
<td></td>
<td>360 kV to 420 kV (0.9 p.u. – 1.05 p.u.)</td>
<td>Unlimited</td>
</tr>
<tr>
<td></td>
<td>420 kV to 460 kV (1.05 p.u. – 1.15 p.u.)</td>
<td>Not allowed</td>
</tr>
<tr>
<td>220 kV</td>
<td>187 kV to 198 kV (0.85 p.u. – 0.9 p.u.)</td>
<td>60 minutes</td>
</tr>
<tr>
<td></td>
<td>198 kV to 246 kV (0.9 p.u. – 1.118 p.u.)</td>
<td>Unlimited</td>
</tr>
<tr>
<td></td>
<td>246 kV to 253 kV (1.118 p.u. – 1.15 p.u.)</td>
<td>Not allowed</td>
</tr>
<tr>
<td>110 kV</td>
<td>93.5 kV to 99 kV (0.85 p.u. – 0.9 p.u.)</td>
<td>60 minutes</td>
</tr>
<tr>
<td></td>
<td>99 kV to 123 kV (0.9 p.u. – 1.118 p.u.)</td>
<td>Unlimited</td>
</tr>
<tr>
<td></td>
<td>123 kV to 126.5 kV (1.05 p.u. – 1.15 p.u.)</td>
<td>Not allowed</td>
</tr>
</tbody>
</table>

Wider **Voltage** 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 PPM.1.6.1.

*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 PPM.1.6.1, 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:

![110kV Connection Voltage Diagram](attachment:image.png)

- Consumption (lead) <= Q/Pmax
- Production (lag)
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**;
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.

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 connection point 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 **Voltage** transient shall be specified on a site specific basis and shall not exceed 5 per cent of the pre-synchronisation **Voltage**.
CONTROLLABLE PPM’S GRID CONNECTED TRANSFORMER

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.

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.

Signals, Communication & Control

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.

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;  

(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  Wind-powered *Controllable PPMs* comprising of *Wind Turbine Generators* 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*:

(a) Wind speed (at hub height or as agreed with the *TSO*) - measurand signal;
(b) Wind direction (at hub height or as agreed with the *TSO*) - measurand signal;
(c) Air temperature - measurand signal;
(d) Air pressure - measurand signal.

PPM1.7.1.2.2  The above meteorological data signals (ref. PPM1.7.1.2.1) shall be provided by a dedicated *Meteorological Mast* located at the wind-powered *Controllable PPMs* site or, where possible and preferable to do so, data from a means of the same or better accuracy. For wind-powered *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 wind-powered *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 wind-powered *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 wind-powered *Controllable PPM*’s scheduled *Operational Date*.

PPM1.7.1.2.2.1  Solar-powered *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*:

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

PPM1.7.1.2.2 The above meteorological data signals (ref. PPM1.7.1.2.2.1) shall be provided by measurement devices located at the solar-powered Controllable PPMs site. All meteorological data signals shall at a minimum meet accuracy levels defined by the TSO. For solar-powered Controllable PPMs where the solar arrays are widely dispersed over a large geographical area and rather different weather patterns are expected for different sections of the solar-powered Controllable PPM, the meteorological data shall be provided from a number of individual measurement devices. It is expected that solar arrays 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 solar-powered Controllable PPM’s scheduled Operational Date.

PPM1.7.1.2.3 Controllable PPMs, in excess of 5 MW, with the exception of wind-powered and solar-powered 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 above meteorological data signals (ref. PPM1.7.1.2.3) shall be provided by a measurement device located at the Controllable PPM site, the exception of wind-powered and solar-powered 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 wind-powered and solar-powered **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** Wind-powered **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)** Wind-powered **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 wind-powered **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 wind-powered **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 wind-powered **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 wind-powered **Controllable PPM’s** scheduled **Operational Date**.
PPM1.7.1.3.2.1 Solar-powered **Controllable PPMs** with a **MEC** in excess of 10 MW shall make the following signals available at the designated **TSO Telecommunication Interface Cabinet** for the **Controllable PPM**:

(a) Solar-powered **Controllable PPM Availability** (0-100 % signal).

PPM1.7.1.3.2.2 For solar-powered **Controllable PPMs** with a **MEC** in excess of 10 MW, where the solar arrays are widely dispersed over a large geographical area and rather different weather patterns are expected for different sections of the solar-powered **Controllable PPM**, the above data set (ref. PPM1.7.1.3.1) shall be provided for a number of groups of solar arrays (e.g. 1 signal for each group of XX solar arrays within the solar-powered **Controllable PPM**). It is expected that solar arrays 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 solar-powered **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 wind-powered and solar-powered **Controllable PPMs**, shall make the following signals available at the designated **TSO Telecommunication Interface Cabinet** for that wind-powered **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 wind-powered and solar-powered **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:

da) 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 shall be accurate at least 97.5% of the time over a rolling 12-month period.

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** 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.

\[ \text{Typically this instruction will be in the form of a Blackstart Shutdown OFF command} \]
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.
PPM 1.7.4 DATA AND COMMUNICATIONS SPECIFICATIONS

PPM 1.7.4.1 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.

PPM 1.7.4.2 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.

PPM 1.7.4.3 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.

PPM 1.7.4.4 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.

PPM 1.7.4.5 Where signals or indications required to be provided by the Controllable PPM under PPM 1.7.1 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.

PPM 1.7.5 PPM RESOURCE FORECASTS

PPM 1.7.5.1 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
CO₂  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
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>EON</td>
<td>Energisation Operational Notification</td>
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<tr>
<td>ESO</td>
<td>External System Operator</td>
</tr>
<tr>
<td>ESPS</td>
<td>Energy Storage Power Station</td>
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<tr>
<td>ESU</td>
<td>Energy Storage Unit</td>
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<tr>
<td>ETSO</td>
<td>European Transmission System Operators</td>
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<td>FON</td>
<td>Final Operational Notification</td>
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<td>Grid Code Review Panel</td>
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<td>GT</td>
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<td>HV</td>
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<tr>
<td>HVDC</td>
<td>High Voltage Direct Current</td>
</tr>
<tr>
<td>IEC</td>
<td>International Electrotechnical Committee</td>
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<tr>
<td>ION</td>
<td>Interim Operational Notification</td>
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<td>IOP</td>
<td>Indicative Outage Programme</td>
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<td>ITU</td>
<td>International Telecommunications Union</td>
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<td>JGCRP</td>
<td>Joint Grid Code Review Panel</td>
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<tr>
<td>LON</td>
<td>Limited Operational Notification</td>
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<td>LV</td>
<td>Low Voltage</td>
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<tr>
<td>MEC</td>
<td>Maximum Export Capacity</td>
</tr>
<tr>
<td>MIC</td>
<td>Maximum Import Capacity</td>
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<td>MO</td>
<td>Market Operator</td>
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<td>MV</td>
<td>Medium Voltage</td>
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<tr>
<td>NCC</td>
<td>National Control Centre</td>
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<tr>
<td>NCDGU</td>
<td>Non-Centrally Dispatched Generating Unit</td>
</tr>
<tr>
<td>NIAUR</td>
<td>Northern Ireland Authority for Utility Regulation</td>
</tr>
<tr>
<td>NIE</td>
<td>Northern Ireland Electricity</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Definition</td>
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<tr>
<td>OC</td>
<td>Operating Code</td>
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<tr>
<td>OLTC</td>
<td>On load Tap Changer</td>
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<tr>
<td>POP</td>
<td>Provisional Outage Programme</td>
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<tr>
<td>POR</td>
<td>Primary Operating Reserve</td>
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<td>PPM</td>
<td>Power Park Module</td>
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<td>PSP</td>
<td>Pumped Storage Plant</td>
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<td>RMS</td>
<td>Root Mean Square</td>
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<td>RTU</td>
<td>Remote Terminal Unit</td>
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<td>SCADA</td>
<td>Supervisory Control and Data Acquisition</td>
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<td>SDC</td>
<td>Scheduling and Dispatch Code</td>
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<td>SEM</td>
<td>Single Electricity Market</td>
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<tr>
<td>THD</td>
<td>Total Harmonic Voltage Distortion</td>
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<td>TSC</td>
<td>Trading and Settlement Code</td>
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<tr>
<td>SLR</td>
<td>Special Load Reading</td>
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<tr>
<td>SONI</td>
<td>System Operator Northern Ireland</td>
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<tr>
<td>SOR</td>
<td>Secondary Operating Reserve</td>
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<tr>
<td>SVC</td>
<td>Static Var Compensator</td>
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<td>TAO</td>
<td>Transmission Asset Owner</td>
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<td>TRM</td>
<td>Transmission Reliability Margin</td>
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<td>TOR</td>
<td>Tertiary Operating Reserve</td>
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<td>TSO</td>
<td>Transmission System Operator</td>
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<td>TTC</td>
<td>Total Transfer Capacity</td>
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<td>UFR</td>
<td>Under Frequency Relay</td>
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<td>Nominal Voltage</td>
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<tr>
<td>VO</td>
<td>Voluntary Outage</td>
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<tr>
<td>WTG</td>
<td>Wind Turbine Generator</td>
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# Units

<table>
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<td>Giga Watt</td>
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<td>Giga Watt hour</td>
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<td>Hz</td>
<td>Hertz</td>
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<tr>
<td>kA</td>
<td>kilo Ampere</td>
</tr>
<tr>
<td>kW</td>
<td>kilo Watt</td>
</tr>
<tr>
<td>kWh</td>
<td>kilo Watt hour</td>
</tr>
<tr>
<td>kV</td>
<td>Kilo Volt</td>
</tr>
<tr>
<td>MWh</td>
<td>Mega Watt hour</td>
</tr>
<tr>
<td>MW</td>
<td>Mega Watt</td>
</tr>
<tr>
<td>TWh</td>
<td>Tera Watt hour</td>
</tr>
<tr>
<td>MVA</td>
<td>Mega Volt Ampere</td>
</tr>
<tr>
<td>Mvar</td>
<td>Mega Volt Ampere reactive / Megavar</td>
</tr>
<tr>
<td>Mvarh</td>
<td>Megavar hour</td>
</tr>
<tr>
<td>var</td>
<td>Volt Ampere reactive</td>
</tr>
</tbody>
</table>
## Definitions

<table>
<thead>
<tr>
<th><strong>Act</strong></th>
<th>The Electricity Regulation Act 1999.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Active Energy</strong></td>
<td>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 <strong>Active Power</strong>, 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)</td>
</tr>
<tr>
<td><strong>Active Power</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Active Power Control</strong></td>
<td>The automatic change in <strong>Active Power</strong> output from a <strong>Controllable PPM</strong> in a response to an <strong>Active Power Control Set-point</strong> received from the <strong>TSO</strong>.</td>
</tr>
<tr>
<td><strong>Active Power Control Mode</strong></td>
<td>A mode of operation of a <strong>Controllable PPM</strong> where the <strong>Controllable PPM</strong> has been instructed by the <strong>TSO</strong> to maintain its <strong>Active Power</strong> output at the <strong>Active Power Control Set-point</strong>.</td>
</tr>
<tr>
<td><strong>Active Power Control Set-point</strong></td>
<td>The maximum amount of <strong>Active Power</strong> in MW, set by the <strong>TSO</strong>, that the <strong>Controllable PPM</strong> is permitted to export.</td>
</tr>
<tr>
<td><strong>Active Power Control Set-Point Ramp Rate</strong></td>
<td>The rate of increase or decrease of <strong>Active Power</strong> output of a <strong>Controllable PPM</strong> in response to an <strong>Active Power Control Set-point</strong> instruction.</td>
</tr>
<tr>
<td><strong>Additional Grid Code Availability Notice</strong></td>
<td>A notice submitted by a <strong>User</strong> to the <strong>TSO</strong> pursuant to SDC1.4.2 relating to additional data on <strong>Availability</strong>.</td>
</tr>
<tr>
<td><strong>Additional Grid Code Characteristics Notice</strong></td>
<td>A notice to be submitted to the <strong>TSO</strong> pursuant to SDC1.4.2 relating to additional technical data.</td>
</tr>
<tr>
<td><strong>AGC Control Range</strong></td>
<td>The range of loads over which <strong>AGC</strong> may be applied.</td>
</tr>
<tr>
<td><strong>AGC Maximum Load</strong></td>
<td>The upper limit of the <strong>AGC Control Range</strong>.</td>
</tr>
<tr>
<td><strong>AGC Minimum Load</strong></td>
<td>The lower limit of the <strong>AGC Control Range</strong>.</td>
</tr>
<tr>
<td><strong>Aggregate Interconnector Ramp Rate</strong></td>
<td>The maximum <strong>Ramp Up Rate</strong> for an <strong>Interconnector</strong> or maximum <strong>Ramp Down Rate</strong> as determined by the <strong>TSO</strong>.</td>
</tr>
<tr>
<td><strong>Aggregated Demand Site</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Aggregated Generating Unit</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Aggregated Maximum Export Capacity</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Aggregator</strong></td>
<td>Either a Generator Aggregator or a Demand Side Unit Operator in respect of an Aggregated Demand Site.</td>
</tr>
<tr>
<td><strong>Alert</strong></td>
<td>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)</td>
</tr>
<tr>
<td><strong>Allocated Harmonic Distortion Limit (AHDL)</strong></td>
<td>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 2nd up to, and including, the 40th.</td>
</tr>
<tr>
<td><strong>Amber Alert</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Ancillary Service</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Ancillary Service Agreement</strong></td>
<td>The bilateral agreement between the TSO and the User, which contains the detail specific to the User’s provision of Ancillary Services.</td>
</tr>
<tr>
<td><strong>Annual Maintenance Outage</strong></td>
<td>A transmission outage that is scheduled with reasonable notice to the relevant <strong>Generator(s)</strong> in advance of the start of the outage for planned maintenance of equipment that is part of an <strong>Outturn Availability Connection Asset</strong>.</td>
</tr>
<tr>
<td><strong>Annual SLR Conditions</strong></td>
<td>12.30 and 18.00 on the second Tuesday of January or any other day nominated by <strong>DSO</strong>.</td>
</tr>
<tr>
<td><strong>Apparatus</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Apparent Power</strong></td>
<td>The product of voltage and of alternating current measured in units of volt-amperes and standard multiples thereof.</td>
</tr>
<tr>
<td><strong>Automatic Frequency Restoration</strong></td>
<td>A system for reconnecting <strong>Demand Customers</strong> automatically following a <strong>Low Frequency Event</strong> on the <strong>Transmission System</strong>, once the frequency has recovered.</td>
</tr>
<tr>
<td><strong>Automatic Generator Control (AGC)</strong></td>
<td>A control system installed between the <strong>NCC</strong> and a <strong>Power Station</strong> whereby MW set points can be adjusted remotely by the <strong>TSO</strong> to reflect the <strong>Dispatch Instruction</strong></td>
</tr>
<tr>
<td><strong>Automatic Low Voltage Demand Disconnection (ALVDD)</strong></td>
<td>The automatic disconnection of <strong>Demand Customers</strong> when the <strong>Voltage</strong> or the rate of change of voltage has violated acceptable limits as determined by the <strong>TSO</strong>.</td>
</tr>
<tr>
<td><strong>Automatic Mains Failure Mode</strong></td>
<td>The operation of <strong>Generation Unit(s)</strong> at an <strong>Individual Demand Site</strong> of a <strong>Demand Side Unit</strong> where in the event of <strong>Disconnection</strong>, the <strong>Generation Unit(s)</strong> is(are) enabled and supplies(y) the <strong>Demand Customer's</strong> or <strong>DSO Demand Customer's Load</strong> while not <strong>Synchronised</strong> to the <strong>Transmission System</strong> or <strong>Distribution System</strong>. Upon sustained restoration of the connection to the <strong>Transmission System</strong> or <strong>Distribution System</strong> for a settable period of time, the <strong>Generation Unit(s)</strong> <strong>Synchronise</strong> to the <strong>Transmission System</strong> or <strong>Distribution System</strong> for a short period of time not exceeding 180 seconds to facilitate the smooth transfer of power prior to <strong>Shutdown</strong> of the <strong>Generation Unit(s)</strong>.</td>
</tr>
<tr>
<td><strong>Automatic Voltage Regulation</strong></td>
<td>Automatic maintenance of a <strong>Generation Unit's</strong> terminal voltage or <strong>Interconnector's Reactive Power</strong> output at a desired setpoint.</td>
</tr>
<tr>
<td><strong>Automatic Voltage Regulator</strong></td>
<td>A continuously acting automatic closed loop control system acting on the excitation system so as to maintain a <strong>Generation Unit's</strong> terminal voltage at a desired setpoint.</td>
</tr>
<tr>
<td><strong>Autoproducer</strong></td>
<td>Persons to whom electrical <strong>Energy</strong> is provided and by whom the electrical <strong>Energy</strong> is generated essentially for their own use, by means of a direct connection to the <strong>Transmission System</strong>.</td>
</tr>
<tr>
<td><strong>Auxiliaries</strong></td>
<td>Any item of <strong>Plant</strong> and/or <strong>Apparatus</strong> not directly a part of the boiler plant or <strong>Generating Unit</strong>, but required for the boiler plant’s or <strong>Generating Unit's</strong> functional operation. 'Auxiliary' shall be defined accordingly.</td>
</tr>
<tr>
<td><strong>Auxiliary Diesel Engine</strong></td>
<td>A diesel engine driving a <strong>Generating Unit</strong> which can supply a <strong>Unit Board</strong> or <strong>Station Board</strong>, which can start without an electrical power supply from outside the <strong>Power Station</strong> within which it is situated.</td>
</tr>
<tr>
<td><strong>Auxiliary Fuel</strong></td>
<td>A fuel other than a <strong>Primary Fuel</strong> which may be used for start up purposes or for support of combustion or <strong>Maximisation</strong> when the <strong>Generation Unit</strong> is producing <strong>Energy</strong></td>
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</tr>
<tr>
<td><strong>Auxiliary Load</strong></td>
<td>The electrical <strong>Demand</strong> of the <strong>Generation Unit’s Auxiliary Plant</strong> required for the operation of the <strong>Generation Unit</strong>.</td>
</tr>
<tr>
<td><strong>Auxiliary Plant</strong></td>
<td>Any item of <strong>Plant</strong> and/or <strong>Apparatus</strong> not directly a part of the boiler plant or <strong>Generation Unit</strong>, but required for the boiler plant’s or <strong>Generation Unit’s</strong> functional operation.</td>
</tr>
<tr>
<td><strong>Availability</strong></td>
<td>At any given time the measure of <strong>Active Power</strong> a <strong>Generation Unit(s)</strong> is capable of delivering to the <strong>Connection Point</strong> and the term “<strong>Availabilities</strong>” shall be construed accordingly. This can be calculated as a gross figure.</td>
</tr>
<tr>
<td></td>
<td>In terms of a <strong>Demand Side Unit</strong>, the <strong>Demand Side Unit MW Capacity</strong> as the measure at any given time of the capability of the <strong>Demand Side Unit</strong> to reduce <strong>Demand</strong>.</td>
</tr>
<tr>
<td></td>
<td>At any given time the measure of <strong>Active Power</strong> an <strong>Interconnector</strong> is capable of importing to or exporting from the <strong>Connection Point</strong> and the term “<strong>Availabilities</strong>” shall be constructed accordingly. This can be calculated as a gross figure.</td>
</tr>
<tr>
<td><strong>Availability Factor</strong></td>
<td>The ratio of the <strong>Energy</strong> that could have been produced during a specified period of time by a <strong>Generation Unit</strong> operating in accordance with its <strong>Availability</strong>, and the <strong>Energy</strong> that could have been produced during the same period by that <strong>Generation Unit</strong> operating at its <strong>Registered Capacity</strong>. <strong>Availability Factor</strong> can alternatively be reported in gross terms.</td>
</tr>
<tr>
<td><strong>Availability Notice</strong></td>
<td>A notice to be submitted to the <strong>TSO</strong> pursuant to SDC1.4.1.1.</td>
</tr>
<tr>
<td><strong>Available Active Power</strong></td>
<td>The amount of <strong>Active Power</strong> that the <strong>Controllable PPM</strong> could produce based on current resource conditions. The <strong>Available Active Power</strong> shall only differ from the actual <strong>Active Power</strong> if the <strong>Controllable PPM</strong> has been curtailed, constrained or is operating in a restrictive <strong>Frequency Response</strong> mode.</td>
</tr>
<tr>
<td><strong>Black Start</strong></td>
<td>The procedure necessary for a recovery from a <strong>Total Shutdown</strong> or <strong>Partial Shutdown</strong>.</td>
</tr>
<tr>
<td><strong>Black Start Capability</strong></td>
<td>Ability in respect of a <strong>Black Start Station</strong>, for at least one of its <strong>Centrally Dispatched Generation Units</strong> or <strong>Interconnector</strong> to start-up from <strong>Shutdown</strong>, without importing energy from the <strong>Transmission System</strong>, and to energise a part of the <strong>Transmission System</strong> and be <strong>Synchronised</strong> or energised (for <strong>Interconnectors</strong>) to the <strong>Transmission System</strong> upon instruction from the <strong>TSO</strong>.</td>
</tr>
<tr>
<td><strong>Black Start Shutdown</strong></td>
<td>In the event of a <strong>Partial Shutdown</strong> or <strong>Total Shutdown</strong> of the <strong>Transmission System</strong>, the <strong>Controllable PPM</strong> shall be sent a <strong>Black Start Shutdown</strong> signal by the <strong>TSO</strong> and upon receipt of the signal, the <strong>Controllable PPM</strong> shall trip the circuit breaker(s) at the <strong>Connection Point</strong> and shutdown the <strong>Controllable PPM</strong> in a controlled manner.</td>
</tr>
<tr>
<td><strong>Black Start Station</strong></td>
<td>A <strong>Power Station</strong> and/or <strong>Interconnector</strong> which is registered pursuant to <strong>Grid Code</strong> as having a <strong>Black Start Capability</strong></td>
</tr>
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<td>-------------------------</td>
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</tr>
<tr>
<td><strong>Block Load</strong></td>
<td>The level of output that a <strong>Generating Unit</strong> immediately produces following <strong>Synchronisation</strong>. For avoidance of doubt, <strong>Block Load</strong> can equal 0 MW.</td>
</tr>
<tr>
<td><strong>Block Load Cold</strong></td>
<td><strong>Block Load</strong> during a <strong>Cold Start</strong>.</td>
</tr>
<tr>
<td><strong>Block Load for an Interconnector</strong></td>
<td>The level of output, in either flow direction, that an <strong>Interconnector</strong> immediately produces following energisation. For avoidance of doubt, <strong>Block Load</strong> can equal 0 MW and can be different in either flow direction.</td>
</tr>
<tr>
<td><strong>Block Load Hot</strong></td>
<td><strong>Block Load</strong> during a <strong>Hot Start</strong>.</td>
</tr>
<tr>
<td><strong>Block Load Warm</strong></td>
<td><strong>Block Load</strong> during a <strong>Warm Start</strong>.</td>
</tr>
<tr>
<td><strong>Blue Alert</strong></td>
<td>An alert issued by the <strong>TSO</strong> signifying that either a <strong>Partial Shutdown</strong> or a <strong>Total Shutdown</strong> of the <strong>Power System</strong> has taken place.</td>
</tr>
<tr>
<td><strong>Business Day</strong></td>
<td>Monday through Friday excluding public holidays and holidays observed by the <strong>TSO</strong>.</td>
</tr>
<tr>
<td><strong>Cancelled Start</strong></td>
<td>A response by a <strong>Generator</strong> to an instruction from the <strong>TSO</strong> cancelling a previous instruction to <strong>Synchronise</strong> to the <strong>Transmission System</strong>.</td>
</tr>
<tr>
<td><strong>Capacity</strong></td>
<td>The rated continuous load-carrying ability, expressed in megawatts (MW) or megavolt-amperes (MVA) of generation, transmission, or other electrical equipment.</td>
</tr>
<tr>
<td><strong>Capacity Adequacy</strong></td>
<td>When there is sufficient <strong>Generation Capacity</strong> to meet the <strong>Demand</strong> and <strong>Reserve</strong> requirements.</td>
</tr>
<tr>
<td><strong>Capacity Adequacy Indicator</strong></td>
<td>An indication issued by the <strong>TSO</strong> for each weekly peak of the year based on <strong>Availability</strong> and <strong>Demand</strong> forecasts whether or not there is sufficient <strong>Generation Capacity</strong> to meet <strong>Demand</strong>.</td>
</tr>
<tr>
<td><strong>Capacity Shortfall Warning</strong></td>
<td>A warning issued by the <strong>TSO</strong> that based on <strong>Availability</strong> and <strong>Demand</strong> forecasts there is insufficient <strong>Generation Capacity</strong> to meet the peak <strong>Demand</strong>.</td>
</tr>
<tr>
<td><strong>CCGT Installation</strong></td>
<td>A collection of <strong>Generation Units</strong> comprising one or more <strong>Combustion Turbine Units</strong> and one or more <strong>Steam Units</strong> where, in normal operation, the waste heat from the <strong>Combustion Turbine Units</strong> is passed to the water/steam system of the associated <strong>Steam Unit</strong> or <strong>Steam Units</strong> and where the component <strong>Generation Units</strong> within the <strong>CCGT Installation</strong> are directly connected by steam or hot gas lines which enable those <strong>Units</strong> to contribute to the efficiency of the combined cycle operation of the <strong>CCGT Installation</strong>.</td>
</tr>
<tr>
<td><strong>CCGT Installation Matrix</strong></td>
<td>The matrix which must be submitted by a <strong>Generator</strong> under the <strong>Planning Code</strong> and which is used by the <strong>TSOs</strong> for <strong>Scheduling</strong> and <strong>Dispatch</strong> purposes under the SDCs as a “look up” table determining which <strong>CCGT Units</strong> will be operating at any given <strong>MW Dispatch</strong> level subject to any updated <strong>Availability</strong> information submitted by a <strong>Generator</strong> to a <strong>TSO</strong> under SDC1.</td>
</tr>
<tr>
<td><strong>CCGT Unit</strong></td>
<td>A <strong>Generation Unit</strong> within a <strong>CCGT Installation</strong></td>
</tr>
</tbody>
</table>
| **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**. |
<p>| <strong>Centrally Dispatched Generating Unit</strong> | A <strong>Generating Unit</strong> within a <strong>Power Station</strong> subject to <strong>Central Dispatch</strong>, which comprises, unless specified otherwise in relation to a particular use of the term, a <strong>Thermal Plant</strong> including a <strong>CCGT Installation</strong>, a <strong>Dispatchable PPM</strong>, <strong>Hydro Unit</strong> and <strong>Pumped Storage Plant</strong> in respect of its <strong>Pumped Storage Generation</strong>. |
| <strong>Charging Capacity</strong> | The maximum amount of <strong>Energy</strong> consumed by <strong>Energy Storage Power Station</strong> when acting as an <strong>Energy Storage Power Station Demand</strong>. |
| <strong>Closed Distribution System</strong> | A <strong>System</strong> 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 <strong>System</strong> and with employment or similar associations with the owner of the <strong>System</strong>. This is a separate system to the <strong>Distribution System</strong>. |
| <strong>Closed Distribution Systems Operator</strong> | An entity which is responsible for, amongst other things, the planning, development, operation and maintenance of a <strong>Closed Distribution System</strong>. |
| <strong>Cold Start</strong> | Any <strong>Synchronisation</strong> of a <strong>Generating Unit</strong> that has previously not been <strong>Synchronised</strong> for a period of time longer than its submitted <strong>Warm Cooling Boundary</strong>. |</p>
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector Network</td>
<td>The network of cables and overhead lines within a Controllable PPM used to convey electricity from individual Generation Units to the Connection Point.</td>
</tr>
<tr>
<td>Combustion Turbine Unit</td>
<td>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.</td>
</tr>
<tr>
<td>Commercial Energy Metering</td>
<td>Metering which is utilised to measure Energy for Tariff charging purposes.</td>
</tr>
<tr>
<td>Commercial Offer Data</td>
<td>The commercial offer data submitted to the MO pursuant to the TSC.</td>
</tr>
<tr>
<td>Commissioning</td>
<td>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.</td>
</tr>
<tr>
<td>Commissioning Instructions</td>
<td>A step-by-step test procedure for a Commissioning Test.</td>
</tr>
<tr>
<td>Commissioning Test</td>
<td>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.</td>
</tr>
<tr>
<td>Committed Outage Programme</td>
<td>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.</td>
</tr>
<tr>
<td>Committed Project Planning Data</td>
<td>Data relating to a User Development once the offer for a Connection, Use of System Agreement and/or supplemental agreements are accepted.</td>
</tr>
<tr>
<td>Communications and Control Room</td>
<td>The communications and control room to be provided by the User in accordance with the Connection Agreement.</td>
</tr>
<tr>
<td>Connection Agreement</td>
<td>The bilateral agreement between the TSO and the User, which contains the detail specific to the User’s connection to the Transmission System.</td>
</tr>
<tr>
<td>Connection Conditions</td>
<td>The section of this Grid Code which is identified as the Connection Conditions.</td>
</tr>
<tr>
<td><strong>Connection Date</strong></td>
<td>The date on which the <strong>Commissioning Instructions</strong> 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.</td>
</tr>
<tr>
<td><strong>Connection Offer</strong></td>
<td>A quotation letter together with the unsigned <strong>Connection Agreement</strong> 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.</td>
</tr>
<tr>
<td><strong>Connection Point</strong></td>
<td>The physical point where the <strong>User’s Plant Apparatus</strong> or <strong>System</strong> is joined to the Transmission System or the Distribution System.</td>
</tr>
<tr>
<td><strong>Connection Site</strong></td>
<td>The site at which the <strong>Plant</strong> and <strong>Apparatus</strong> of the User at the User's side of the Connection Point is to be installed including the land, spaces, roads and any surfaces.</td>
</tr>
<tr>
<td><strong>Constrained Group</strong></td>
<td>A group of <strong>Generating Units</strong> located within a constrained part of the System as determined by the TSO.</td>
</tr>
<tr>
<td><strong>Contingency</strong></td>
<td>The unexpected failure or <strong>Outage</strong> of a system component, such as a <strong>Generation Unit</strong>, transmission line, circuit breaker, switch, or other electrical element. A <strong>Contingency</strong> also may include multiple components, which are related by situations leading to simultaneous component outages.</td>
</tr>
<tr>
<td><strong>Contingency Reserve</strong></td>
<td>The margin of available <strong>Generation Capacity</strong> over forecast <strong>System Demand</strong> which is required in the period of 24 hours ahead down to real time, to cover against uncertainties in availability of <strong>Generation Capacity</strong> and against <strong>Demand</strong> forecast errors or variations.</td>
</tr>
<tr>
<td><strong>Continuous Parallel Mode</strong></td>
<td>Unrestricted periods of <strong>Synchronised</strong> operation of <strong>Generation Unit(s)</strong> to the Transmission System or Distribution System at an Individual Demand Site of a Demand Side Unit, subject to <strong>Connection Agreement</strong> or DSO Connection Agreement conditions.</td>
</tr>
<tr>
<td><strong>Control Action</strong></td>
<td>An action, such as switching, whereby the <strong>Transmission System</strong> is operated.</td>
</tr>
<tr>
<td><strong>Control Centre</strong></td>
<td>A location used for the purpose of monitoring, control and operation of the Transmission System or a User System other than a <strong>Generator’s System</strong>.</td>
</tr>
<tr>
<td><strong>Control Facility</strong></td>
<td>A location used for the purpose of <strong>Monitoring</strong>, control and operation of the User's Plant and Apparatus and for accepting <strong>Dispatch Instructions</strong> via <strong>Electronic Interface</strong>.</td>
</tr>
<tr>
<td><strong>Control Phase</strong></td>
<td>The <strong>Control Phase</strong> follows on from the Programming Phase and starts with the issue of the <strong>Generation Schedule</strong> for the next day and covers the period down to the real time.</td>
</tr>
<tr>
<td><strong>Control Synchronising</strong></td>
<td>The coupling (by manual or automatic closing of the circuit breaker) of two asynchronous <strong>Systems</strong> by means of synchroscope.</td>
</tr>
<tr>
<td><strong>Controllable PPM</strong></td>
<td>A site containing at least one <strong>PPM</strong> can automatically act upon a remote signal from the TSO to change its <strong>Active Power</strong> output.</td>
</tr>
<tr>
<td><strong>Controllable PPM Availability</strong></td>
<td>The amount of MW the <strong>Controllable PPM</strong> can produce given favourable resource conditions.</td>
</tr>
<tr>
<td><strong>Controllable PPM MW Availability Declaration</strong></td>
<td>A measure of the maximum <strong>Active Power</strong> output which can be produced by a <strong>Controllable PPM</strong> given favourable resource conditions. Account shall be taken of partial and/or full outages of individual <strong>Generation Units</strong> within the <strong>Controllable PPM</strong>.</td>
</tr>
<tr>
<td><strong>Controllable PPM Operator</strong></td>
<td>The operator of the <strong>Controllable PPM</strong>.</td>
</tr>
<tr>
<td><strong>Controlled Active Power</strong></td>
<td>The amount of <strong>Active Power</strong> that a <strong>Controllable PPM</strong> is permitted to export based on the <strong>Active Power Control Set-point</strong> signal sent by the <strong>TSO</strong>.</td>
</tr>
<tr>
<td><strong>Critical Fault Clearance Time</strong></td>
<td>The longest fault duration not leading to out-of-step conditions such as pole-slipping in a <strong>Generating Unit</strong> following a <strong>Fault Disturbance</strong>. <strong>Critical Fault Clearance Time</strong> will vary according to the active and reactive power output of the <strong>Generating Unit</strong>. The minimum <strong>Critical Fault Clearance Time</strong> for a particular <strong>Fault Disturbance</strong> is likely to occur when the <strong>Generating Unit</strong> is at maximum <strong>Active Power</strong> output and maximum leading <strong>Reactive Power</strong> output.</td>
</tr>
<tr>
<td><strong>Current Source Technology</strong></td>
<td>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 <strong>Frequency</strong> and <strong>Voltage</strong>.</td>
</tr>
<tr>
<td><strong>Customer</strong></td>
<td>A person to whom electrical power is provided (whether or not this is the same person who provides the electrical power).</td>
</tr>
<tr>
<td><strong>Customer Demand Management</strong></td>
<td>Reducing the supply of electricity to a <strong>Customer</strong> or disconnecting a <strong>Customer</strong> in a manner agreed for commercial purposes between a <strong>Supplier</strong> and its <strong>Customers</strong>.</td>
</tr>
<tr>
<td><strong>Cycle Operating Mode</strong></td>
<td>The <strong>Open Cycle Mode</strong> or combine cycle <strong>Operating Mode</strong> of a <strong>CCGT Installation</strong> which may need to be specified pursuant to a <strong>Dispatch Instruction</strong> under SDC2.4.2.4(j).</td>
</tr>
<tr>
<td><strong>DCC Unit</strong></td>
<td>A <strong>Demand Facility</strong>, <strong>Closed Distribution System</strong> or <strong>Distribution System</strong> that is not a <strong>Non-DCC Unit</strong>. A <strong>Pumped Storage Unit</strong> which only operates as <strong>Pumped Storage Plant Demand</strong>, and does not meet <strong>Non-DCC Unit</strong> criteria, is classified as a <strong>DCC Unit</strong>.</td>
</tr>
<tr>
<td><strong>Declaration</strong></td>
<td>A notice prepared by the <strong>User</strong> in respect of a <strong>User’s Plant</strong> submitted to the <strong>TSO</strong> in accordance with the requirements of SDC1 and setting out the values (and times applicable to those values) of <strong>Availability</strong>, <strong>Ancillary Services</strong> capabilities, <strong>Operating Characteristics</strong>, and “<strong>Declared</strong>” shall be construed accordingly.</td>
</tr>
<tr>
<td><strong>Declared Operating Characteristics</strong></td>
<td>The <strong>Operating Characteristics</strong> which the <strong>Generator</strong> or <strong>Demand Side Unit Operator</strong> shall have informed the <strong>TSO</strong> under the provisions of SDC1 and which shall reasonably reflect the true <strong>Operating Characteristics</strong> of the <strong>Generation Unit</strong> or <strong>Demand Side Unit</strong>.</td>
</tr>
</tbody>
</table>
| **De-energise** | Disconnect from the **Transmission System** utilising circuit switches etc to isolate the **Plant** and/or **Apparatus**, and “**De-**
<table>
<thead>
<tr>
<th><strong>Deload Break Point</strong></th>
<th>The point at which due to technical reason a <strong>Generating Unit</strong> may need to pause during its <strong>MW Output</strong> reduction process.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>De-Loading Rate</strong></td>
<td>The rate at which a <strong>Generation Unit</strong> reduces <strong>MW Output</strong> from <strong>Minimum Generation</strong> to zero when it is instructed to cease output. There are up to two possible deloading rates, which shall be named accordingly: <strong>De-Loading Rate 1</strong> and <strong>De-Loading Rate 2</strong>.</td>
</tr>
<tr>
<td><strong>Demand</strong></td>
<td>The amount of electrical power consumed by the <strong>Power System</strong> comprising of both <strong>Active</strong> and <strong>Reactive Power</strong>, unless otherwise stated.</td>
</tr>
<tr>
<td><strong>Demand Control</strong></td>
<td>All or any of the methods of achieving a <strong>Demand</strong> reduction or an increase in <strong>Demand</strong> as set out in OC5.</td>
</tr>
<tr>
<td><strong>Demand Control Alert</strong></td>
<td>A warning issued by the <strong>TSO</strong> when the <strong>TSO</strong> anticipates that it will or may instruct the <strong>DSO</strong> to implement <strong>Demand</strong> reduction.</td>
</tr>
<tr>
<td><strong>Demand Customer</strong></td>
<td>An person to whom electrical <strong>Energy</strong> is provided by means of a direct connection to the <strong>Transmission System</strong>. <strong>Autoproducers</strong> are to be considered both <strong>Generators</strong> and <strong>Demand Customers</strong>. <strong>Demand Facilities</strong> are a type of <strong>Demand Customer</strong>.</td>
</tr>
<tr>
<td><strong>Demand Disconnection</strong></td>
<td>Disconnection of <strong>Demand Customers</strong>.</td>
</tr>
<tr>
<td><strong>Demand Facility(ies)</strong></td>
<td>A facility which consumes electrical energy and is connected at one or more <strong>Connection Points</strong> to the <strong>Transmission System</strong>. The <strong>Distribution System</strong> and/or auxiliary supplies of a <strong>Generation Unit</strong> do not constitute a <strong>Demand Facility</strong>.</td>
</tr>
<tr>
<td><strong>Demand Facility Owner</strong></td>
<td>A person who owns a <strong>Demand Facility</strong>.</td>
</tr>
<tr>
<td><strong>Demand Side Unit</strong></td>
<td>An <strong>Individual Demand Site</strong> or <strong>Aggregated Demand Site</strong> with a <strong>Demand Side Unit MW Capacity</strong> of at least 4 MW. The <strong>Demand Side Unit</strong> shall be subject to <strong>Central Dispatch</strong>.</td>
</tr>
<tr>
<td><strong>Demand Side Unit Best Correlated Profile</strong></td>
<td>The four <strong>Demand Side Unit Profiles</strong> from one day to eighty-four days prior to the <strong>Dispatch Instruction</strong>, offset to minimise the average absolute error across all the <strong>Meter</strong> periods comprising the <strong>Demand Side Unit Profile</strong> when compared to the <strong>Demand Side Unit Profile</strong> which finishes with the <strong>Dispatch</strong> period, resulting in the four smallest average absolute errors, averaged.</td>
</tr>
<tr>
<td><strong>Demand Side Unit Energy Profile</strong></td>
<td>The estimated total <strong>Energy</strong> requirement for an <strong>Individual Demand Site</strong> or aggregated consumption for each <strong>Individual Demand Site</strong> which form part of an <strong>Aggregated Demand Site</strong> for each <strong>Imbalance Settlement Period</strong> in the following <strong>Trading Day</strong> and which must be submitted to the <strong>TSO</strong> in the <strong>Availability Notice</strong> under SDC1.4.4.2.</td>
</tr>
<tr>
<td><strong>Demand Side Unit Calculated MWh Response</strong></td>
<td>The value of the quarter-hour <strong>Demand Side Unit Performance Monitoring Baseline</strong> less the sum of the quarter-hour <strong>Meter</strong> readings of all the <strong>Individual Demand Sites</strong> that comprise the <strong>Demand Side Unit</strong> aligned to a quarter-hour <strong>Meter</strong> period.</td>
</tr>
<tr>
<td><strong>Demand Side Unit MW Availability</strong></td>
<td>The forecasted change in <strong>Active Power</strong> which can be achieved in one currency zone by a <strong>Demand Side Unit</strong> for each <strong>Imbalance Settlement Period</strong> in the following <strong>Trading Day</strong> period and...</td>
</tr>
<tr>
<td>Category</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Demand Side Unit MW Capacity</td>
<td>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.</td>
</tr>
<tr>
<td>Demand Side Unit MW Response</td>
<td>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.</td>
</tr>
<tr>
<td>Demand Side Unit MW Response Time</td>
<td>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.</td>
</tr>
<tr>
<td>Demand Side Unit MWh Response</td>
<td>The equivalent Energy in a quarter-hour Meter period of a Demand Side Unit MW Response requested in a Dispatch Instruction.</td>
</tr>
<tr>
<td>Demand Side Unit Notice Time</td>
<td>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.</td>
</tr>
<tr>
<td>Demand Side Unit Operator</td>
<td>A person who operates a Demand Side Unit, with an aggregated Demand Side Unit MW Capacity not less than 4 MW.</td>
</tr>
<tr>
<td>Demand Side Unit Performance Monitoring Baseline</td>
<td>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.</td>
</tr>
<tr>
<td>Demand Side Unit Performance Monitoring Error</td>
<td>The absolute value of the Demand Side Unit Calculated MWh Response less the Demand Side Unit MWh Response.</td>
</tr>
<tr>
<td>Demand Side Unit Performance Monitoring Percentage Error</td>
<td>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.</td>
</tr>
<tr>
<td>Demand Side Unit Profile</td>
<td>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.</td>
</tr>
<tr>
<td><strong>Demand Side Unit Ramp Time</strong></td>
<td>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.</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Demand Side Unit SCADA Error</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Demand Side Unit SCADA Percentage Error</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>De-maximisation Instruction</strong></td>
<td>An instruction issued by the TSO to Generators to cease Maximisation.</td>
</tr>
<tr>
<td><strong>Design Minimum Operating Level (DMOL):</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Designated Operator</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>De-Synchronise</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>De-Synchronising</strong></td>
<td>The act of taking a Generating Unit off the Network, to which it has been Synchronised, and like terms shall be construed accordingly.</td>
</tr>
<tr>
<td><strong>Disconnection</strong></td>
<td>The physical separation of Users (or Customers) from the Transmission System or a User System as the case may be.</td>
</tr>
<tr>
<td><strong>Dispatch</strong></td>
<td>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 &quot;Dispatched&quot; shall be construed accordingly.</td>
</tr>
</tbody>
</table>
| **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
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>manner of operation of the CDGU, Demand Side Unit, Interconnector and/or Pumped Storage Plant Demand. “Instruct” and “Instructed” shall be construed accordingly.</td>
<td></td>
</tr>
<tr>
<td>Dispatch Instruction Test Flag</td>
<td>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.</td>
</tr>
<tr>
<td>Dispatchable PPM</td>
<td>A Controllable PPM which must have a Control Facility in order to be dispatched via an Electronic Interface by the TSO.</td>
</tr>
<tr>
<td>Disputes Resolution Procedure</td>
<td>The procedures described in the Connection Agreement, Use of System Agreement and Ancillary Services Agreement relating to disputes resolution.</td>
</tr>
<tr>
<td>Distribution Control Centre Control Centre of the Distribution System Operator</td>
<td></td>
</tr>
<tr>
<td>Distribution Facility(ies)</td>
<td>A Closed Distribution System or Distribution System connection, or the electrical plant and equipment used at the Connection Point, to the Transmission System.</td>
</tr>
<tr>
<td>Distribution System</td>
<td>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.</td>
</tr>
<tr>
<td>Distribution System Operator (DSO)</td>
<td>An entity unit within ESB which is responsible for, amongst other things, the planning, development, operation and maintenance of the Distribution System.</td>
</tr>
<tr>
<td>Disturbance</td>
<td>An unplanned event that produces an abnormal System condition.</td>
</tr>
<tr>
<td>Disturbing Loads</td>
<td>A load on the System that adversely affects Power Quality.</td>
</tr>
<tr>
<td>DSO Connection Agreement</td>
<td>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.</td>
</tr>
<tr>
<td>DSO Demand Customer</td>
<td>A person to whom electrical Energy is provided by means of a direct connection to the Distribution System.</td>
</tr>
<tr>
<td>Dwell Time Down</td>
<td>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.</td>
</tr>
<tr>
<td>Dwell Time Down Trigger Point</td>
<td>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.</td>
</tr>
<tr>
<td>Dwell Time Up</td>
<td>The duration for which the Generating Unit must remain at the</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Dwell Time Up Trigger Point</td>
<td>Dwell Time Up Trigger Point during a change in its MW Output while ramping up between Minimum Generation and instructed MW Output.</td>
</tr>
<tr>
<td>Earthing</td>
<td>A way of providing a connection between conductors and earth by an Earthing Device.</td>
</tr>
<tr>
<td>Earthing Device</td>
<td>A means of providing a connection between a conductor and earth being of adequate strength and capability for the intended purpose.</td>
</tr>
<tr>
<td>Effect of Parallel Flows</td>
<td>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.</td>
</tr>
<tr>
<td>Electronic Alert System</td>
<td>The primary means by which an Alert is transmitted by the TSO to Users (or to certain Users only) in accordance with OC9.</td>
</tr>
<tr>
<td>Electronic Interface</td>
<td>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.</td>
</tr>
<tr>
<td>Embedded Generation</td>
<td>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.</td>
</tr>
<tr>
<td>Embedded Generator Interface Protection</td>
<td>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.</td>
</tr>
<tr>
<td>Emergency</td>
<td>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.</td>
</tr>
<tr>
<td>Emergency Control Centre (ECC)</td>
<td>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).</td>
</tr>
<tr>
<td>Emergency Instruction</td>
<td>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...</td>
</tr>
<tr>
<td><strong>End of Restricted Range</strong></td>
<td>The end point in MW of a <strong>Forbidden Zone</strong>. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>End Point of Start-up Period</strong></td>
<td>The time after which the rate of change of the <strong>Generating Unit Output</strong> is not dependent upon the initial <strong>Warmth</strong> of the <strong>Generating Unit</strong>.</td>
</tr>
<tr>
<td><strong>Energise</strong></td>
<td>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 <strong>Generator’s Plant</strong> and <strong>Apparatus</strong> and “<strong>Energised</strong>” and “<strong>Energising</strong>” shall be construed accordingly.</td>
</tr>
<tr>
<td><strong>Energy</strong></td>
<td>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 <strong>Active Power</strong>, measured in units of Watt-hours or standard multiples thereof.</td>
</tr>
<tr>
<td><strong>Energy Limit</strong></td>
<td>The forecasted maximum amount of <strong>Energy</strong> that can be generated by an <strong>Energy Limited Generating Unit</strong> within the <strong>Trading Day</strong>.</td>
</tr>
<tr>
<td><strong>Energy Limited Generating Unit</strong></td>
<td>A <strong>Generating Unit</strong> with a limit on the <strong>Energy</strong> it can deliver in a specified time period.</td>
</tr>
<tr>
<td><strong>Energy Storage Generator</strong></td>
<td>A <strong>Generator</strong> which owns and/or operates any <strong>Energy Storage Power Station</strong>.</td>
</tr>
<tr>
<td><strong>Energy Storage Power Station (ESPS)</strong></td>
<td>A site containing at least one <strong>ESU</strong> can automatically act upon a remote signal from the <strong>TSO</strong> to change its <strong>Active Power</strong> output.</td>
</tr>
<tr>
<td><strong>Energy Storage Power Station (ESPS) Demand</strong></td>
<td>An <strong>Energy Storage Power Station</strong> in its operation of consuming <strong>Energy</strong>.</td>
</tr>
<tr>
<td><strong>Energy Storage Unit (ESU)</strong></td>
<td>A <strong>Generation Unit(s)</strong> using storage devices to generate and consume electricity as, or as part of, a <strong>PPM</strong>.</td>
</tr>
<tr>
<td><strong>ESB Networks Electrical Safety Rules</strong></td>
<td>The current version of the document prepared by <strong>ESB</strong> and entitled “<strong>ESB Networks Electrical Safety Rules</strong>”.</td>
</tr>
<tr>
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</tr>
<tr>
<td><strong>Estimated Registered Data</strong></td>
<td>Those items of <strong>Planning Data</strong> which either upon connection will become <strong>Registered Data</strong>, or which for the purposes of the <strong>Plant</strong> and/or <strong>Apparatus</strong> concerned as at the date of submission are <strong>Registered Data</strong>, but in each case which for the seven succeeding the <strong>TSO</strong> financial years will be an estimate of what is expected.</td>
</tr>
<tr>
<td><strong>Event</strong></td>
<td>An unscheduled or unplanned occurrence on, or relating to either the <strong>Transmission System</strong> or a <strong>User’s System</strong>, including faults, incidents and breakdowns.</td>
</tr>
<tr>
<td><strong>External Interconnection</strong></td>
<td><strong>Apparatus</strong> for the transmission of electricity to (from) the <strong>Transmission System</strong> or the <strong>Other Transmission System</strong> from (to) a transmission or distribution system located outside the island of Ireland.</td>
</tr>
<tr>
<td><strong>External System</strong></td>
<td>In relation to an <strong>External System Operator</strong> means the transmission or distribution system which it operates which is located outside the island of Ireland and any <strong>Apparatus</strong> or <strong>Plant</strong> which connects that system to the <strong>External</strong></td>
</tr>
<tr>
<td><strong>Interconnection</strong> and which is owned or operated by such <strong>External System Operator</strong>.</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td></td>
</tr>
<tr>
<td><strong>External System Operator</strong></td>
<td>A person who operates an <strong>External System</strong> which is connected to the <strong>Transmission System</strong> or the <strong>Other Transmission System</strong> by an <strong>External Interconnection</strong>.</td>
</tr>
<tr>
<td><strong>Externally Interconnected Party</strong></td>
<td>The operator of an electrical transmission or distribution system outside the island of Ireland which is connected to the <strong>Transmission System</strong> by an <strong>External Interconnection</strong>.</td>
</tr>
<tr>
<td><strong>Extraordinary AVR Response</strong></td>
<td>Any response to a <strong>Voltage Dip</strong> that requires an extraordinary response from normal behaviour of the <strong>Automatic Voltage Regulator</strong> of a <strong>Generation Unit</strong>. For the avoidance of doubt any action of an <strong>Automatic Voltage Regulator</strong>, which results in anything other than an adjustment of the excitation field current is deemed to be an <strong>Extraordinary AVR Response</strong>. Where such schemes, including fast valving, are being considered by a <strong>Generator</strong> they need to be formally agreed with the <strong>TSO</strong> before implementation, such agreement not to be unreasonably withheld.</td>
</tr>
<tr>
<td><strong>Extraordinary Governor Response</strong></td>
<td>Any response to a <strong>Voltage Dip</strong> that requires an extraordinary response from normal behaviour of the <strong>Governor Control System</strong> of a <strong>Generation Unit</strong>. For the avoidance of doubt any action other than Governor Control System with respect to Frequency dips is deemed to be an <strong>Extraordinary Governor Response</strong>. Where such schemes, including fast valving, are being considered by a <strong>Generator</strong> they need to be formally agreed with the <strong>TSO</strong> before implementation, such agreement not to be unreasonably withheld.</td>
</tr>
<tr>
<td><strong>Facility</strong></td>
<td>The <strong>User’s</strong> facility located at the <strong>Connection Site</strong> including the <strong>User’s Plant</strong> and <strong>Apparatus</strong> plus the <strong>Plant</strong> and <strong>Apparatus</strong> to be installed at the <strong>User’s</strong> side of the <strong>Connection Point</strong> necessary to effect the connection.</td>
</tr>
<tr>
<td><strong>Failure to Follow Notice to Synchronise Instruction</strong></td>
<td>An instruction given by the <strong>TSO</strong> to a <strong>Generator</strong> in respect of its CDGU confirming that it has failed to <strong>Synchronise</strong> more than 15 minutes after the time specified in the <strong>Notice to Synchronise</strong>.</td>
</tr>
<tr>
<td><strong>Failure to Reach Minimum Generation Instruction</strong></td>
<td>An instruction given by the <strong>TSO</strong> to a <strong>Generator</strong> in respect of its CDGU confirming that it has <strong>De-Synchronised</strong> where it has tripped before reaching <strong>Minimum Generation</strong>.</td>
</tr>
<tr>
<td><strong>Fault Disturbance</strong></td>
<td>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 <strong>Plant</strong> anywhere in the <strong>Transmission System</strong> where the operation of the <strong>TSO</strong> protection will not disconnect the <strong>Generator Plant</strong> from the existing or planned <strong>Transmission System</strong> under normal or Scheduled Outages conditions. For the avoidance of doubt this <strong>Fault Disturbance</strong> can include bus zone protection.</td>
</tr>
<tr>
<td><strong>Fault Inception</strong></td>
<td>The point in time at which the <strong>Transmission System Voltage</strong> at the <strong>Connection Point</strong> 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 <strong>Voltage</strong> under construction is less than 0.9pu of the nominal <strong>Voltage</strong>.</td>
</tr>
<tr>
<td><strong>Fault Ride-Through</strong></td>
<td>The ability of a Generating Unit to stay Synchronised to the Transmission System during and following a Fault Disturbance.</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Fault Ride-Through Time</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Final Physical Notification</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Flexible Outage</strong></td>
<td>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</td>
</tr>
<tr>
<td><strong>Forbidden Zone</strong></td>
<td>A MW range within which a Generator or Interconnector cannot operate in a stable manner due to an inherent technical limitation of the machine.</td>
</tr>
<tr>
<td><strong>Forced Outage Probability</strong></td>
<td>The probability, in percentage terms, of a Generation Unit or an Interconnector not being available to provide Energy or Ancillary Services.</td>
</tr>
<tr>
<td><strong>Forecast Minimum Generation Profile</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Forecast Minimum Output Profile</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Forecast Statement</strong></td>
<td>A statement as defined in Section 38 of the Act</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>The number of alternating current cycles per second (expressed in Hertz) at which a System is running.</td>
</tr>
<tr>
<td><strong>Frequency Control</strong></td>
<td>The control of the Frequency on the Power System.</td>
</tr>
<tr>
<td><strong>Frequency Deadband</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Frequency Demand Disconnection</strong></td>
<td>Disconnection of Demand Customers when Frequency falls to a particular threshold.</td>
</tr>
<tr>
<td><strong>Frequency Regulation</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Frequency Response</strong></td>
<td>The automatic adjustment of Active Power output from a Generation Unit(s) or Interconnector in response to Frequency changes</td>
</tr>
<tr>
<td><strong>Frequency Response Deadband</strong></td>
<td>Frequency Response Deadband means an interval used intentionally to make the Frequency control unresponsive.</td>
</tr>
<tr>
<td><strong>Frequency Response Insensitivity</strong></td>
<td>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.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Frequency Response Ramp Rate</td>
<td>The minimum rate of increase or decrease of Active Power output of a Controllable PPM when acting to control Transmission System Frequency.</td>
</tr>
<tr>
<td>Frequency Response System</td>
<td>A facility providing the means to automatically adjust the Active Power output from a Generation Unit(s) in response to changes in Frequency.</td>
</tr>
<tr>
<td>Frequency Sensitive Mode</td>
<td>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.</td>
</tr>
<tr>
<td>Gas Turbine Unit</td>
<td>A Generation Unit driven by gas.</td>
</tr>
<tr>
<td>Gate Closure 1</td>
<td>In respect of a Trading Day is 13.30 hours on the Trading Day prior to that Trading Day.</td>
</tr>
<tr>
<td>Gate Closure 2</td>
<td>In respect of an Imbalance Settlement Period, 1 hour before the start of that Imbalance Settlement Period.</td>
</tr>
<tr>
<td>General Conditions</td>
<td>The part of Grid Code which is defined as the General Conditions.</td>
</tr>
<tr>
<td>Generating Plant</td>
<td>A Power Station subject to Central Dispatch.</td>
</tr>
<tr>
<td>Generating Unit</td>
<td>Has the same meaning as Generation Unit.</td>
</tr>
<tr>
<td>Generation</td>
<td>The process of producing electrical energy from other forms of energy; also, the amount of electric energy produced, usually expressed in megawatthours (MWh).</td>
</tr>
<tr>
<td>Generation Outage Programme</td>
<td>Any or all of the Indicative Outage Programme, the Provisional Outage Programme and the Committed Outage Programme.</td>
</tr>
<tr>
<td>Generation Unit</td>
<td>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.</td>
</tr>
<tr>
<td>Generation Unit Output</td>
<td>The Active Power and Reactive Power produced by a Generation Unit net of Generation Unit Auxiliary Load</td>
</tr>
<tr>
<td>Generator</td>
<td>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.</td>
</tr>
<tr>
<td>Generator Aggregator</td>
<td>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.</td>
</tr>
<tr>
<td>GeneratorDeclaredInflexibilities</td>
<td>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.</td>
</tr>
<tr>
<td><strong>Generator Site</strong></td>
<td>The site owned (or occupied pursuant to a lease, licence or other agreement) by the Generator which contains the Connection Point.</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Generator Terminal</strong></td>
<td>The stator terminals of a Generating Unit.</td>
</tr>
<tr>
<td><strong>Generator Transformer</strong></td>
<td>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 PPMs, this shall be interpreted to mean the Controllable PPM's Grid Connected Transformer rather than the individual WTG transformers.</td>
</tr>
<tr>
<td><strong>Good Industry Practice</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Governor Control System</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Governor Droop</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Grid Code</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Grid Code Review Panel</strong></td>
<td>The panel as set out in GC5 of the General Conditions</td>
</tr>
<tr>
<td><strong>Grid Code Test</strong></td>
<td>A test that is to be mutually agreed, with agreement not to be unreasonably withheld, and conducted in accordance with Grid Code.</td>
</tr>
<tr>
<td><strong>Grid Connected</strong></td>
<td>Connected to the Transmission System.</td>
</tr>
<tr>
<td><strong>Grid Connected Transformer</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Grid Connection Point</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Grid Supply Point or GSP</strong></td>
<td>A point of connection between the Transmission System and the Distribution System or a Demand Customer or other network operator.</td>
</tr>
<tr>
<td><strong>Harmonic Voltage Distortion Level</strong></td>
<td>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 $(50 \times h)$ Hz which is present in the Voltage</td>
</tr>
<tr>
<td><strong>waveform in addition to its fundamental Frequency component.</strong></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td></td>
</tr>
<tr>
<td>The Harmonic Voltage Distortion Level is expressed as a percentage of the RMS value of the fundamental Frequency Voltage.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>High Frequency Event</strong></th>
<th>An event where the Transmission System Frequency deviates to a value above 50.2 Hz.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Hot Cooling Boundary</strong></th>
<th>The period of time, following De-Synchronisation of a Generating Unit after which the Warmth State transfers from being hot to being warm.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Hot Start</strong></th>
<th>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.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>HVDC Unit</strong></th>
<th>An Interconnector or DC-connected PPM that is not a Non-HVDC Unit.</th>
</tr>
</thead>
</table>

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. |

<table>
<thead>
<tr>
<th><strong>Hydro Unit</strong></th>
<th>A Generating Unit which generates electricity from the movement of water excluding Pumped Storage Generation.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Imbalance Settlement Period</strong></th>
<th>A thirty minute period beginning on the hour or the half-hour.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Impedance Loci</strong></th>
<th>A set of diagrams characterising the Transmission System impedance vector for a range of frequencies at the Connection Point from the 2nd up to, and including, the 40th harmonic. These diagrams will contain polygons, whose envelopes outline the bounds of the Transmission System impedance under intact network and appropriate single contingency conditions.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>In Writing</strong></th>
<th>This includes typewriting, printing, lithography, electronic mail, facsimile and other modes of reproducing words in a legible and non-transitory form;</th>
</tr>
</thead>
</table>

| **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).

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent Sector Users</td>
<td>A person who has been authorised by the <strong>TSO</strong> to use the interconnector pursuant to a valid Use of System Agreement.</td>
</tr>
<tr>
<td>Indicative Operations Schedule</td>
<td>A schedule prepared by the <strong>TSO</strong> in conjunction with the <strong>Other TSO</strong> pursuant to SDC1.4.8.1.</td>
</tr>
<tr>
<td>Indicative Outage Programme</td>
<td>A programme of <strong>Outages</strong> of the <strong>Generator’s Generation Units</strong> or <strong>Interconnectors</strong> prepared by the <strong>TSO</strong> pursuant to OC2 and covering years 4-7 ahead.</td>
</tr>
<tr>
<td>Individual Demand Site</td>
<td>A single premises of a <strong>Demand Customer</strong> connected to the <strong>Transmission System</strong> or a <strong>DSO Demand Customer</strong> connected to the <strong>Distribution System</strong> with a <strong>Demand Side Unit MW Capacity</strong>.</td>
</tr>
<tr>
<td>Initial Symmetrical Short-Circuit Current</td>
<td>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.</td>
</tr>
<tr>
<td>Installed Plant</td>
<td>The size, nature and name plate rating of each fundamental constituent part of the <strong>Generation Unit</strong>. For a conventional <strong>Generation Unit</strong> 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 <strong>Wind Turbine Generator</strong> size, make and model and the number of <strong>Wind Turbine Generator(s)</strong> installed. Relevant, additional information should also be included, such as <strong>Power System Stabilisers</strong>. Where a <strong>User</strong> is not clear on the requirements, clarification must be sought from the <strong>TSO</strong>.</td>
</tr>
<tr>
<td>Interconnection Agreement</td>
<td>An agreement between the <strong>TSO</strong> and an <strong>External System Operator</strong>, which may include agreement with the <strong>Interconnector Owner</strong> and/or <strong>Interconnector Operator</strong>.</td>
</tr>
<tr>
<td>Interconnector</td>
<td>A <strong>HVDC</strong> electrical transmission system as a means for the bulk transmission of electrical power to or from the <strong>Transmission System or Other Transmission System</strong> to or from an <strong>External Transmission System</strong>. An <strong>Interconnector</strong> comprises at least two <strong>Interconnector Converter Stations</strong> with DC transmission lines or cable between the <strong>Interconnector Converter Stations</strong>.</td>
</tr>
<tr>
<td>Interconnector Converter Station</td>
<td>Part of an <strong>Interconnector</strong> with one or more HVDC converter units installed in a single location together with buildings, filters, <strong>Reactive Power</strong> devices, control, monitoring, protective, measuring and auxiliary equipment.</td>
</tr>
<tr>
<td>Interconnector Converter Station Owner</td>
<td>A person who owns an <strong>Interconnector Converter Station</strong>. For the avoidance of doubt the <strong>Interconnector Converter Station Owner</strong> shall be responsible for all <strong>Grid Code</strong> requirements in relation to the <strong>Interconnector Converter Station</strong>.</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
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</tr>
<tr>
<td>Interconnector Filter</td>
<td>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.</td>
</tr>
<tr>
<td>Interconnector Frequency Droop</td>
<td>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.</td>
</tr>
<tr>
<td>Interconnector Minimum Export Load</td>
<td>Minimum MW output an Interconnector can export continuously to a remote network while maintaining stability.</td>
</tr>
<tr>
<td>Interconnector Minimum Import Load</td>
<td>Minimum MW output an Interconnector can import continuously from a remote network while maintaining stability.</td>
</tr>
<tr>
<td>Interconnector Minimum Load</td>
<td>Absolute sum of the Interconnector Minimum Export Load and Interconnector Minimum Import Load representing the minimum range of bi-directional power transfer.</td>
</tr>
<tr>
<td>Interconnector Operating Protocol</td>
<td>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.</td>
</tr>
<tr>
<td>Interconnector Operator</td>
<td>A person who operates an Interconnector and is subject to the Grid Code pursuant to any agreement with the TSO or otherwise.</td>
</tr>
<tr>
<td>Interconnector Owner</td>
<td>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.</td>
</tr>
<tr>
<td>Interconnector Ramp Rate</td>
<td>The maximum rate of increase or decrease of the power transferred, in either flow direction, by an Interconnector.</td>
</tr>
<tr>
<td>Interconnector Ramp-down Capability</td>
<td>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.</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Interconnector Ramp-up Capability</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Interconnector Registered Capacity</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Interconnector Registered Export Capacity</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Interconnector Registered Import Capacity</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Interconnector Schedule Quantities</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Interconnector Transformer</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Interconnector’s Plant</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Inter-jurisdictional Tie Line</strong></td>
<td>The lines, facilities and equipment that connect the transmission system of the Republic of Ireland to the transmission system of Northern Ireland.</td>
</tr>
<tr>
<td><strong>Intermediary</strong></td>
<td>The person representing a Generating Unit for the purposes provided for in the TSC.</td>
</tr>
<tr>
<td><strong>Interruptible Tariff</strong></td>
<td>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].</td>
</tr>
<tr>
<td><strong>Interruptible Tariff Customers</strong></td>
<td>Customers who purchase electricity under an Interruptible Tariff.</td>
</tr>
<tr>
<td><strong>Investigation</strong></td>
<td>Investigation carried out by the TSO under OC10, and “Investigate” shall be construed accordingly.</td>
</tr>
<tr>
<td><strong>Joint Grid Code Review Panel</strong></td>
<td>The panel as set out in GC.6 of the General Conditions</td>
</tr>
<tr>
<td><strong>Licence</strong></td>
<td>An electricity generation licence or an electricity supply licence, as the context requires, granted pursuant to Section 14 of the Act.</td>
</tr>
<tr>
<td><strong>Licence Standards</strong></td>
<td>The standards set out or referred to in the TSO Licence.</td>
</tr>
<tr>
<td><strong>Load</strong></td>
<td>The Active Power or Reactive Power, as the context requires,</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Frequency Event</td>
<td>An event where the Transmission System Frequency deviates to a value below 49.5Hz.</td>
</tr>
<tr>
<td>Low Frequency Relay</td>
<td>An electrical measuring relay intended to operate when its characteristic quantity (Frequency) reaches the relay settings by decrease in Frequency.</td>
</tr>
<tr>
<td>Margin</td>
<td>The difference between maximum Active Power (net of Auxiliary Loads) from Available Generation Units and net System Demand expressed in MW.</td>
</tr>
<tr>
<td>Market Operator</td>
<td>Shall have the meaning set out in the TSC.</td>
</tr>
<tr>
<td>Maximisation</td>
<td>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.</td>
</tr>
<tr>
<td>Maximisation Instruction</td>
<td>An instruction issued by the TSO to the Generator to Maximise the MW Output of a Generation Unit.</td>
</tr>
<tr>
<td>Maximum Charge Capacity</td>
<td>The maximum amount of Energy that can be produced from the storage of an Energy Storage Generator for a Trading Day.</td>
</tr>
<tr>
<td>Maximum Continuous Rating</td>
<td>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.</td>
</tr>
<tr>
<td>Maximum Down Time</td>
<td>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.</td>
</tr>
<tr>
<td>Maximum Export Capacity</td>
<td>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.</td>
</tr>
<tr>
<td>Maximum Import Capacity</td>
<td>The values (kW and/or kVA) provided in accordance with the User’s Connection Agreement or DSO Demand Customer’s DSO Connection Agreement.</td>
</tr>
<tr>
<td>Maximum On Time</td>
<td>The maximum time that a Generating Unit can run following Start Up.</td>
</tr>
<tr>
<td>Maximum Ramp Down Rate</td>
<td>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.</td>
</tr>
<tr>
<td>Maximum Ramp Up Rate</td>
<td>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.</td>
</tr>
<tr>
<td>Maximum Storage Capacity</td>
<td>The maximum amount of Energy that can be produced from the reservoir of a Pumped Storage Generator for a Trading Day.</td>
</tr>
<tr>
<td><strong>Measurement Point</strong></td>
<td>The <strong>Measurement Point</strong> shall be the <strong>Connection Point</strong> to the <strong>Transmission System</strong> or such other point or points as may be agreed between the <strong>TSO</strong> and the <strong>User</strong>.</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Merit Order</strong></td>
<td>An order, compiled by the <strong>TSO</strong> in conjunction with the <strong>Other TSO</strong> pursuant to SDC1 of <strong>Commercial Offer Data</strong> sorted in price order.</td>
</tr>
<tr>
<td><strong>Meshed Transmission Station</strong></td>
<td>A <strong>Transmission Station</strong> which is looped into the <strong>Transmission System</strong>.</td>
</tr>
<tr>
<td><strong>Meteorological Mast</strong></td>
<td>A device erected at the <strong>Controllable PPM</strong> 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.</td>
</tr>
<tr>
<td><strong>Meter</strong></td>
<td>A device for measuring and recording units of electrical energy.</td>
</tr>
<tr>
<td><strong>Metering Code</strong></td>
<td>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 <strong>Trading and Settlement Code</strong>.</td>
</tr>
<tr>
<td><strong>Metering Equipment</strong></td>
<td><strong>Meters</strong>, 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 <strong>Active Energy</strong> and <strong>Reactive Energy</strong> measuring equipment at or related to a <strong>Site</strong>.</td>
</tr>
<tr>
<td><strong>Minimum Charge Capacity</strong></td>
<td>The minimum amount of <strong>Energy</strong> that must be produced from the storage of an <strong>Energy Storage Generator</strong> for a <strong>Trading Day</strong>.</td>
</tr>
<tr>
<td><strong>Minimum Demand Regulation (MDR)</strong></td>
<td>That minimum margin of <strong>Active Power</strong> to provide a sufficient regulating margin for adequate <strong>Frequency Control</strong>.</td>
</tr>
<tr>
<td><strong>Minimum Down Time</strong></td>
<td>In the case of <strong>Demand Side Units</strong>, the minimum period of time during which <strong>Demand Side Unit MW Response</strong> at a <strong>Demand Side Unit</strong> can be greater than zero.</td>
</tr>
<tr>
<td><strong>Minimum Generation</strong></td>
<td>The minimum <strong>MW Output</strong> which a <strong>Generating Unit</strong> can generate continuously, registered with the <strong>TSO</strong> under SDC1 as a <strong>Technical Parameter</strong>.</td>
</tr>
<tr>
<td><strong>Minimum Load</strong></td>
<td>Minimum <strong>MW Output</strong> a <strong>Generator</strong> can maintain on a continuous basis, whilst providing <strong>System Services</strong>.</td>
</tr>
</tbody>
</table>
| **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 |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Model(s)</td>
<td>A software representation(s) of a User System and/or Plant provided to the TSO for the purposes of Power System simulation.</td>
</tr>
<tr>
<td>Modification</td>
<td>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, 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.</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Monitoring carried out by the TSO under OC10, and “Monitor” shall be construed accordingly.</td>
</tr>
<tr>
<td>Mvar Output</td>
<td>The Reactive Power produced or absorbed by a Generation Unit net of Generation Unit Auxiliary Load</td>
</tr>
<tr>
<td>MW Dispatch Instruction</td>
<td>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.</td>
</tr>
<tr>
<td>MW Output</td>
<td>The actual Active Power output in MW of a Generation Unit at the Connection Point.</td>
</tr>
<tr>
<td>National Control Centre</td>
<td>The TSO’s National Control Centre, as notified by the TSO to the Generator from time to time.</td>
</tr>
<tr>
<td>Network</td>
<td>The Transmission System and the Distribution System taken together.</td>
</tr>
<tr>
<td>Network Control</td>
<td>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.</td>
</tr>
<tr>
<td>NI System</td>
<td>Together, the Other Transmission System and the distribution system in Northern Ireland.</td>
</tr>
<tr>
<td>No Load Cost</td>
<td>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.</td>
</tr>
<tr>
<td>Non-Centrally Dispatched Generation Unit (NCDGU)</td>
<td>A Generating Unit not subject to Central Dispatch.</td>
</tr>
</tbody>
</table>
| 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**.

---

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
<table>
<thead>
<tr>
<th>Non-RfG Generation Unit</th>
<th>contract for the purchase of the <em>Plant</em> being modified after the 15th September 2018 will be deemed a <em>HVDC Unit</em>.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A Generation Unit with a signed Connection Agreement:</strong></td>
<td><strong>A Generation Unit with a signed Connection Agreement:</strong></td>
</tr>
<tr>
<td>a) Connected to the <em>Network</em> on or before the 30th November 2018; or</td>
<td>a) Connected to the <em>Network</em> on or before the 30th November 2018; or</td>
</tr>
<tr>
<td>b) Whose owner has concluded a final and binding contract for the purchase of the main <em>Plant</em> on or before the 30th November 2018 and provides evidence of same, as acknowledged by the <em>TSO</em>, 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 <em>Plant</em> to be constructed, assembled, or purchased; or</td>
<td>b) Whose owner has concluded a final and binding contract for the purchase of the main <em>Plant</em> on or before the 30th November 2018 and provides evidence of same, as acknowledged by the <em>TSO</em>, 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 <em>Plant</em> to be constructed, assembled, or purchased; or</td>
</tr>
<tr>
<td>c) Is one of the exceptions to the applicability of the <em>RfG Generation Unit</em> requirements and is a <em>Generation Unit</em> as follows:</td>
<td>c) Is one of the exceptions to the applicability of the <em>RfG Generation Unit</em> requirements and is a <em>Generation Unit</em> as follows:</td>
</tr>
<tr>
<td>(i) Installed to provide back-up power and operate in parallel with the <em>Network</em> for less than five minutes per calendar month while the system is in normal system state; or</td>
<td>(i) Installed to provide back-up power and operate in parallel with the <em>Network</em> for less than five minutes per calendar month while the system is in normal system state; or</td>
</tr>
<tr>
<td>(ii) No permanent <em>Connection Point</em> and is used by the <em>TSO</em> to temporarily provide power when normal system capacity is partly or completely unavailable; or</td>
<td>(ii) No permanent <em>Connection Point</em> and is used by the <em>TSO</em> to temporarily provide power when normal system capacity is partly or completely unavailable; or</td>
</tr>
<tr>
<td>(iii) <em>Energy Storage Units</em> except for <em>Pumped Storage Plant</em>.</td>
<td>(iii) <em>Energy Storage Units</em> except for <em>Pumped Storage Plant</em>.</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Normal Dispatch Condition</th>
<th>The condition of the <em>Generation Unit</em> at the <em>End of the Start-up Period</em>.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notice to Synchronise</td>
<td>A <em>Dispatch Instruction</em> given by the <em>TSO</em> from its <em>National Control Centre</em> to the <em>Generator’s</em> approved contact person or location to <em>Synchronise</em> the <em>Generation Unit</em>.</td>
</tr>
<tr>
<td>Off-Site Storage Location</td>
<td>The site in close vicinity to the <em>Generator Site</em> where (pursuant to a lease, licence or other agreement) the <em>User</em> stores stocks of <em>Primary Fuel</em> and/or <em>Secondary Fuel</em>. A dedicated pipeline with a dedicated pump must be in place on this site between the dedicated fuel tank off-site and the <em>Generating Plant</em>. As a maximum, this <em>Off-Site Storage Location</em> should be no more than 6 km from the <em>Generating Plant</em>.</td>
</tr>
<tr>
<td>Open Cycle Gas Turbine Unit</td>
<td>A <em>Generation Unit</em> driven by a gas turbine other than a <em>CCGT Installation</em> or <em>CCGT Unit</em>.</td>
</tr>
</tbody>
</table>
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 7th 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
<table>
<thead>
<tr>
<th><strong>Other Grid Code</strong></th>
<th>The code prepared pursuant to the licence to carry out electricity transmission activities granted to the <strong>Other TSO</strong> pursuant to Article 10(1)(b) of the <em>Electricity (Northern Ireland) Order 1992</em> in Northern Ireland, as from time to time revised in accordance with such licence.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Other Relevant Data</strong></td>
<td>The data referred to in SDC1.4.4.4.</td>
</tr>
<tr>
<td><strong>Other Transmission System</strong></td>
<td>The transmission system operated by the <strong>Other TSO</strong> in Northern Ireland.</td>
</tr>
<tr>
<td><strong>Other TSO</strong></td>
<td>The holder of a licence granted pursuant to Article 10(1)(b) of the <em>Electricity (Northern Ireland) Order 1992</em> 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 <strong>Other Transmission System</strong>.</td>
</tr>
</tbody>
</table>
| **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
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Control Phase</td>
<td>The days following the Control Phase</td>
</tr>
<tr>
<td>Post Event Notice</td>
<td>A notice issued by the TSO in accordance with OC10</td>
</tr>
<tr>
<td>Power Factor</td>
<td>The ratio of Active Power to Apparent Power.</td>
</tr>
</tbody>
</table>
| 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.                                                                                           |

consumption of and/or supply and/or transmission of electricity other than Apparatus.
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; and
(c) automatic load shedding.

<table>
<thead>
<tr>
<th><strong>Primary Fuel</strong></th>
<th>The fuel or fuels registered in accordance with the <strong>Grid Code</strong> as the principal fuel(s) authorised for <strong>Energy</strong> production by the <strong>Generation Unit</strong>.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Fuel Switch Over Output</strong></td>
<td>The <strong>MW Output</strong>, not lower than <strong>Minimum Load</strong> at which a <strong>Generation Unit</strong> can achieve a switch over from <strong>Primary Fuel</strong> to <strong>Secondary Fuel</strong>.</td>
</tr>
<tr>
<td><strong>Primary Operating Reserve (POR)</strong></td>
<td>The additional <strong>MW Output</strong> (and/or reduction in <strong>Demand</strong>) required at the <strong>Frequency</strong> nadir (minimum), compared to the pre-incident output (or <strong>Demand</strong>), which is fully available and sustainable between 5 seconds and 15 seconds after an <strong>Event</strong> and where the nadir occurs between 5 and 15 seconds after the <strong>Event</strong>. If the actual <strong>Frequency</strong> nadir occurs less than 5 seconds or more than 15 seconds after the <strong>Event</strong>, then for the purpose of <strong>POR</strong> monitoring the nadir is deemed to be the lowest <strong>Frequency</strong> which occurred between 5 and 15 seconds after the event.</td>
</tr>
</tbody>
</table>
| **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. |
<p>| <strong>Priority Dispatch</strong> | The <strong>Dispatch</strong> given priority as afforded under governing legislation in either jurisdiction. |
| <strong>Programming Phase</strong> | The period between <strong>Operational Planning Phase</strong> and the <strong>Control Phase</strong>. It starts at the 1 week ahead stage and finishes with the issue of the <strong>Generation Schedule</strong> for the day ahead. |
| <strong>Provisional Outage Programme</strong> | An <strong>Outage</strong> programme of the <strong>Generator’s Generation Units</strong> and of <strong>Interconnectors</strong>, as prepared by the <strong>TSO</strong> pursuant to OC2 and covering years 2-3 ahead. |
| <strong>Provisional Running Orders</strong> | A statement prepared and issued by the <strong>TSO</strong> to the <strong>Generator</strong> pursuant to SDC1, which indicates for each <strong>Generation Unit</strong> owned or controlled by the <strong>Generator</strong>, the expected load pattern, the required fuel or fuels and <strong>Synchronising</strong> and <strong>De-Synchronising</strong> times for the following day. |
| <strong>Prudent Utility Practice</strong> | 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... |</p>
<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pumped Storage Generation</td>
<td>A <strong>Pumped Storage Plant</strong> in its operation of producing <strong>Energy</strong> by releasing water from an upper reservoir.</td>
</tr>
<tr>
<td>Pumped Storage Generator</td>
<td>A <strong>Generator</strong> which owns and/or operates any <strong>Pumped Storage Plant</strong>.</td>
</tr>
<tr>
<td>Pumped Storage Mode</td>
<td>A mode of operation of a <strong>Pumped Storage Unit</strong>.</td>
</tr>
<tr>
<td>Pumped Storage Plant</td>
<td>A <strong>Generation Plant</strong> that produces <strong>Active Energy</strong> using water from an upper reservoir and takes energy by pumping water up to the same reservoir.</td>
</tr>
<tr>
<td>Pumped Storage Plant Demand</td>
<td>A <strong>Pumped Storage Plant</strong> in its operation of consuming <strong>Energy</strong> by pumping water to an upper reservoir.</td>
</tr>
<tr>
<td>Pumped Storage Unit</td>
<td>A <strong>Generation Unit</strong> within a <strong>Pumped Storage Plant</strong>.</td>
</tr>
<tr>
<td>Ramp Down Break Point</td>
<td>The MW level at which the <strong>Ramp Down Rate</strong> 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.</td>
</tr>
<tr>
<td>Ramp Down Rate</td>
<td>The maximum rate of decrease in a <strong>Generating Unit’s Output</strong> after the <strong>End Of Start-up Period</strong>. The <strong>Ramp Down Rate</strong> applies over the output range from its <strong>Registered Capacity</strong> to <strong>Minimum Generation</strong>. The rate of change is not dependent upon the initial <strong>Warmth</strong> of the plant but may depend on the <strong>MW Output</strong>. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.</td>
</tr>
<tr>
<td>Ramp Up Break Point</td>
<td>The MW level at which the <strong>Ramp Up Rate</strong> 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.</td>
</tr>
<tr>
<td>Ramp Up Rate</td>
<td>The maximum rate of increase in a <strong>Generating Unit’s Output</strong> after the <strong>End Of Start-up Period</strong>. This rate of increase continues until the <strong>Generating Unit</strong> reaches the level of output instructed by the control room operator of its <strong>Registered Capacity</strong>. The rate of increase is not dependent upon the initial <strong>Warmth</strong> of the plant but may depend on the <strong>MW Output</strong>. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter.</td>
</tr>
<tr>
<td>Ramp-down Capability</td>
<td>The rate of decrease in a <strong>Generation Unit’s Output</strong> after the <strong>End Of Start-up Period</strong>. <strong>Ramp-down Capabilities</strong> apply over the output range from its <strong>Registered Capacity</strong> to <strong>Minimum generation</strong>. The rate of change is not dependent upon the initial warmth of the plant but may depend on the <strong>MW Output</strong>.</td>
</tr>
<tr>
<td>Ramp-up Capability</td>
<td>The rate of increase in a <strong>Generation Unit’s Output</strong> after the <strong>End Of Start-up Period</strong>. This rate of increase continues until the <strong>Generation Unit</strong> reaches the level of output instructed by the control room operator or its <strong>Registered Capacity</strong>. Following the <strong>End Of Start-up Period</strong>, the rate of increase is not dependent upon the initial warmth of the plant but may depend on the <strong>MW Output</strong>.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Rate of Change of Frequency (ROCOF)</td>
<td>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).</td>
</tr>
<tr>
<td>Reactive Power</td>
<td>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.</td>
</tr>
<tr>
<td>Red Alert</td>
<td>An Alert issued by the TSO to the User in the circumstances set out in OC9.</td>
</tr>
<tr>
<td>Re-declaration</td>
<td>Notification to the TSO by the User of any revisions to data, pursuant to SDC1.4.5.</td>
</tr>
<tr>
<td>Registered Capacity</td>
<td>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.</td>
</tr>
<tr>
<td>Registered Data</td>
<td>Those items of Standard Planning Data and Detailed Planning Data that upon connection become fixed (subject to any subsequent changes).</td>
</tr>
<tr>
<td>Registered Fuel</td>
<td>The fuel(s) registered under the Planning Code of the Grid Code.</td>
</tr>
<tr>
<td>Registered Operating Characteristics</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>The values of an Interconnector’s Operating Characteristics for operation of the Interconnector pursuant to the Grid Code registered under the Connection Conditions.</td>
</tr>
<tr>
<td>Regulating Margin</td>
<td>The margin of generating Capacity that is Synchronised over Demand which is required in order to maintain Frequency Control.</td>
</tr>
<tr>
<td>Regulatory Authorities</td>
<td>Each Regulatory Authority taken together.</td>
</tr>
<tr>
<td>Regulatory Authority</td>
<td>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).</td>
</tr>
<tr>
<td>Remote Terminal Unit (RTU)</td>
<td>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.</td>
</tr>
<tr>
<td>Remote Transmission Assets</td>
<td>Any Plant and Apparatus or meters owned by the TAO which:</td>
</tr>
<tr>
<td></td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>b) are by agreement between the TAO and such User</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
</tr>
<tr>
<td>Replacement Reserve</td>
<td>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.</td>
</tr>
<tr>
<td>Reserve Characteristics</td>
<td>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.</td>
</tr>
<tr>
<td>Resource Following Mode</td>
<td>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 ).</td>
</tr>
<tr>
<td>Resource Following Ramp Rate</td>
<td>The maximum rate of increase of Active Power output of a Controllable PPM in response to an increase in resource availability.</td>
</tr>
<tr>
<td>Responsible Manager</td>
<td>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.</td>
</tr>
<tr>
<td>Responsible Operator</td>
<td>A person nominated by a User to be responsible for control of Plant and Apparatus related to the User's System.</td>
</tr>
<tr>
<td>RfG Generation Unit</td>
<td>A Generation Unit that is not a Non-RfG Generation Unit.</td>
</tr>
<tr>
<td>Rise Time</td>
<td>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.</td>
</tr>
<tr>
<td>Rota Load Shedding Plan</td>
<td>A plan that provides for disconnection and reconnection of defined blocks of demand on instruction from the TSO.</td>
</tr>
<tr>
<td>Safety Rules</td>
<td>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.</td>
</tr>
<tr>
<td>Scheduled Operational Date</td>
<td>Has the meaning set out in the Connection Agreement.</td>
</tr>
<tr>
<td>Scheduled Outage</td>
<td>Any Fixed Outage, Flexible Outage or Short Term Scheduled Outage.</td>
</tr>
<tr>
<td>Scheduling Agent</td>
<td>In relation to an Interconnector, a person nominated to provide Interconnector Schedule Quantities to the TSO.</td>
</tr>
<tr>
<td>Scheduling and Dispatch Code (SDC)</td>
<td>The parts of the Grid Code which specify the scheduling and Dispatch process.</td>
</tr>
<tr>
<td>Secondary Frequency Control</td>
<td>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...</td>
</tr>
</tbody>
</table>
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 CDGUs, effected by Generators in response to a Dispatch Instruction from the TSO issued simultaneously to the relevant Power Stations. 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.

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.
### 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.

<table>
<thead>
<tr>
<th>Step Change</th>
<th>A step change is defined as a single, rapid change of the RMS voltage. <strong>Transmission System</strong> step changes can occur due to switching in and out of capacitors, lines, cables, transformers and other plant.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substitute Reserve</td>
<td>The additional MW output (and/or reduction in <strong>Demand</strong>) required compared to the pre-incident output (or <strong>Demand</strong>) which is fully available and sustainable over the period from 4 hours to 24 hours following an <strong>Event</strong>.</td>
</tr>
<tr>
<td>Supplier</td>
<td>The holder of a <strong>Supply Licence</strong>.</td>
</tr>
<tr>
<td>Supply</td>
<td>The process of delivering electrical energy by a <strong>Supplier</strong>; also, the amount of electric energy delivered, usually expressed in megawatthours (MWh).</td>
</tr>
<tr>
<td>Synchronise</td>
<td>The condition where an incoming <strong>Generation Unit</strong> or system is connected to another <strong>System</strong> so that the frequencies and phase relationships of that <strong>Generation Unit</strong> or <strong>System</strong>, as the case may be, and the <strong>System</strong> to which it is connected are identical and the terms “<strong>Synchronise</strong>”, “<strong>Synchronising</strong>” and “<strong>Synchronisation</strong>” shall be construed accordingly.</td>
</tr>
<tr>
<td>Synchronous Compensation</td>
<td>The operation of rotating synchronous <strong>Apparatus</strong> for the specific purpose of either the <strong>Generation</strong> or absorption of <strong>Reactive Power</strong>.</td>
</tr>
<tr>
<td>Synchronous Start-Up Time Cold</td>
<td>The time taken to bring a <strong>Generating Unit</strong> to a <strong>Synchronised</strong> state from a <strong>Cold (De-Synchronised)</strong> state.</td>
</tr>
<tr>
<td>Synchronous Start-Up Time Hot</td>
<td>The time taken to bring a <strong>Generating Unit</strong> to a <strong>Synchronised</strong> state from a <strong>Hot (De-Synchronised)</strong> state.</td>
</tr>
<tr>
<td>Synchronous Start-Up Time Warm</td>
<td>The time taken to bring a <strong>Generating Unit</strong> to a <strong>Synchronised</strong> state from a <strong>Warm (De-Synchronised)</strong> state.</td>
</tr>
<tr>
<td>System</td>
<td>Any <strong>User System</strong> and/or the <strong>Transmission System</strong> as the case may be.</td>
</tr>
<tr>
<td>System Capacity Shortfall Warning</td>
<td>A warning issued by the <strong>TSO</strong> if, the <strong>Availability</strong> forecast and <strong>Demand</strong> forecast indicate that there will be a deficit in any week.</td>
</tr>
<tr>
<td>System Emergency Condition</td>
<td>A <strong>Partial Shutdown</strong> or <strong>Total Shutdown</strong> or any other physical or operational condition and/or occurrence on the <strong>Power System</strong> which, in the <strong>TSO’s</strong> 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 <strong>TSO’s</strong> ability to discharge any statutory, regulatory or other legal obligation and/or (b) the safety and/or reliability of the <strong>Power System</strong>.</td>
</tr>
<tr>
<td>System Model</td>
<td>A software representation of the <strong>Transmission System</strong> developed and maintained by the <strong>TSO</strong> for the purposes of <strong>Power System</strong> simulation. The <strong>System Model</strong> contains all data relating to the <strong>Transmission System</strong> network, <strong>User Registered Operating Characteristics</strong> and <strong>User Models</strong>.</td>
</tr>
<tr>
<td>System Planning</td>
<td>The process by which the performance of the <strong>System</strong> is evaluated and future changes and additions to the <strong>System</strong> are determined.</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>System Planning Data</strong></td>
<td>Data that must be submitted at regular periods by all <strong>Users</strong>, or other such data or information as requested by the <strong>TSO</strong> under <strong>PC.6</strong></td>
</tr>
<tr>
<td><strong>System Services</strong></td>
<td>Services which are required for <strong>System</strong> reasons and which include those which must be provided by <strong>Users</strong> in accordance with the <strong>Connection Conditions</strong> and those which must be provided by a <strong>User</strong> if the <strong>User</strong> has agreed to provide them under supplemental agreements.</td>
</tr>
<tr>
<td><strong>System Support Agreement</strong></td>
<td>A bilateral agreement between the <strong>TSO</strong> and a <strong>User</strong> for services which are required for <strong>System</strong> reasons and which exclude those which must be provided by <strong>Users</strong> in accordance with the <strong>Connection Conditions</strong>.</td>
</tr>
<tr>
<td><strong>System Support Services</strong></td>
<td>Those services defined as <strong>System Support Services</strong> in Condition 1 of the <strong>TSO Licence</strong> granted to the <strong>Other TSO</strong>.</td>
</tr>
<tr>
<td><strong>System Test</strong></td>
<td><strong>Tests</strong> which involve simulating conditions, or the controlled application of irregular, unusual or extreme conditions, on the <strong>System</strong>, or any part of the <strong>System</strong>, but which do not include <strong>Commissioning</strong> or recommissioning tests or any other tests of a minor nature.</td>
</tr>
<tr>
<td><strong>Target Charge Level Percentage</strong></td>
<td>As defined in the <strong>TSC</strong>.</td>
</tr>
<tr>
<td><strong>Target Charge Levels</strong></td>
<td>Part of the <strong>Commercial Offer Data</strong> for an <strong>Energy Storage Power Station Generator</strong> and means the target level of the storage for the end of the <strong>Trading Day</strong>.</td>
</tr>
<tr>
<td><strong>Target Frequency</strong></td>
<td>That <strong>Frequency</strong> determined by the <strong>TSO</strong>, in its reasonable opinion, as the desired operating <strong>Frequency</strong> of the <strong>Power System</strong>.</td>
</tr>
<tr>
<td><strong>Technical Parameters</strong></td>
<td>The technical capabilities, flexibilities and limitations for the operation of a <strong>User’s Plant</strong> as registered or declared in accordance with the provisions of the <strong>Grid Code</strong> including those parameters listed in Appendix A to <strong>SDC1</strong>.</td>
</tr>
<tr>
<td><strong>Technical Parameters Notice</strong></td>
<td>A notification as submitted under <strong>SDC1.4.4.1</strong>.</td>
</tr>
<tr>
<td><strong>Temporary Voltage Depression</strong></td>
<td>A rapid change in fundamental <strong>Frequency RMS</strong> or peak <strong>Voltage</strong> over several cycles and remaining within the normal operating voltage range. This form of disturbance can manifest as an <strong>RMS Voltage</strong> depression with a slow recovery to nominal <strong>Voltage</strong>. The <strong>RMS Voltage</strong> depression is attributable to starting motors or the energisation of transformers or reactors and is characterised by the following diagram:</td>
</tr>
<tr>
<td><strong>Tertiary Operating Reserve</strong></td>
<td><strong>Tertiary Operating Reserve band 1</strong> and <strong>Tertiary Operating Reserve band 2</strong>.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Tertiary Operating Reserve band 1</td>
<td>The additional <strong>MW Output</strong> (and/or reduction in <strong>Demand</strong>) required compared to the pre-incident output (or <strong>Demand</strong>) which is fully available and sustainable over the period from 90 seconds to 5 minutes following an event.</td>
</tr>
<tr>
<td>Tertiary Operating Reserve band 2</td>
<td>The additional <strong>MW Output</strong> (and/or reduction in <strong>Demand</strong>) required compared to the pre-incident output (or <strong>Demand</strong>) which is fully available and sustainable over the period from 5 minutes to 20 minutes following an event.</td>
</tr>
<tr>
<td>Test Proposer</td>
<td>The <strong>User</strong> submitting proposal for a test under OC8.</td>
</tr>
<tr>
<td>Testing</td>
<td>Testing carried out by the <strong>TSO</strong> pursuant to OC10 and/or CC and the term “<strong>Test</strong>” shall be construed accordingly.</td>
</tr>
<tr>
<td>Thermal Overload</td>
<td>A <strong>Thermal Overload</strong> 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.</td>
</tr>
<tr>
<td>Thermal Plant</td>
<td>A <strong>Generating Unit</strong> that uses any source of thermal <strong>Energy</strong>.</td>
</tr>
<tr>
<td>Total Harmonic Voltage Distortion (THD)</td>
<td>The <strong>Total Harmonic Voltage Distortion</strong> is the RMS value of the sum of all individual <strong>Harmonic Voltage Distortion Levels</strong> up to a specified order ( H ), where ( H ) is set to be 40.</td>
</tr>
<tr>
<td>Total Shutdown</td>
<td>The situation existing when all generation has ceased and there is no electricity supply from <strong>External Interconnection</strong>.</td>
</tr>
<tr>
<td>Total Transfer Capacity</td>
<td>The total amount of power that can be exchanged continuously to or from the <strong>Transmission System</strong> over the <strong>Interconnector</strong> while ensuring the safe operation of the <strong>Transmission System</strong>. 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.</td>
</tr>
<tr>
<td>Trading and Settlement Code</td>
<td>The <strong>Single Electricity Market</strong> Trading and Settlement Code which the <strong>Market Operator</strong> is required to administer and maintain in force under the <strong>Market Operator</strong> licences issued by the <strong>Regulatory Authorities</strong>.</td>
</tr>
<tr>
<td>Trading Day</td>
<td>The period commencing at 23.00 each day and ending at 23.00 the next day.</td>
</tr>
<tr>
<td>Transmission Asset Owner (TAO)</td>
<td>The <strong>ESB</strong>, acting in its capacity as the <strong>Transmission System Owner</strong>.</td>
</tr>
<tr>
<td>Transmission Reliability Margin</td>
<td>A transmission transfer capacity margin which accounts for the security margin for regulation, reserve sharing, and <strong>Rescue Flows</strong> between the <strong>Transmission System</strong> and any <strong>External System</strong> and may also take into account uncertainties of system conditions and other assumptions made to produce <strong>Total Transfer Capacity</strong> ex-ante.</td>
</tr>
<tr>
<td>Transmission Station</td>
<td>A node in the electricity <strong>Transmission System</strong> with transmission circuit/s, transformer/s, circuit breakers and their associated protection and communications systems.</td>
</tr>
<tr>
<td>Transmission System</td>
<td>The <strong>System</strong> consisting (wholly or mainly) of high <strong>Voltage</strong> electric lines and cables operated by the <strong>TSO</strong> for the purposes of transmission of electricity from one <strong>Power Station</strong> to a sub-</td>
</tr>
<tr>
<td><strong>Transmission System Operator (TSO)</strong></td>
<td>The holder of the licence granted pursuant to Section 14 of the Act 1999 to operate a Transmission System.</td>
</tr>
<tr>
<td><strong>Transmission System Owner</strong></td>
<td>The holder of the licence granted pursuant to Section 14 of the Act to own the Transmission System.</td>
</tr>
<tr>
<td><strong>Transmission System Security Planning Standards</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Transmission Use of System Agreement</strong></td>
<td>An agreement between the TSO and a User setting out the terms relating to the use of the Transmission System.</td>
</tr>
<tr>
<td><strong>TSO Licence</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>TSO Telecommunication Interface Cabinet</strong></td>
<td>The physical interface point between the TSO’s telecommunications equipment and the Controllable PPM’s control equipment.</td>
</tr>
<tr>
<td><strong>Unit Board</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Unit Transformer</strong></td>
<td>A transformer directly connected to a Generating Unit’s terminals, and which supplies power to the Auxiliaries of a Generating Unit.</td>
</tr>
<tr>
<td><strong>Use of System Tariffs</strong></td>
<td>Tariffs set by the TSO subject to approval by the CRU for use of the Transmission System.</td>
</tr>
<tr>
<td><strong>User</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>User Development</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>User Site</strong></td>
<td>A site owned (or occupied pursuant to a lease, licence or other agreement) by a User in which there is a Connection Point.</td>
</tr>
<tr>
<td><strong>User System</strong></td>
<td>Any system owned or operated by a User comprising:- (i) Generating Units; (ii) Interconnectors; and/or</td>
</tr>
</tbody>
</table>
(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.

<table>
<thead>
<tr>
<th><strong>User System Entry Point</strong></th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Var</strong></td>
<td>A single unit of Reactive Power.</td>
</tr>
<tr>
<td><strong>Voltage</strong></td>
<td>Voltage of relevant section of Transmission System - nominally 400kV, 220kV or 110kV</td>
</tr>
<tr>
<td><strong>Voltage Control</strong></td>
<td>The retention of the Voltage on the System within acceptable limits.</td>
</tr>
<tr>
<td><strong>Voltage Dip</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Voltage Flicker</strong></td>
<td>The impression of unsteadiness of visual sensation induced by a light stimulus whose luminance or spectral distribution fluctuates with time.</td>
</tr>
<tr>
<td><strong>Voltage Regulation</strong></td>
<td>The automatic adjustment of Reactive Power output from a Generation Unit(s) in response to Voltage changes (e.g. from a Generation Unit).</td>
</tr>
<tr>
<td><strong>Voltage Regulation Set-point</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Voltage Regulation System</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Voltage Regulation System Slope Setting</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Warm Cooling Boundary</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Warm Start</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Warmth</strong></td>
<td>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).</td>
</tr>
<tr>
<td><strong>Warmth State</strong></td>
<td>Either cold, warm or hot, as defined under the timeframes since last De-Synchronisations for Cold Start, Warm Start or Hot Start respectively.</td>
</tr>
<tr>
<td><strong>Warning</strong></td>
<td>A warning as provided for in OC10.7.1.1</td>
</tr>
<tr>
<td><strong>Wind Turbine Generator(s) (WTG)</strong></td>
<td>A Generation Unit(s) generating electricity from wind.</td>
</tr>
</tbody>
</table>