



EirGrid Grid Code

Version 5.0

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GRID CODE TABLE OF CONTENTS

GC GENERAL CONDITIONS

GC.1 INTRODUCTION..... GC-2
GC.2 OBJECTIVE..... GC-2
GC.3 SCOPE..... GC-2
GC.4 PURPOSE..... GC-2
GC.5 GRID CODE REVIEW PANEL..... GC-3
GC.6 JOINT GRID CODE REVIEW PANEL GC-3
GC.7 GRID CODE REVISIONS..... GC-4
GC.8 GRID CODE INTERPRETATION..... GC-5
GC.9 DEROGATIONS..... GC-6
GC.10 PLANT FAILURES GC-8
GC.11 ASSISTANCE IN IMPLEMENTATION GC-10
GC.12 UNFORESEEN CIRCUMSTANCES GC-11
GC.13 HIERARCHY GC-11
GC.14 OWNERSHIP OF PLANT AND/OR APPARATUS GC-11
GC.15 SYSTEM CONTROL..... GC-12
GC.16 ILLEGALITY AND PARTIAL INVALIDITY GC-12

PC PLANNING CODE

PC.1 INTRODUCTION PC-2
PC.2 OBJECTIVES PC-2
PC.3 SCOPE PC-3
PC.4 PLANNING PROCEDURES FOR CONNECTION PC-3
PC.5 SYSTEM PLANNING PC-7
PC.6 DATA..... PC-7
PC.7 PLANNING STANDARDS..... PC-11
PC.8 VALIDATION AND VERIFICATION OF DATA PC-12

PCA PLANNING CODE APPENDIX

INTRODUCTION.....PCA-2
PC.A1 GENERAL INFORMATION.....PCA-2
PC.A2 NEW CONNECTIONS.....PCA-3
PC.A3 DEMAND DATA REQUIREMENTSPCA-5
PC.A4 GENERATOR DATA REQUIREMENTSPCA-14
PC.A5 INTERCONNECTOR DATA REQUIREMENTSPCA-29
PC.A6 DEMAND SIDE UNIT OPERATORS.....PCA-32

CC CONNECTION CONDITIONS

CC.1 INTRODUCTION CC-2
CC.2 OBJECTIVE CC-2
CC.3 SCOPE CC-3
CC.4 TRANSMISSION STATION COMPOUND CC-3
CC.5 PLANT DESIGNATIONS..... CC-3

| | | |
|--------|---|-------|
| CC.6 | RELEVANT TECHNICAL STANDARDS APPLYING TO USER PLANT AND APPARATUS | CC-6 |
| CC.7 | SPECIFIC DESIGN AND PERFORMANCE STANDARDS | CC-7 |
| CC.7.3 | GENERATORS | CC-10 |
| CC7.5 | INTERCONNECTOR | CC-19 |
| CC.8 | TRANSMISSION SYSTEM PERFORMANCE..... | CC-29 |
| CC.9 | METERING..... | CC-30 |
| CC.10 | USER PROTECTION AND POWER QUALITY | CC-30 |
| CC.11 | COMMUNICATION FACILITIES | CC-37 |
| CC.12 | SIGNALS TO BE PROVIDED BY USERS | CC-37 |
| CC.13 | POWER SUPPLIES | CC-39 |
| CC.14 | RESPONSIBILITY FOR SAFETY | CC-40 |
| CC.15 | COMMISSIONING AND NOTIFICATION..... | CC-40 |

OC1 DEMAND FORECASTS

| | | |
|-------|--|-------|
| OC1.1 | INTRODUCTION..... | OC1-2 |
| OC1.2 | OBJECTIVES..... | OC1-3 |
| OC1.3 | SCOPE..... | OC1-3 |
| OC1.4 | DATA REQUIRED BY THE TSO IN THE OPERATIONAL PLANNING PHASE | OC1-3 |
| OC1.5 | POST CONTROL PHASE..... | OC1-5 |
| OC1.6 | THE TSO DEMAND FORECASTS | OC1-5 |

OC2 OPERATIONAL PLANNING

| | | |
|-------|--|-------|
| OC2.1 | INTRODUCTION..... | OC2-2 |
| OC2.2 | OBJECTIVE | OC2-2 |
| OC2.3 | SCOPE..... | OC2-3 |
| OC2.4 | OUTAGE SCHEDULING | OC2-3 |
| OC2.5 | NOT USED..... | OC2-7 |
| OC2.6 | CHANGES TO THE COMMITTED OUTAGE PROGRAMME WITHIN THE IMPLEMENTATION YEAR (YEAR 0) | OC2-7 |
| OC2.7 | OTHER INFORMATION TO BE NOTIFIED | OC2-9 |

OC3 NOT USED

OC4 SYSTEM SERVICES

| | | |
|-------|-------------------------|--------|
| OC4.1 | INTRODUCTION..... | OC4-1 |
| OC4.2 | SCOPE..... | OC4-1 |
| OC4.3 | FREQUENCY CONTROL | OC4-2 |
| OC4.4 | VOLTAGE CONTROL | OC4-8 |
| OC4.5 | NETWORK CONTROL | OC4-14 |
| OC4.6 | OPERATING MARGIN | OC4-18 |
| OC4.7 | BLACK START | OC4-22 |

OC5 DEMAND CONTROL

OC5.1 INTRODUCTION OC5-2
OC5.2 OBJECTIVE OC5-3
OC5.3 SCOPE OC5-3
OC5.4 PROCEDURE FOR THE IMPLEMENTATION OF DEMAND CONTROL ON THE INSTRUCTIONS
OF THE TSO OC5- 4
OC5.5 AUTOMATIC LOW FREQUENCY DEMAND DISCONNECTION OC5-5
OC5.6 AUTOMATIC FREQUENCY RESTORATION OC5-5
OC5.7 AUTOMATIC LOW VOLTAGE DEMAND DISCONNECTION..... OC5-6

OC6 SMALL SCALE GENERATOR CONDITIONS

OC6.1 INTRODUCTION OC6-2
OC6.2 OBJECTIVE OC6-3
OC6.3 SCOPE OC6-3
OC6.4 OUTAGE SCHEDULING OC6-4
OC6.5 CHANGES TO THE COMMITTED OUTAGE PROGRAMME WITHIN THE
IMPLEMENTATION YEAR OC6-4
OC6.6 OTHER INFORMATION TO BE NOTIFIED OC6-6
OC6.7 NETWORK CONTROL OC6-6

OC7 INFORMATION EXCHANGE

OC7.1 NOTIFICATION OF EVENTS AND OPERATIONS OC7-2
OC7.1.1 INTRODUCTION OC7-3
OC7.1.2 OBJECTIVE OC7-3
OC7.1.3 SCOPE OC7-3
OC7.1.4 REQUIREMENT TO NOTIFY OC7-3
OC7.1.5 NOTIFICATION OF AN OPERATION OC7-3
OC7.1.6 FORM OF NOTIFICATION OF AN OPERATION OC7-3
OC7.1.7 RECORDING OF AN OPERATION OC7-4
OC7.1.8 TIMING IN RESPECT OF AN OPERATION OC7-4
OC7.1.9 NOTIFICATION OF EVENTS OC7-5
OC7.1.10 FORM OF NOTIFICATION OF AN EVENT OC7-5
OC7.1.11 PROVISION OF FURTHER INFORMATION OC7-5
OC7.1.12 RECORDING OF AN EVENT OC7-6
OC7.1.13 TIMING IN RESPECT OF AN EVENT OC7-6
OC7.2 OPERATIONAL COMMUNICATION AND DATA RETENTION OC7-7
OC7.2.1 INTRODUCTION OC7-7
OC7.2.2 OBJECTIVE OC7-7
OC7.2.3 SCOPE OC7-8
OC7.2.4 CONTACT LOCATIONS OC7-8
OC7.2.5 COMMUNICATION FACILITIES OC7-14
OC7.2.6 COMMUNICATION BETWEEN THE TSO AND THE USER OC7-16
OC7.2.7 DATA AND NOTICES OC7-17
OC7.2.8 DATA RETENTION OC7-18

OC8 OPERATIONAL TESTING

OC8.1 INTRODUCTION OC8-2
OC8.2 OBJECTIVE OC8-2
OC8.3 SCOPE..... OC8-3
OC8.4 TESTS REQUIRED BY THE TSO OC8-3
OC8.5 TESTS REQUIRED BY THE USERS OC8-4
OC8.6 PROCEDURE FOR REQUESTING OPERATIONAL TESTS..... OC8-4
OC8.7 EVALUATION OF PROPOSED OPERATIONAL TESTS OC8-6
OC8.8 APPROVAL FOR OPERATIONAL TESTING OC8-6
OC8.9 SCHEDULING OF OPERATIONAL TESTS OC8-8
OC8.10 DISPATCHING OF OPERATIONAL TESTS OC8-8
OC8.11 TEST REPORTING..... OC8-9
OC8.12 DISPUTES OC8-10

OC9 EMERGENCY CONTROL AND POWER SYSTEM RESTORATION

OC9.1 INTRODUCTION OC9-2
OC9.2 OBJECTIVE OC9-2
OC9.3 SCOPE..... OC9-3
OC9.4 SYSTEM ALERTS OC9-3
OC9.5 POWER SYSTEM RESTORATION OC9-4
OC9.6 DE-ENERGISATION OF THE USER’S PLANT BY THE TSO OC9-5

OC10 MONITORING, TESTING AND INVESTIGATION

OC10.1 INTRODUCTION..... OC10-3
OC10.2 OBJECTIVE OC10-3
OC10.3 SCOPE..... OC10-4
OC10.4 MONITORING OC10-4
OC10.5 TESTING..... OC10-7
OC10.6 INVESTIGATION OC10-10
OC10.7 CONSEQUENCES OF MONITORING, TESTING AND INVESTIGATION..... OC10-11
OC10.8 DISPUTATION OF ASSESSMENT OF NON-COMPLIANCE BY THE A USER..... OC10-17

OC11 SAFETY CO-ORDINATION

OC11.1 INTRODUCTION..... OC11-2
OC11.2 OBJECTIVE OC11-2
OC11.3 SCOPE..... OC11-3
OC11.4 THE SAFETY RULES OC11-3
OC11.5 SAFETY AT THE INTERFACE BETWEEN THE TRANSMISSION SYSTEM AND THE USER
SYSTEM OC11-4

SDC1 SCHEDULING AND DISPATCH CODE NO.1

UNIT SCHEDULING

| | |
|----------------------|---|
| SDC1.1 | INTRODUCTION |
| SDC1.2 | OBJECTIVE |
| SDC1.3 | SCOPE |
| SDC1.4 | PROCEDURE |
| SDC1.4.1 | Availability Notice |
| SDC1.4.2 | Additional Grid Code Availability Notice |
| SDC1.4.3 | General Availability Requirements |
| SDC1.4.4 | Technical and Commercial Data Requirements |
| SDC1.4.5 | Revisions/Re-declarations to data |
| SDC1.4.6 | Defaults |
| SDC1.4.7 | Form of Submission |
| SDC1.4.8 | Compilation of the Indicative Operations Schedule |
| SDC1.4.8.10 | Regulation |
| SDC1.4.8.11 | Data Requirements |
| SDC1 Appendix | Part 1 Technical Parameters Part 2 Additional Grid Code Characteristics Notice |
| SDC1 Annex 1 | Description of differences between the EirGrid SDC1 and the SONI SDC1. |

SDC2 SCHEDULING AND DISPATCH CODE NO.2 **CONTROL SCHEDULING AND DISPATCH**

| | |
|------------------------|--|
| SDC2.1 | INTRODUCTION |
| SDC2.2 | OBJECTIVE |
| SDC2.3 | SCOPE |
| SDC2.4 | PROCEDURE |
| SDC2.4.1 | Information Used |
| SDC2.4.2 | Dispatch Instructions |
| SDC2.4.2.1 | Introduction |
| SDC2.4.2.2 | Issue of Dispatch Instructions |
| SDC2.4.2.3 | Scope of Dispatch Instructions |
| SDC2.4.2.4 | Types of Dispatch Instruction |
| SDC2.4.2.5 | Form of Instruction |
| SDC2.4.2.6 | Target Frequency |
| SDC2.4.2.7 | SDC2 Appendix Reference |
| SDC2.4.2.8 | Consistency with Declarations |
| SDC2.4.2.9 | Emergency Circumstances |
| SDC2.4.2.10 | Communication with Users |
| SDC2.4.2.11 | Action Required from Users |
| SDC2.4.2.12 | Implementation of Instructions by Users |
| SDC2.4.2.13 | Non- dispatched De-Synchronisation |
| SDC2.4.2.14 | Exceptions to the use of the Merit Order |
| SDC2.4.2.15 | User Plant Changes |
| SDC2.4.2.16 | AVRs and var limiters |
| SDC2.4.2.17 | AVRs and var limiters |
| SDC2.4.2.18 | Minimum Demand Regulation ("MDR") |
| SDC2.4.3 | Special Actions |
| SDC2 Appendix A | Dispatch Instructions for CDGUs and Demand Side Units |
| SDC2 Appendix B | Dispatch Instructions for Generator Reactive Power |
| SDC2 Annex 1 | Description of differences between the EirGrid SDC2 and the SONI SDC2 |

WFPS1 CONTROLLABLE WIND FARM POWER STATION GRID CODE PROVISIONS

| | |
|---|----------|
| WFPS1.1 INTRODUCTION..... | WFPS1-2 |
| WFPS1.2 OBJECTIVE..... | WFPS1-2 |
| WFPS1.3 SCOPE..... | WFPS1-2 |
| WFPS1.4 FAULT RIDE THROUGH REQUIREMENTS..... | WFPS1-5 |
| WFPS1.5 TRANSMISSION SYSTEM FREQUENCY REQUIREMENTS..... | WFPS1-7 |
| WFPS1.6 TRANSMISSION SYSTEM VOLTAGE REQUIREMENTS..... | WFPS1-14 |
| WFPS1.7 SIGNALS, COMMUNICATIONS & CONTROL..... | WFPS1-19 |

Glossary

| | | |
|----|-------------|---|
| 1. | Acronyms | 2 |
| 2. | Units | 3 |
| 3. | Definitions | 5 |

GC GENERAL CONDITIONS

| | |
|--|--------------|
| GC.1 INTRODUCTION | GC-2 |
| GC.2 OBJECTIVE | GC-2 |
| GC.3 SCOPE | GC-2 |
| GC.4 PURPOSE | GC-2 |
| GC.5 GRID CODE REVIEW PANEL | GC-3 |
| GC.6 JOINT GRID CODE REVIEW PANEL..... | GC-3 |
| GC.7 GRID CODE REVISIONS..... | GC-4 |
| GC.8 GRID CODE INTERPRETATION | GC-5 |
| GC.9 DEROGATIONS | GC-6 |
| GC.10 PLANT FAILURES..... | GC-8 |
| GC.11 ASSISTANCE IN IMPLEMENTATION..... | GC-10 |
| GC.12 UNFORESEEN CIRCUMSTANCES | GC-11 |
| GC.13 HIERARCHY | GC-11 |
| GC.14 OWNERSHIP OF PLANT AND/OR APPARATUS | GC-11 |
| GC.15 SYSTEM CONTROL | GC-12 |
| GC.16 ILLEGALITY AND PARTIAL INVALIDITY | GC-12 |

GC GENERAL CONDITIONS

GC.1 INTRODUCTION

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

GC1.2 Terms which are capitalised and in bold type shall be interpreted according to the definition in the **Glossary** of the **Grid Code**. Where the **Glossary** refers to any word or term which is more particularly defined in a part of the **Grid Code**, the definition in that part of the **Grid Code** will prevail over the definition in the **Glossary** in the event of any inconsistency

GC.2 OBJECTIVE

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

- (a) to ensure, insofar as it is possible, that the various sections of the **Grid Code** work together, and work in practice, for the benefit of the operation of the **Power System** and for the benefit of the **TSO** and **Users**;
- (b) to provide a set of principles governing the status and development of the **Grid Code** and related issues, as approved by the **CER**;
- (c) to provide an outline of how the **TSO**, the **Other TSO** and the **Regulatory Authorities** will cooperate with regard to **Grid Code** revisions and derogations to both **Sections Under Common Governance** and other **Grid Code** sections which may be considered to be relevant to the operation of the **SEM**.

GC.3 SCOPE

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

GC.4 PURPOSE

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

GC.5 GRID CODE REVIEW PANEL

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

- (a) generally review and discuss the **Grid Code** and its workings;
- (b) review and discuss suggestions for amendments to the **Grid Code** which the **TSO**, the **CER**, 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 **CER**.

GC.6 JOINT GRID CODE REVIEW PANEL

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

- a) generally review and discuss the **Sections Under Common Governance** and their workings;
- b) review and discuss suggestions for amendments to the **Sections Under Common Governance** of the **Grid Code**, which the **TSO**, either **Regulatory Authority**, or any **User** may wish to submit to the **TSO** for consideration by the **Joint Grid Code Review Panel** from time to time;
- c) discuss what changes are necessary to the **Sections Under Common Governance** of the **Grid Code** arising out of any unforeseen circumstances referred to it by the **TSO** under GC.12; and

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

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

GC.7 GRID CODE REVISIONS

GC.7.1 All revisions to the **Grid Code** must be reviewed by the **Grid Code Review Panel** or the **Joint Grid Code Review Panel** (where relevant) prior to application to the **CER** 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 **CER**, 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 **CER**.

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

GC.7.2 Following review of a proposed revision by the **Grid Code Review Panel** or the **Joint Grid Code Review Panel** (where relevant), the **TSO** will apply to the **CER** 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 **CER**, 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 **CER** regarding the proposed revision.

GC.7.3 The **CER** 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 **CER**, the **CER** 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 **CER** 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 **CER** 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 **CER**. 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 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 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 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.9.3 and shall provide the **CER** 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 **CER**.

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

On receipt of a derogation assessment from the **TSO**, the **CER** 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 **CER** 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 **CER** identifies that a derogation request may impact on the **Other Transmission System** or the operation of the **SEM**, the **CER** shall keep the **Regulatory Authority** in Northern Ireland informed in its consideration of the request.

Provided that the **CER** considers that the grounds for the derogation are reasonable, then the **CER** 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.9.3 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.

GC.9.4 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 make such reasonable efforts as are required to remedy such non-compliance as soon as reasonably practicable.

GC.9.5 In the case where the **TSO** requests a derogation, the **TSO** shall submit the information set out in GC.9.3 to the **CER**.

GC.9.6 To the extent of any derogation granted in accordance with this GC.9, 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.9.7 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.9.8 Where a material change in circumstance has occurred a review of any existing derogations, and any derogations under consideration, may be initiated by the **CER** at the request of the **CER**, the **TSO**, or **Users**.

GC.10 PLANT FAILURES

GC.10.1.1 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.10.1.2 Where time permits and if the **TSO** reasonably considers that a non-compliance of a **User** as described in GC.10.1.1 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.10.1.3 If the **TSO**, acting reasonably, and taking into account the operation of the **Transmission System** and the consultation with any affected **Users** in GC.10.1.2, 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.10.1.4 If the **TSO**, at its discretion, taking into account the operation of the **Transmission System** and the consultation with any affected **Users** in GC.10.1.2, 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.10.2 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.10.3 Failing agreement between the **User** and the **TSO**, the **User** shall immediately apply for derogation in accordance with GC 9.2.

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 **CER**.

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..... | PC-2 |
| PC.2 OBJECTIVES | PC-2 |
| PC.3 SCOPE..... | PC-3 |
| PC.4 PLANNING PROCEDURES FOR CONNECTION..... | PC-3 |
| PC.5 SYSTEM PLANNING..... | PC-7 |
| PC.6 DATA | PC-7 |
| PC.7 PLANNING STANDARDS | PC-11 |
| PC.8 VALIDATION AND VERIFICATION OF DATA | PC-12 |

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 Planning Criteria** 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**, after which the **Connection Offer** will automatically lapse. 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. Within 60 **Business Days** (or such longer period as the **TSO** may agree in any particular case) of acceptance of the **Connection Offer** the **User** shall supply the data pertaining to the **User Development** as listed in the Appendix to this **Planning Code**.

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

PC.4.4 Complex Connections

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

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

PC.4.5 Notice Required

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

PC.5 SYSTEM PLANNING

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

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

- (a) plan and develop the **Transmission System** in accordance with the relevant standards;
- (b) undertake co-ordinated planning and development of both the **Transmission System** and the **Other Transmission System**;
- (c) monitor **Power System** adequacy and **Power System** performance and project future **Power System** adequacy and **Power System** performance; and
- (d) fulfil its statutory and regulatory obligations.

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

PC.6 DATA

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

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

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

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

PC.6.3 **Preliminary Project Planning Data**

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

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

- (i) **User's** name (legal and project name);
- (ii) **User's** contact details;
- (iii) **User's** date of completed application;
- (iv) Status of application, for example in progress or issued;
- (v) Specific location, including grid co-ordinates;
- (vi) The **Registered Capacity** applied for; and
- (vii) Interacting group where applicable.

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

PC.6.4 **Committed Project Planning Data**

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

- (a) to use it in the preparation of the **Forecast Statement** and in any further information given pursuant to the **Forecast Statement**;
- (b) to use it when considering and/or advising on applications (or possible applications) of other **Users** (including making use of it by giving data from it, both orally and in writing, to other **Users** making an application (or considering or discussing a possible application) which is, in the **TSO's** view, relevant to that other application or possible application);
- (c) to use it for the **TSO** planning purposes and to use it when participating in co-ordinated planning and development of both the **Transmission System** and the **NI System**;
- (d) the **TSO** may disclose it to the **Other TSO** for the purposes of consideration of developments on the **Other Transmission System**; and
- (e) the **TSO** may disclose it to the **External TSO** for the purposes of consideration of **Interconnector** developments with the **External System**.

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

- (a) will always be forecast, known as **Forecast Data**;
- (b) upon connection become fixed (subject to any subsequent changes), known as **Registered Data**; and
- (c) relate to **Plant** and/or **Apparatus** which upon connection will become **Registered Data**, but which prior to connection will be an estimate of what is expected, known as **Estimated Registered Data**.

PC.6.6 **System Planning Data**

PC.6.6.1 The **Planning Code** requires that, as soon as is practical, and not later than a date which is the earlier of 18 months prior to the scheduled **Operational Date** or six months after the signing of the **Connection Agreement**, unless otherwise directed by the **CER**, 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 Planning Criteria** and relevant standards in the planning and development of the **Transmission System** and where appropriate when participating in the co-ordinated planning and development of both the **Transmission System** and the **Other Transmission System**.

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

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

- (a) the size of the **Generation Units** and the number of **Generation Units** comprising the **User's System**;
- (b) the size and rating of the **Interconnector**;
- (c) proximity to the existing **Transmission System**; and
- (d) the cost of the proposed connection.

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

- a) the size of the **MW Demand** at the **Connection Point**;
- b) consistency with future development of the **Transmission System** or the **Other Transmission System**;
- c) proximity to the existing **Transmission System**.; and
- d) the cost of the proposed connection.

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

- (a) the size of the **MW Demand** at the **Connection Point**;
- (b) consistency with future development of the **Transmission System** or the **Other Transmission System**;
- (c) consistency with co-ordinated planning of the **Transmission System** and of the **Distribution System**;
- (d) proximity to the existing **Transmission System**; and
- (e) the cost of the proposed connection.

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

PC.8 VALIDATION AND VERIFICATION OF DATA

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

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

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

P.C.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.

GRID CODE - PLANNING CODE APPENDIX
Statistical and Forecast Information Requirements

PCA PLANNING CODE APPENDIX

| | |
|---|--------|
| INTRODUCTION..... | PCA-2 |
| PC.A1 GENERAL INFORMATION | PCA-2 |
| PC.A2 NEW CONNECTIONS | PCA-3 |
| PC.A3 DEMAND DATA REQUIREMENTS..... | PCA-5 |
| PC.A4 GENERATOR DATA REQUIREMENTS..... | PCA-14 |
| PC.A5 INTERCONNECTOR DATA REQUIREMENTS..... | PCA-29 |
| PC.A6 DEMAND SIDE UNIT OPERATORS..... | PCA-32 |

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 (PC4.2, PC4.3, PC4.4, PC5 and PC6).

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 **Interconnectors** and PC.A6 applies to **Demand Side Unit Operators**.

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

PC.A1: General Information

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

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

PC.A1.3. Contact Person _____

PC.A1.4. Telephone Number _____

PC.A1.5. Telefax Number _____

PC.A1.6. Email Address _____

PC.A2: New Connections

PC.A2.1 General Details

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

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

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

PC.A2.2 Map and Diagrams:

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

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

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

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

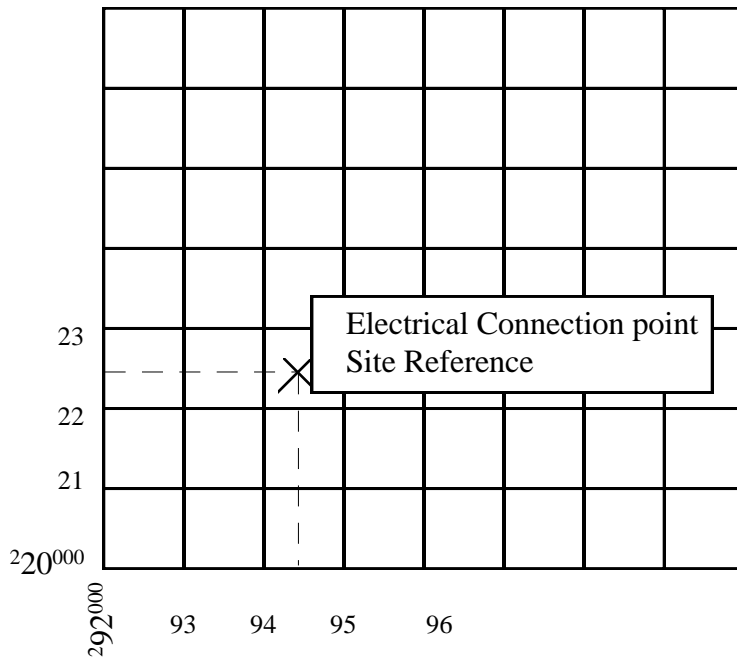
PC.A2.3.1 Licence:

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

PC.A2.3.2 Authorisation:

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

Figure 1: Example of a Discovery Series Map grid



Site co-ordinates: Easting 294500, Northing 222500

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. 292^{000} Q=2),

YY are the numbers on the horizontal axis directly below the site to the left (i.e. 94)

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

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

PC.A2.3.3 Exemptions and Policy Documents:

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

PC.A3: Demand Data Requirements

PC.A3.1 Treatment of Demand Data

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

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

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

PC.A3.2 Registered Connection Capacity

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

PC.A3.3 Measured and Forecast Data

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

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

The measurements of demand and 10-year demand forecasts should be submitted 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)

PC.A3.6 Fluctuating Loads

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

PCA3.6.1. Rate of change of **Active Power** and **Reactive Power**, both increasing and decreasing (kW/s. kvar/s)

PCA3.6.2. The shortest repetitive time interval between fluctuations in Active Power and **Reactive Power Demand** (Seconds)

PCA3.6.3. The magnitude of the largest step changes in **Active Power** and **Reactive Power Demand** (kW, Kvar)

PC.A3.7 Disturbing Loads

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

PC.A3.8 Grid Connected Transformer

| | Symbol | Units |
|--|----------------------|----------------------------------|
| Number of windings | | |
| Vector Group | | |
| Rated current of each winding | | A |
| Transformer Rating | | MVA _{Trans} |
| Transformer nominal LV voltage | | kV |
| Transformer nominal HV voltage | | kV |
| Tapped winding | | |
| Transformer Ratio at all transformer taps | | |
| Transformer Impedance (resistance R and reactance X) at all taps | R+jX | % on rating MVA _{Trans} |
| For 3 winding transformers, where there are external connections to all 3 windings, the impedance (resistance R and reactance X) between each pair of windings is required, measured with the third set of terminals open-circuit. | Z _{HV:LV1} | % on rating MVA _{Trans} |
| | Z _{HV:LV2} | % on rating MVA _{Trans} |
| | Z _{LV1:LV2} | % on rating MVA _{Trans} |
| Transformer zero sequence impedances at nominal tap | | |
| Zero Phase Sequence impedance measured between the HV terminals (shorted) and the neutral terminal, with the LV terminals open-circuit. | Z _{HT 0} | Ohm |
| Zero Phase Sequence impedance measured between the HV terminals (shorted) and the neutral terminal, with the LV terminals short-circuited to the neutral. | Z _{HL 0} | Ohm |
| Zero Phase Sequence impedance measured between the LV terminals (shorted) and the neutral terminal, with the HV terminals open-circuit. | Z _{LT 0} | Ohm |
| Zero Phase Sequence impedance measured between the LV terminals (shorted) and the neutral terminal, with the HV terminals short-circuited to the neutral. | Z _{LH 0} | Ohm |
| Zero Phase Sequence leakage impedance measured between the HV terminals (shorted) and the LV terminals (shorted), with the Delta winding closed. | Z _{L 0} | Ohm |
| Earthing Arrangement including LV neutral earthing resistance & reactance | | |
| Core construction (number of limbs, shell or core type) | | |
| Open circuit characteristic | | Graph |

PC.A3.9 Shunt Capacitor / Reactor Data

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

- PC.A3.9.1 Rating (Mvar)
- PC.A3.9.2 Resistance / Reactance / Susceptance of all components of the capacitor or reactor bank
- PC.A3.9.3 Fixed or switched.
- PC.A3.9.4 If switched, control details (manual, time, load, voltage, etc.)
- PC.A3.9.5 If automatic control, details of settings.

PC.A4: Generator Data Requirements

PC.A4.1 General Details

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

| | |
|--|-------|
| Station Name | _____ |
| Number of Generating units | _____ |
| Primary Fuel Type / Prime Mover (e.g. gas, hydro etc.) | _____ |
| Secondary Fuel Type (e.g. oil) | _____ |
| Generation Export Connection Capacity Required (MW) | _____ |

PC.A4.2 Treatment of Generator Data

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

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

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

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

PC.A4.3 Generator Operating Characteristics and Registered Data

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

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

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

Unit Number _____
 Registered Capacity (MW) _____
 Fuel _____

| | Symbol | Units |
|--|--------|-------|
| * Normal Maximum Continuous Generation Capacity: | | MW |
| * Normal Maximum Continuous Export Capacity | | MW |
| Primary Fuel Switchover Output | | MW |
| Secondary Fuel Switchover Output | | MW |
| * Power Station auxiliary load | | MW |
| § Power Station auxiliary load | | Mvar |
| * Maximum (Peaking) Generating Capacity | | MW |
| * Maximum (Peaking) Export Capacity | | MW |
| * Normal Minimum Continuous Generating Capacity | | MW |
| * Normal Minimum Continuous Export Capacity | | MW |
| * Generator Rating: | Mbase | MVA |
| * Normal Maximum Lagging Power Factor | | Mvar |
| * Normal Maximum Leading Power Factor | | Mvar |
| § Governor Droop | R | |
| § Forbidden zones | | MW |
| § Terminal Voltage adjustment range | | kV |
| § Short Circuit Ratio | | |
| § Rated Stator Current | | Amps |
| * Number of available hours of running at Registered Capacity from on-site fuel storage stocked to its full capacity | | |

| Description | | |
|---|--|----------|
| § Capability Chart showing full range of operating capability of the generator including thermal and excitation limits. | | Diagram |
| § Open Circuit Magnetisation Curves | | Graph |
| § Short Circuit characteristic | | Graph |
| § Zero power factor curve | | Graph |
| § V curves | | Diagram |
| Symbol | | |
| Units | | |
| § Time to synchronise from warm | | Hour |
| § Time to synchronise from cold | | Hour |
| § Minimum up-time | | Hour |
| § Minimum down-time | | Hour |
| § Normal loading rate | | MW / min |
| § Normal deloading rate | | MW / min |
| § Can the 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 | | MW |
| Other relevant operating characteristics not otherwise provided.... | | |

§ Reserve Capability

Primary Spinning Reserve

Secondary Spinning Reserve

Tertiary Reserve

Give details of reserve capability of the generator in different operating modes:

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

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

CCGT Installation Matrix

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

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

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

| CCGT INSTALLATION | CCGT UNIT AVAILABLE | | | | | |
|--------------------------------|----------------------|------------|-----------|------------|-----------|-----------|
| | 1st GT | 2nd GT | 3rd GT | 1st ST | 2nd ST | 3rd ST |
| | OUTPUT USABLE | | | | | |
| Unit MW Capacity → | <i>e.g. 150</i> | <i>150</i> | <i>-</i> | <i>100</i> | <i>-</i> | <i>-</i> |
| Total MW Output Range ↓ | | | | | | |
| [] MW to [] MW | | | | | | |
| [] MW to [] MW | | | | | | |
| [] MW to [] MW | | | | | | |
| [] MW to [] MW | | | | | | |
| [] MW to [] MW | | | | | | |
| [] MW to [] MW | | | | | | |

PC.A4.4 Generator Parameters

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

Generator Time Constants

| | Symbol | Units |
|---|------------|-------|
| § Direct axis open Circuit Transient | T_{do}' | sec |
| § Direct axis open Circuit sub-Transient | T_{do}'' | sec |
| § Quad axis open Circuit Transient | T_{qo}' | sec |
| § Quad axis open Circuit sub-Transient | T_{qo}'' | sec |
| § Direct axis short Circuit Transient | T_d' | sec |
| § Direct axis short Circuit sub-Transient | T_d'' | sec |
| § Quad axis short Circuit Transient | T_q' | sec |
| § Quad axis short Circuit sub-Transient | T_q'' | sec |

PC.A4.5 Excitation System:

Fill in the following parameters or supply a Laplace-domain control block diagram in accordance with IEEE standard excitation models (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.

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

PC.A4.6 Speed Governor System:

Supply a Laplace-domain control block diagram in accordance with IEEE standard 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 in relation to frequency deviations and setpoint operation.

PC.A4.7 Control Devices (including Power System Stabilisers) and Protection Relays

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

PC.A4.8 Environmental Impact

| | |
|-----------------|---|
| CO ₂ | tonne CO ₂ / tonne fuel Unit CO ₂ removal efficiency |
| SO ₂ | tonne SO ₂ / tonne fuel Unit SO ₂ removal efficiency |
| NO _x | tonne NO _x / exported MWh curve |

PC.A4.9 Pumped Storage

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

PC.A4.10 Wind Turbine Generators and Mains Excited Asynchronous Generators

State whether turbines are Fixed Speed or Variable Speed:

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

Please provide details of the anticipated operating regime of generation, i.e. continuous, seasonal etc. List the anticipated maximum export level in MW for each calendar month, and indicate how generation would vary over a typical 24 hour period during the month of maximum export.

Give details of expected rapid or frequent variations in output, including magnitude, max rate of change expected, frequency and duration.

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

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

Give details of reactive power compensation to be installed

PC.A4.10.1 MODELLING REQUIREMENTS FOR WIND TURBINE GENERATORS

PC.A4.10.1.1 INTRODUCTION

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

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

Currently (September 2004) there are no suitable PSS/E library models for **Wind Turbine Generators**. As a result, the **TSO** requires **Controllable WFPSs** greater than 5MW to provide specially written models and associated data parameters specific to the **Wind Turbine Generators** and any associated controls and reactive compensation equipment to be used in the applicant's **Controllable WFPS** scheme. The requirements of these models are as outlined in this section of the **Planning Code Appendix**.

PC.A4.10.1.2 WIND TURBINE GENERATOR DYNAMIC MODELS

PC.A4.10.1.2.1 Requirement to provide a dynamic model

Each **Controllable WFPS** shall provide a dynamic model, or shall provide an unambiguous reference to a dynamic model previously provided to the **TSO**, appropriate for the **Controllable WFPS**. If all the **Wind Turbine Generators** in the **Controllable WFPS** are not identical, the model shall incorporate separate modules to represent each type of **Wind Turbine Generator**. Appropriate data and parameter values must be provided for each model. The model shall be provided in PSS/E format, or in such other format as may be agreed between the **Controllable WFPS** and the **TSO**.

The models for **Wind Turbine Generators** and the **Controllable WFPS** (computer software based on a mathematical representation of the behaviour of the machine) must be able to calculate how quantities such as **Active Power** output, **Reactive Power** output, turbine speed etc. vary as factors such as the **Voltage** at the **Connection Point** change. They must take account of the inherent characteristics of

the machines and the actions of the **WTG** control systems and any relevant **Controllable WFPS** control systems.

The models provided shall be treated as **Preliminary Project Planning Data**, **Committed Project Planning Data** or **System Planning Data** as appropriate, as set out in **PC.6** of the **Planning Code**.

PC.A4.10.1.2.2 Computer environment

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

PC.A4.10.1.2.3 Features to be represented in the dynamic model

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

- a) the electrical characteristics of the **Generator**;
- b) the separate mechanical characteristics of the turbine and the **Generator** and the drive train between them;
- c) variation of power co-efficient with pitch angle and tip speed ratio;
- d) blade pitch control;
- e) converter controls;
- f) reactive compensation;
- g) protection relays.

PC.A4.10.1.2.4 Model aggregation

For computational reasons, it is essential that the models of individual **WTGs** can be aggregated into a smaller number of models, each representing a number of **WTGs** at the same site. A representation of the collector network may be included in the aggregate model of the **Controllable WFPS**.

PC.A4.10.1.2.5 Model documentation

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

The **TSO** may, when necessary to ensure the proper running of its complete system representation or to facilitate its understanding of the results of a dynamic simulation, request additional information concerning the model, including the source code of one or more routines in the model. The **Controllable WFPS** shall comply with any such request without delay. Where the **Controllable WFPS** or any other party (acting reasonably) designates such information as confidential on the basis that it

incorporates trade secrets, the **TSO** shall not disclose the information so designated to any third party.

PC.A4.10.1.2.6 Time to Comply

Where a **User** requires reasonable time to develop the necessary model or models so as to comply fully with all the provisions in this section **PCA 4.10.1.2**, the **User** may apply to the **TSO** to be deemed compliant with the provisions of **PCA 4.10.1.2** on the basis of **GC.10.1.3** of the **General Conditions** of the **Grid Code**. The **TSO** shall consider any such application in accordance with **GC.10.1.3**, 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 **PCA 4.10.1.2**, the provisions of **GC.10.1.4** shall apply and the **User** shall apply for a derogation under the terms of GC.9.

PC.A4.10.1.3 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 **Controllable WFPS** 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 **Controllable WFPS**, appropriate tests shall be carried out and measurements taken at the **Controllable WFPS** to assess the validity of the dynamic model. The tests and measurements required shall be agreed with the **TSO**.

The **Controllable WFPS** 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 **WTG** under laboratory conditions and/or actual observed behaviour of the real **WTG** as installed and connected to a transmission or distribution network.

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

The conditions validated should as far as possible be similar to those of interest, e.g. low short circuit level at **Connection Point**, close up, severe faults, nearby moderate

faults, remote faults, **Voltage** excursions, **Frequency** excursions, large wind speed variations.

PC.A4.10.1.4 WIND FARM DATA

In order to construct a valid dynamic model of each **Controllable WFPS**, the following **Controllable WFPS** data is required:

Wind Turbine Generator (WTG) transformer

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

Rating of **WTG** transformer (MVA or kVA)

WTG transformer voltage ratio (kV)

WTG transformer impedance (%)

Internal Controllable WFPS network and corresponding data

Please describe how the **Controllable WFPS's** internal network structure (collector network) will be laid out (by means of a single-line diagram or other description of connections). The description should include a breakdown of how the individual **WTGs** are connected together aswell as how they are connected back to the **Controllable WFPS** substation. Please specify different cable or overhead line types and the individual length of each section of circuit.

| | Type1 | Type2 | Type3 | Extend |
|--|-------|-------|-------|------------------|
| Total length (m) | | | | Table |
| Conductor cross section area per core (mm) | | | | as |
| Conductor type (Al, Cu, etc) | | | | approp- riate |
| Type of insulation | | | | |
| Charging capacitance (µF/km) | | | | |
| Charging current (Ampere/km) | | | | |
| Positive sequence resistance (R1 Ohm/km) | | | | |
| Positive sequence reactance (X1 Ohm/km) | | | | |

Grid connected transformer

This is the transformer that is connecting the **Controllable WFPS** site with the **Distribution/Transmission System (equivalent to the Generator Transformer of a conventional power station)**. Data is required for this transformer as follows:

Rating of grid transformer (MVA or kVA)

Transformer **Voltage** ratio (kV)

Transformer impedance (%)

Reactive compensation installed at site

Number of inductive devices

Indicate for each device the inductive **Mvar** capability. If the device has more than one stage please indicate the number of stages and the **Mvar** capability switched in each stage i.e. 0.5 **Mvar** in 5 steps etc.

Number of capacitive devices

Indicate for each device the Capacitive **Mvar** capability. If the device has more than one stage please indicate the number of stages and the **Mvar** capability switched in each stage i.e. 0.5 **Mvar** in 5 steps etc.

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

PC.A4.11 Generator Transformer

| | Symbol | Units |
|--|----------------|----------------------------------|
| Number of windings | | |
| Vector Group | | |
| Rated current of each winding | | Amps |
| Transformer Rating | | MVA _{Trans} |
| Transformer nominal LV voltage | | kV |
| Transformer nominal HV voltage | | kV |
| Tapped winding | | |
| Transformer Ratio at all transformer taps | | |
| Transformer Impedance at all taps ¹ | | % on rating MVA _{Trans} |
| Transformer zero sequence impedance at nominal tap | Z ₀ | Ohm |
| Earthing Arrangement including neutral earthing resistance & reactance | | |
| Core construction (number of limbs, shell or core type) | | |
| Open circuit characteristic | | Graph |

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

PC.A4.12 Generator Forecast Data

PC.A4.12.1 Expected Maintenance Requirements

Expected Maintenance Requirements weeks / year

PC.A4.12.2 Forecast Availability of Registered Capacity

Apart from the expected scheduled maintenance requirements,

| Availability of Registered Capacity | Reason | Available Exported MW | Time % |
|-------------------------------------|--------|-----------------------|--------|
| Registered Capacity | | | |
| Restricted Rating | | | |
| Forced outage probability | | | |
| | Total | | 100% |

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

PC.A4.12.3 Energy Limitations

| | |
|---------|-----|
| Daily | GWh |
| Weekly | GWh |
| Monthly | GWh |
| Annual | GWh |

PC.A4.12.4 Hydro Expected Monthly GWh

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

PC.A4.13 Generator Aggregators

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

- (i) Name of **Generator Aggregator** group;
- (ii) Total **Generation Capacity** at their **Connection Points** of all **Generation Units** being aggregated (MW) (**Aggregated Maximum Export Capacity**);

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

- (iii) Location;
- (iv) **Registered Capacity**; and
- (v) Name of the **Transmission Station** to which the **Generation Site** is normally connected.

PC.A5: Interconnector Data Requirements

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

PC.A5.1 Interconnector Operating Characteristics and Registered Data

The Minimum technical, design and operational criteria to be met by **Interconnectors** are specified in the **Connection Conditions**.

For an **Interconnector** the following shall be provided for specified temperature conditions:

- (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.
- (v) **Interconnector** control model
- (a) the **TSO** requires suitable and accurate dynamic models for **Interconnectors** connected to, or applying for a connection to, the **Transmission System** in order to assess reliably the impact of the installation on the dynamic performance and security and stability of the **Power System**. Modelling requirements are processed on the identification by the applicant of the relevant PSS/E library model and the provision of the applicable data parameters in the appropriate application form;
 - (b) transfer function block diagram including parameters representation of the control systems of each **Interconnector** converter and **Interconnector** converter station, for both the rectifier and inverter

modes. A suitable model would feature the electrical characteristics of the **Interconnector**, the output of these would include but is not limited by the following; converter firing angle, Valve winding voltage, DC Voltage, DC Current as the output variables;

- (c) transfer function block diagram representation including parameters of the **Interconnector** transformer tap changer control systems, including time delays;
- (d) transfer function block diagram representation including parameters of AC filter and reactive compensation equipment control systems, including any time delays;
- (e) transfer function block diagram representation including parameters of any **Frequency** and/or load control systems;
- (f) 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;
- (g) transfer block diagram representation of the **AC Voltage** control, **Reactive Power** control at converter ends for a voltage source converter.

(vi) **Interconnector** Transformer;

| | Symbol | Units |
|--|----------------|----------------------------------|
| number of windings | | |
| vector Group | | |
| rated current of each winding | | A |
| transformer rating | | MVA _{Trans} |
| transformer nominal LV voltage | | kV |
| transformer nominal HV voltage | | kV |
| tapped winding | | |
| transformer ratio at all transformer taps | | |
| transformer impedance at all taps ¹ | | % on rating MVA _{Trans} |
| transformer zero sequence impedance at nominal tap | Z ₀ | Ohm |
| earthing arrangement including neutral earthing resistance & reactance | | |
| core construction (number of limbs, shell or core type) | | |
| open circuit characteristic | | graph |

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

PC.A6: 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) the name of the **Transmission Station(s)** to which each **Individual Demand Site** comprising the **Demand Side Unit** is/are normally connected;
 - (vii) single line diagram for each **Individual Demand Site**;
 - (viii) details of all **Generation Units** used as part of the **Demand Side Unit**, including the **Capacity**, the MVA rating, fuel type, and whether it will be used as a standby plant;
 - (ix) details of all **Demand** loads with **Demand** reduction capability of 5 MW or greater, including size in MW and demand reduction capability from load;
 - (x) **Maximum Import Capacity** of each **Individual Demand Site** comprising the **Demand Side Unit** (MW);
 - (xi) **Maximum Export Capacity** of each **Individual Demand Site** comprising the **Demand Side Unit** (MW);
 - (xii) proof of a valid **Connection Agreement** for each **Demand Customer** and proof of a valid **DSO Connection Agreement** for each **DSO Demand Customer** that comprises the **Demand Side Unit** clearly showing **Maximum Import Capacity** and **Maximum Export Capacity** (if applicable);
 - (xiii) whether the **Distribution System Operator** has been informed about the intention of the **Demand Side Unit Operator** to operate a **Demand Side Unit** (the **Demand Side Unit Operator** is obliged to inform the **Distribution System Operator**);
 - (xiv) details of any special operating or network limitations placed by the **Distribution System Operator** on the **Demand Side Unit**;
 - (xv) details of restrictions to the **Operation** of **Individual Demand Sites** comprising the **Demand Side Unit** (e.g. EPA Licence or planning conditions);
 - (xvi) confirmation that all **Individual Demand Sites** comprising the **Demand Side Unit** are not currently registered or shall not be

- registered as or part of any **Aggregated Generator Unit** or other **Demand Side Unit**;
- (xvii) whether any **Individual Demand Site** comprising the **Demand Side Unit** participates in any demand side management schemes;
 - (xviii) annual **Demand Side Unit MW Capacity** profile of the **Demand Side Unit** for each **Trading Period** of the year;
 - (xix) annual **Demand Side Unit Energy Profile** of the **Demand Side Unit** for each **Trading Period** of the year;
 - (xx) annual **Demand Side Unit Energy Profile** of each **Individual Demand Site** comprising the **Demand Side Unit** for each **Trading Period** of the year;
 - (xxi) detailed specification of the **Demand Side Unit** control system and method of aggregation, and the communications systems that will be in place between the **Demand Side Unit Control Facility** and the **Individual Demand Sites**;
 - (xxii) project milestones;
 - (xxiii) proposed effective date in **Single Electricity Market**; and
 - (xxiv) 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)**;
 - (iv) **Demand Side Unit MW Capacity** of each **Individual Demand Site** comprising the **Demand Side Unit** available from on-site **Generation (MW)**;
 - (v) total **Demand Side Unit MW Capacity** of the **Demand Side Unit** available from avoided **Demand** consumption (**MW**);
 - (vi) **Demand Side Unit MW Capacity** of each **Individual Demand Site** comprising the **Demand Side Unit** available from avoided **Demand** consumption (**MW**);
 - (vii) **Demand Side Unit MW Response Time** of the **Demand Side Unit**;
 - (viii) **Demand Side Unit MW Response Time** of each **Individual Demand Site** comprising the **Demand Side Unit**;
 - (ix) **Minimum Down Time** of the **Demand Side Unit**;
 - (x) **Minimum Down Time** of each **Individual Demand Site** comprising the **Demand Side Unit**;
 - (xi) **Maximum Down Time** of the **Demand Side Unit**;

- (xii) **Maximum Down Time** of each **Individual Demand Site** comprising the **Demand Side Unit**;
- (xiii) **Minimum off time** of the **Demand Side Unit**;
- (xiv) **Minimum off time** of each **Individual Demand Site** comprising the **Demand Side Unit**;
- (xv) **Maximum Ramp Up Rate** of the **Demand Side Unit**;
- (xvi) **Maximum Ramp Up Rate** of each **Individual Demand Site** comprising the **Demand Side Unit**;
- (xvii) **Maximum Ramp Down Rate** of the **Demand Side Unit**;
- (xviii) **Maximum Ramp Down Rate** of each **Individual Demand Site** comprising the **Demand Side Unit**;

CC CONNECTION CONDITIONS

| | | |
|---------------|---|--------------|
| CC.1 | INTRODUCTION..... | CC-2 |
| CC.2 | OBJECTIVE..... | CC-2 |
| CC.3 | SCOPE | CC-3 |
| CC.4 | TRANSMISSION STATION COMPOUND..... | CC-3 |
| CC.5 | PLANT DESIGNATIONS..... | CC-3 |
| CC.6 | RELEVANT TECHNICAL STANDARDS APPLYING TO USER PLANT AND APPARATUS..... | CC-6 |
| CC.7 | SPECIFIC DESIGN AND PERFORMANCE STANDARDS..... | CC-7 |
| CC.7.3 | GENERATORS..... | CC-10 |
| CC7.5 | INTERCONNECTOR | CC-19 |
| CC.8 | TRANSMISSION SYSTEM PERFORMANCE | CC-29 |
| CC.9 | METERING | CC-30 |
| CC.10 | USER PROTECTION AND POWER QUALITY | CC-30 |
| CC.11 | COMMUNICATION FACILITIES | CC-37 |
| CC.12 | SIGNALS TO BE PROVIDED BY USERS | CC-37 |
| CC.13 | POWER SUPPLIES..... | CC-39 |
| CC.14 | RESPONSIBILITY FOR SAFETY..... | CC-40 |
| CC.15 | COMMISSIONING AND NOTIFICATION | CC-40 |

CC CONNECTION CONDITIONS

CC.1 INTRODUCTION

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

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

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

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

CC.2 OBJECTIVE

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

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

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

CC.2.4 The **Connection Conditions** outline the types of signals and indications that will be

required to be made available to the **TSO** by each **User**.

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

CC.3 SCOPE

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

- (a) **Generators** with **Registered Capacity** greater than 2MW;
- (b) **Interconnectors**;
- (c) **Demand Customers**; and
- (d) **Demand Side Unit Operators**.

CC.4 TRANSMISSION STATION COMPOUND

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

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

CC.5 PLANT DESIGNATIONS

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

CC.5.2 The designation and proposed nomenclature of **User Plant** and **Apparatus** connected to the **Transmission System** shall be in accordance with the **TSO** standard practice which, in particular, is designed to ensure that designation and nomenclature avoids confusion. The **User** shall notify the designation and proposed nomenclature of **Users' Plant** and/or **Apparatus** to the **TSO** who may, if

the **TSO** determines that such proposed designation may lead to confusion or does not conform with the **TSO** standard practice, notify substitute designation which shall apply to such **User Plant** and/or **Apparatus**.

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

- (a) **Generation Units:** for hydro and wind: G1, G2 etc.
for thermal: U1, U2 etc.
- (b) **Interconnectors:** for: I1, I2 etc
- (c) **Generator transformers and Interconnector Transformers:** at 400 kV; T4001, T4002 etc.
(i.e. transformers for at 220 kV; T2001, T2002 etc.
Generation Unit production) at 110 kV; T101, T102 etc.
- (d) **Power Station transformers:** at 400 kV; ST4001, ST4002 etc.
(i.e. dedicated transformers at 220 kV; ST2001, ST2002 etc.
supplying both the **Generation Unit** and the **Power Station** at 110 kV; ST101, ST102 etc.
auxiliaries from the **HV** busbar)
- (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 110/38kV; T141, T142 etc.
for 110/20kV; T121, T122 etc.
for 110/11kV and below; T101, T102 etc.
- (g) Bus sections, conventional busbars: single bus; A1, A2 etc.
double bus; A1, A2, B1, B2 etc.
- (h) Bus sections, ring busbars: each section identified by

designation of **Plant** and/or
Apparatus item connected to it.

- | | | |
|-----|------------------------|---|
| (i) | Bus Couplers: | K1, K2 etc. |
| (j) | Lines and cables: | each line or cable at a station identified by name of station or stations at the remote end or ends of the line or cable in alphabetical order. |
| (k) | Circuit Breakers | CB. |
| (l) | Main Earth Disconnects | DE. |
| (m) | Line Disconnect | DL. |
| (n) | Busbar Disconnects | DA, DB, etc. |
| (p) | Coupler Disconnects | DA, DB, etc. |

CC.5.4 Every **User** shall be responsible for the provision, erection and maintenance of clear and unambiguous labelling showing the designation and nomenclature of its **Plant** and **Apparatus** at the **User Site**.

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

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

- (a) Irish and EU Law and
- (b) the relevant European standards; or
- (c) if there is no relevant European standards, such other relevant standard which is in common use in the European Union;

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

CC.6.2 In the event that any standard or specification with which a **User's Plant** and/or **Apparatus** is required to comply under CC.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 **CER** 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):

| Parameter (Minimum) | 110kV | 220kV | 400kV |
|---|-------|-------|-------|
| Insulation Level (kV); <ul style="list-style-type: none">- Lightning Impulse (1.2/50 μsec.)- Switching Impulse (0.25/2.5 ms)- Power Frequency (50 Hz, for 1 min) | 550 | 1050 | 1550 |
| Clearance outdoor in air of live metal parts (mm) phase to earth | 1100 | 2400 | 4100 |
| Height of live parts above pedestrian passageways (mm) | 3400 | 4700 | 6400 |
| Height of bottom of unscreened live bushings above ground (mm) | 2300 | 2300 | 2300 |
| Height of live conductors above roadways (mm) | 8000 | 9000 | 10500 |

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

CC.7.2.3 LV cables and wiring

CC.7.2.3.1 All multi-core control and protection cables shall be provided with a suitable metallic screen. Facilities for earthing these screens at the base of cabinets shall be provided.

CC.7.2.3.2 **LV** supply cable and auxiliary wiring shall be routed from the **Transmission Station** to each **User's** control building through a mutually agreed cable corridor. The cables will be laid in concrete troughs with reinforced concrete covers, or as mutually agreed, to the **User's** marshalling rack, which will be situated near the **Transmission Station**.

CC.7.2.4 Locking

CC.7.2.4.1 The facility to lock in the open/closed position and interlocking facilities shall be provided by each **User** on appropriate disconnects and/or circuit breakers (with withdraw facilities) in order to ensure that the incoming feeder(s) to the facility can be safely isolated when required by the **TSO**. The specific details of this requirement will be outlined at the design phase.

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

CC.7.2.5 Grid Connected Transformers

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

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.7.2.5.3.1 Provision should be made for the earthing of the neutral of each **Transformer** connected to the 110kV **System** by bringing out the neutral and ensuring that the insulation is such that the transformer can be operated unearthed.

- CC.7.2.5.3.2 Provision should be made for the earthing of the neutral of each transformer connected to the 220kV **System** by bringing out the neutral. The **TSO** will consider on a case by case basis if the **Transformer** is required to be operated with the 220kV neutral unearthed. Applicants will be advised of this at the time of the **Connection Offer**.
- CC.7.2.5.3.3 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.7.2.5.4 The **TSO** will provide the facility for the tripping of **Grid Connected Transformer HV** circuit breakers from the **User's** transformer protection.
- CC.7.2.5.5 An **Interconnector Transformer** shall be designed such that the **Reactive Power** capability is possible over the full range of **Transmission System Voltages** (specified in CC.7.5.1.1 (f)). The **TSO** and an **Interconnector** owner will liaise on matters related to the **Interconnector Transformer** at the design stage.
- CC.7.2.5.6 **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

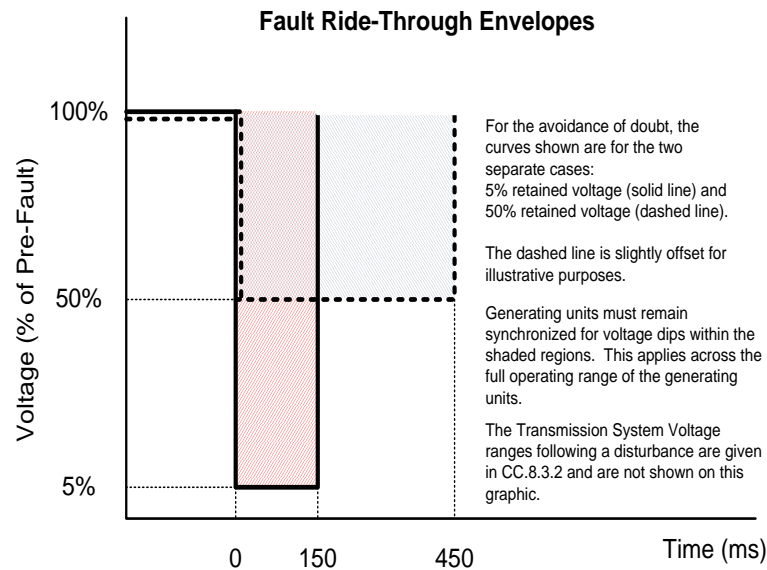
- CC.7.3.1 The conditions specified in this section of the code apply to all **Generation Units** connected to or connecting to the **Transmission System**. Unless explicitly stated all conditions specified apply over the full operating capabilities of the **Generation Unit** at the **Connection Point**.

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) 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;
- (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 pre-fault conditions subject to its normal **Governor Control System** and **Automatic Voltage Regulator** response. The use of **Extraordinary Governor Response** and/or **Extraordinary AVR Response** to remain synchronised during and following a fault is prohibited unless specifically agreed with the **TSO**, such agreement not be unreasonably withheld.

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



- (i) remain synchronised to the **Transmission System** during a negative phase sequence load unbalance in accordance with IEC 60034-1
- (j) The short circuit ratio of each **Generation Unit** shall be in accordance with IEC 60034-1
- (k) **Minimum Load** not greater than 50% of **Registered Capacity** for **CCGT Installations** and not greater than 35% of **Registered Capacity** for all other **Generation Units**. For **CCGT Installations** whilst operating in **Open Cycle Mode** as a result of combined cycle plant capability being unavailable, the **Minimum Load** of each **Combustion Turbine Unit** must be not greater than 35% of the **Registered Capacity** divided by the number of **Combustion Turbine Units**.
- (l) **Ramp up capability** not less than 1.5% of **Registered Capacity** per minute when the **Unit** is in the **Normal Dispatch Condition**.
- (m) **Ramp down capability** not less than 1.5% of **Registered Capacity** per minute when the **Unit** is in the **Normal Dispatch Condition**.
- (n) **Minimum up-time** not greater than 4 hours for **Thermal Units**
- (o) **Minimum down-time** not greater than 4 hours for **Thermal Units**

- (p) **Forbidden Zones** within the range between normal **Minimum Load** plus 5% and **Registered Capacity** less 10%, not more than 2 specified zones each not greater than 10% of **Registered Capacity**
- (q) **Block Loading** not greater than 10% of **Registered Capacity**
- (r) Time off-load before going into longer standby conditions remain in a hot condition for at least 12 hours and remain in a warm condition for at least 60 hours
- (s) Time to **Synchronise** (from instruction) hot : not greater than 3 hours
warm : not greater than 8 hour
cold : not greater than 12 hours
- (t) (i) Time from **Synchronising** to **Minimum Load** hot : not greater than 40 minutes
warm : not greater than 90 minutes
cold : not greater than 180 minutes
- (ii) Time to deload from **Minimum Load** to **De-Synchronising** not greater than 40 minutes, except where agreed with the TSO.
- (u) **Operating Reserve**
- (i) **POR** not less than 5% **Registered Capacity**
To be provided, at a minimum, at **MW Outputs** in the range from 50% to 95% **Registered Capacity**, with provision in the range of 95% to 100% **Registered Capacity** to be not less than that indicated by a straight line with unity decay from 5% of **Registered Capacity** at 95% output to 0 at 100% output.
- (ii) **SOR** not less than 5% **Registered Capacity**
To be provided, at a minimum, at **MW Outputs** in the range from 50% to 95% **Registered Capacity**, with provision in the range of 95% to 100% **Registered Capacity** to be not less than that indicated by a straight line with unity decay from 5% of **Registered Capacity** at 95% output to 0 at 100% output.
- (iii) **TOR1** not less than 8% **Registered Capacity**
To be provided, at a minimum, at **MW Outputs** in the range from 50% to 92% **Registered Capacity**, with provision in the range of 92% to 100% **Registered Capacity** to be not less than that indicated

by a straight line with unity decay from 8% of Registered Capacity at 92% output to 0 at 100% output.

(iv) **TOR2 not less than 10% Registered Capacity**

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

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

For all applicable **Generation Units**:

- (w) 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**.
- (x) 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 **CER**. 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 **CER** 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 OC4.3.4. **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.7.3.3 **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 Voltage** within the limits as specified in CC.8.3.2, notwithstanding CC.7.3.6;

CC.7.3.5 Each **Generation Unit** shall be designed, where practicable, to mitigate the risk of common mode failure with other **Generation Units**. In particular each **Generation Unit** shall be designed so that it can operate with its essential auxiliaries supplied through a unit transformer which shall be connected between the **Generation Unit** circuit breaker and the **Generator Transformer LV** terminals, or from another secure source as agreed with the **TSO**. Auxiliary supplies may, provided that they are in accordance with **Good Industry Practice**, be taken from an alternative source during commissioning, testing, start-up or emergencies.

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

CC.7.3.6 **Reactive Power** capability

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

| Voltage Range | Connected at: | At Registered Capacity between: | At 35% of Registered Capacity between: |
|---|----------------------|--|--|
| $99\text{kV} \leq V \leq 123\text{kV}$ | 110kV | 0.93 power factor leading to 0.85 power factor lagging | 0.7 power factor leading to 0.4 power factor lagging |
| $85\text{kV} \leq V < 99\text{kV}$ | | Unity power factor to 0.85 power factor lagging | 0.7 power factor leading to 0.4 power factor lagging |
| $200\text{kV} \leq V \leq 245\text{kV}$ | 220kV | 0.93 power factor leading to 0.85 power factor lagging | 0.7 power factor leading to 0.4 power factor lagging |
| $190\text{kV} \leq V < 200\text{kV}$ | | Unity power factor to 0.85 power factor lagging | 0.7 power factor leading to 0.4 power factor lagging |
| $360\text{kV} \leq V \leq 420\text{kV}$ | 400kV | 0.93 power factor leading to 0.85 power factor lagging | 0.7 power factor leading to 0.4 power factor lagging |
| $350\text{kV} \leq V < 360\text{kV}$ | | Unity power factor to 0.85 power factor lagging | 0.7 power factor leading to 0.4 power factor lagging |

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

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

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

CC.7.3.6.5 The **TSO** and the **Generator** will liaise on matters related to CC.7.3.6 at the design stage.

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 OC4. 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 contributing to control of **Transmission System Voltage** by continuous modulation of **Generator Voltage** by means of a suitable continuously acting **Automatic Voltage Regulation (AVR)** which shall comply with **BS4999 part 140**, or equivalent European Standards and the characteristics of which have been accepted by the **TSO** prior to the **Connection Date**, such acceptance not to be unreasonably withheld.

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

- (a) 2.5% on the 110kV system
 - (b) 1.6% on the 220kV and 400kV systems
- or as agreed with the **TSO**.

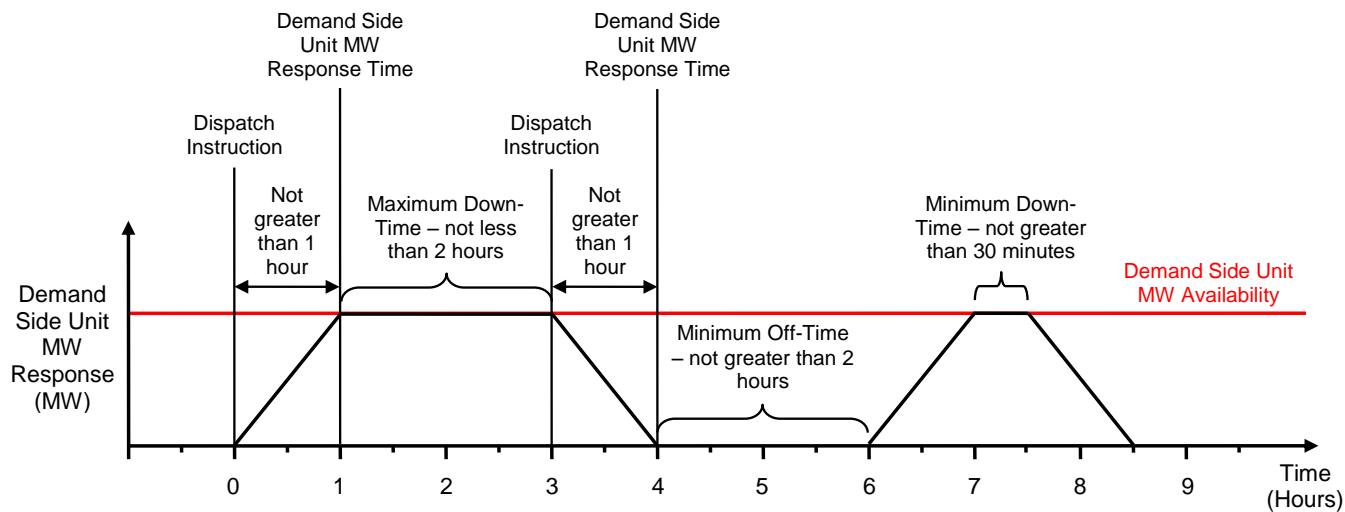
CC.7.4 Each **Demand Side Unit** shall, as a minimum, have the following capabilities:

- (a) Able to provide **Demand Side Unit MW Response** between 0 MW and the **Demand Side Unit MW Capacity**;
- (b) **Maximum Ramp Up Rate** not less than 1.67% per minute of **Demand Side Unit MW Response** as specified in the **Dispatch Instruction**;
- (c) **Maximum Ramp Down Rate** not less than 1.67% per minute of **Demand Side Unit MW Response** as specified in the **Dispatch Instruction**;

- (d) **Minimum Down Time** not greater than 30 minutes;
- (e) **Maximum Down Time** not less than 2 hours;
- (f) **Minimum off time** not greater than 2 hours; and
- (g) **Demand Side Unit MW Response Time** of not greater than 1 hour.

On-site **Generation** that forms part of a **Demand Side Unit**, shall, as a minimum, have the following capabilities:

- (h) operate continuously at normal rated output at **Transmission System Frequencies** in the range 49.5Hz to 50.5Hz;
- (i) remain synchronised to the **Transmission System** at **Transmission System Frequencies** within the range 47.5Hz to 52.0Hz for a duration of 60 minutes;
- (j) 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
- (k) 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.



CC7.5 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 **OC4-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 pre-fault 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 OC4;

- (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.

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.7.5.2 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**;

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 **OC4 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

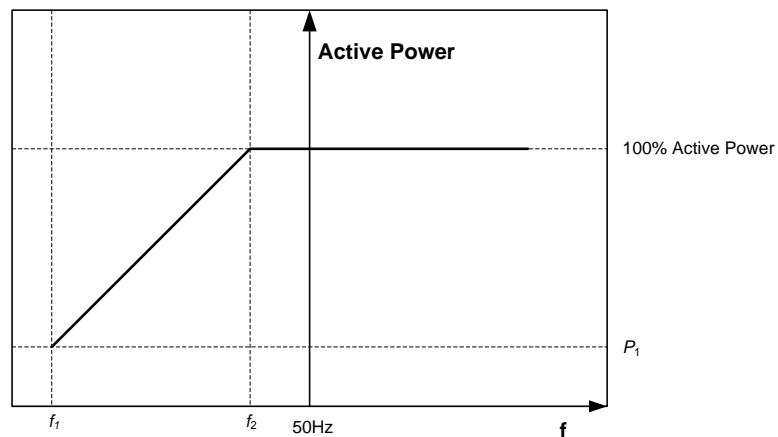
CC.7.5.7.1 Each **Interconnector** must be fitted with a fast acting control device to provide **Frequency Response** under normal operating conditions in accordance with OC4.3. The control device must be designed and operated to the appropriate;

- (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) $48\text{Hz} \leq f_2 \leq 50\text{Hz}$
- (iv) $95\% \leq P_1 \leq 100\%$ Active Power



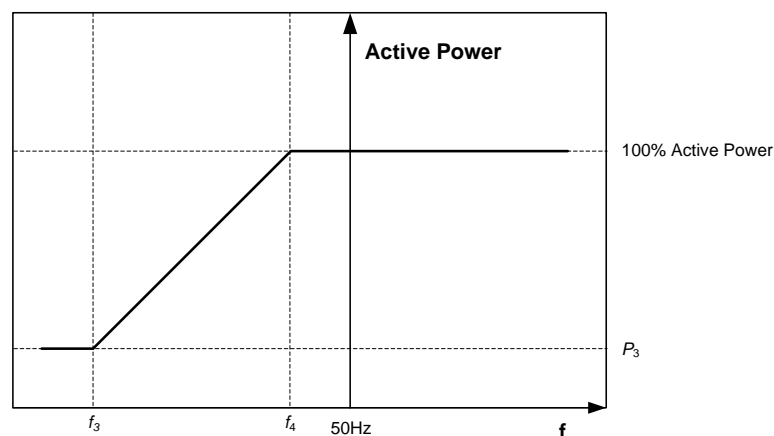
Settings for each of f_1 , f_2 and P_1 shall be specified by the **TSO** at least 120 **Business Days** prior to the **Interconnector's** scheduled **Operational Date**. The **Interconnector Operator** shall be responsible for implementing the appropriate settings during **Commissioning**.

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) $48\text{Hz} \leq f_3 \leq 50\text{Hz}$
- (iii) $48\text{Hz} \leq f_4 \leq 50\text{Hz}$
- (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, $\pm 0.015\text{Hz}$);

CC.7.5.9 Automatic Voltage Regulation

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

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

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

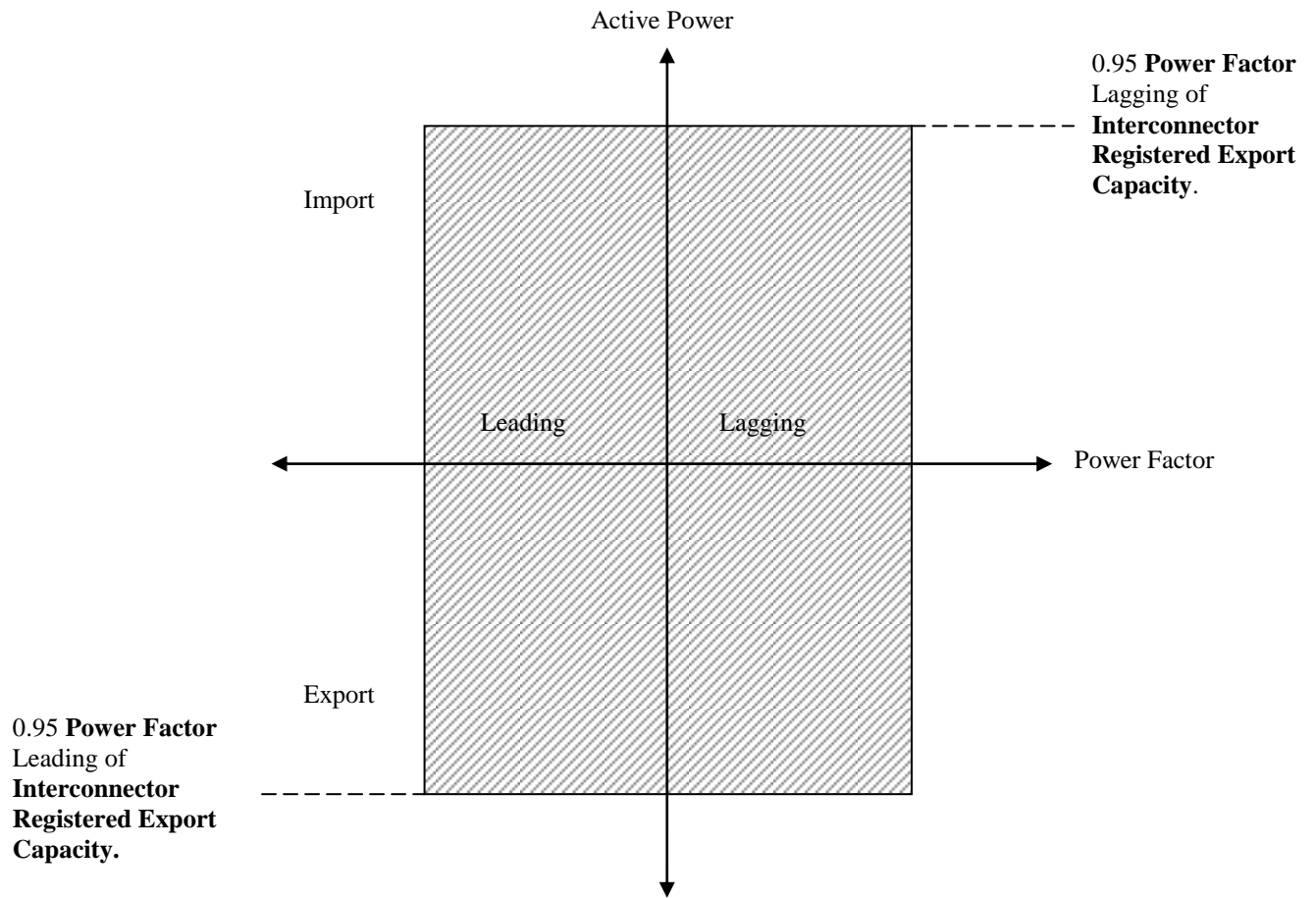
CC.7.5.9.3 The **Voltage Regulation System Slope Setting** shall be capable of being set to any value between 1% and 10%. The setting shall be specified by the **TSO** at least 120 **Business Days** prior to the **Interconnector's** scheduled **Operational Date**. The **Interconnector** shall be responsible for implementing the appropriate settings during **Commissioning**. The slope setting may be varied from time to time depending on **Transmission System** needs. The **TSO** shall give the **Interconnector** a minimum of 1 **Business Days** notice if a change is required. The **Interconnector** shall formally confirm that any requested changes have been implemented within 1 **Business Days** of receiving the **TSO's** formal request.

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

shall achieve 90 % of its steady-state **Reactive Power** response within 1 second. The response may require a transition from maximum **Mvar** production to maximum **Mvar** absorption or vice-versa.

CC.7.5.10 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**.



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.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.7.2.5.4.

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.10.10 DSO

CC.10.10.1 The **DSO** shall provide differential-protection on **Grid Connected Transformers**.

CC.10.10.2 The **TSO** may require the **DSO** to install additional protection schemes, where the **TSO** can reasonably show that it is prudent or necessary to do so, such schemes may include but are not limited to the following:

- (a) directional overcurrent protection or distance protection on **User's** transformer(s);
- (b) direct intertripping between the **Grid Connection Point** circuit breaker and the **User Connection Point** circuit breaker;
- (c) neutral voltage displacement protection on **HV** side of **User's** transformer(s);
- (d) loss of mains protection;
- (e) under/over voltage protection;
- (f) under/over frequency protection;
- (g) unit (differential) type protection on **Distribution System** lines or cables;
- (h) distance protection on the **User Connection Point** circuit breaker on **Distribution** lines or cables;
- (i) bus zone protection on 110 kV **Distribution System** busbars; and

- (j) teleprotection channels (for use with distance protection) between the **Grid Connection Point** circuit breaker and **User Connection Point** circuit breaker.

CC.10.10.3 Distance protection or over-current protection shall be provided by the **TSO** on **Grid Connection Point** circuit breaker(s) unless where otherwise agreed by the **TSO** and **DSO**.

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.10.12 Interconnectors

CC10.12.1 **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) from external System Integrity Protection schemes.

CC.10.12.3 Distance protection shall be provided by the **TSO** on the **Grid Connection Point** circuit breaker of **Interconnector Transformers**.

CC.10.13 Power Quality

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

CC.10.13.1 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.10.13.2 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.10.13.3 **Interconnector Operators** shall ensure that their connection to the **Transmission System** does not result in the level of distortion or fluctuation of the supply **Voltage** on the **Transmission System**, at the **Connection Point**, exceeding that allocated to them. These limits will be determined by the **TSO** during discussions with the **Interconnector**, where the necessary data will be exchanged between both parties, the exchange of data shall not be unreasonably withheld. This data may consist of impedance loci at the **Connection Point** and the **Interconnector** harmonic current emissions. Distortion and fluctuation limits are outlined in IEC/TR3 61000-3-6 (Harmonics) and IEC/TR3 61000-3-7 (Voltage fluctuation). **Interconnectors** shall also operate their **Plant** in a manner which will not cause the requirements in CENELEC Standard EN 50160 to be breached.

The **Interconnector** cannot be connected to the **Transmission System** until:

- (a) the required harmonic studies have been completed by the **Interconnector Owner** and or **Interconnector Operator** to show compliance with the standards outlined above and reviewed by the **TSO**;
- (b) any appropriate remedies to enable the **Interconnector** to operate with harmonic distortion levels within agreed limits have been identified and implemented with the **TSO**.

CC.10.13.4 For **Interconnectors** the harmonic voltage distortion emission limits and any special conditions pertaining to the quality of supply must be included in the **Connection Agreement**, and are subject to verification of compliance by the **TSO** through an ongoing approved monitoring programme to be implemented by the **Interconnector Operator**, or as agreed with the **TSO**.

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) and (i) 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) and (k) are applicable to **Demand Customers** only,*

- (j) **MW** and +/- **Mvar** at the **HV** terminals of the **Grid Connected Transformer**; and
- (k) **Grid Connected Transformer** tap position.

(l), (m), (n), (o), (p), (q), (r) and (s) are applicable to **Demand Side Unit Operators** who represent a **Demand Side Unit**:

- (l) **Demand Side Unit MW Response** from **Generation**;
- (m) **Demand Side Unit MW Response** from avoided **Demand** consumption;
- (n) Remaining **Demand Side Unit MW Capacity**;
- (o) **Demand Side Unit MW Response** from each **Demand** load with a **Demand Side Unit MW Capacity** of greater than or equal to 5 **MW**;
- (p) **MW Output** from **Generation Units** with a **Capacity** greater than or equal to 5 **MW**;
- (q) **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;
- (r) **MW Output** from **Generation Units** on **Individual Demand Sites** with a combined **Capacity** of greater than or equal to 5 **MW**, as required by the TSO; and
- (s) **Demand Side Unit MW Response** from each **Individual Demand Site** that comprises the **Demand Side Unit**, as required by the TSO.

(t), (u), (v), (w) and (x) are applicable to **Interconnectors** only:

- (t) **+/-MW** and **+/-Mvar** at the high **Voltage** terminals of the **Interconnector Transformer**;
- (u) **kV** at **Interconnector Transformer** high **Voltage** terminals;
- (v) **Interconnector Transformer** tap position;
- (w) **Interconnector** status; and
- (x) **Frequency**.

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 **OC11**.

CC.15 COMMISSIONING AND NOTIFICATION

CC.15.1 The **TSO** and the **User** shall, in accordance with the provisions set out in the **Connection Agreement**, meet to discuss **Commissioning**, including **Commissioning Tests** and **Grid Code Tests**. The **User's** obligations in relation to **Testing** set out in this CC.15 are in addition to the requirements under the **Connection Agreement**.

CC.15.2 **Users** are required to carry out such tests (which are defined to be **Grid Code Tests**) as are required in order to confirm that the **User's Plant** and **Apparatus** meets all the requirements of the **Grid Code** which must be met prior to the **Operational Date**. The **TSO** may, under the **Connection Agreement**, notify to the **User** such **Grid Code Tests** as it requires the **User** to carry out. The **TSO** may not necessarily test for CC.7.3.1.1 (a), (b), (c), (d) and (e) but reserve the right to test to establish design and operational compliance. For the avoidance of doubt it is the responsibility of **Users** at all times to ensure their compliance with the **Grid Code** and testing successfully or otherwise shall not in any way diminish or reduce such responsibilities.

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.

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

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**.

OC1 DEMAND FORECASTS

OC1.1 INTRODUCTIONOC1-2
OC1.2 OBJECTIVESOC1-3
OC1.3 SCOPEOC1-3
OC1.4 DATA REQUIRED BY THE TSO IN THE OPERATIONAL PLANNING PHASE.....OC1-3
OC1.5 POST CONTROL PHASE.....OC1-5
OC1.6 THE TSO DEMAND FORECASTSOC1-5

OC1 DEMAND FORECASTS

OC1.1 INTRODUCTION

OC1.1.1 OC1 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**.

OC1.1.2 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 OC1.

OC1.1.3 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 OC1.6.1.

OC1.1.4 In OC1.4, 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**.

OC1.1.5 OC1 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**.

OC1.1.6 In this OC1, 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.

OC1.1.7 The reference in this OC1 to a "day" shall mean the period covered by the **Trading Day**, even though that may not be a calendar day.

OC1.1.8 References in OC1 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.

OC1.2 OBJECTIVES

The objectives of **OC1** are to:

OC1.2.1 Ensure the provision of data to the **TSO** by **Users** in the **Operational Planning Phase, Programming Phase, Control Phase** and **Post Control Phase**; and

OC1.2.2 Describe the factors to be taken into account by the **TSO** when **Demand** forecasting in the **Programming Phase** and **Control Phase**

OC1.3 SCOPE

OC1 applies to the **TSO** and to all **Users**, which term in this OC1 means:

- (a) **Generators;**
- (b) **The Distribution System Operator;**
- (c) **Suppliers;** and
- (d) **Demand Customers.**

OC1.4 DATA REQUIRED BY THE TSO IN THE OPERATIONAL PLANNING PHASE

OC1.4.1 Each **User** shall provide the **TSO** with the data requested in the relevant parts of OC1.4 below (except **Demand** solely related to **Power Station Auxiliary Plant** when fed in accordance with pre-agreed feeding arrangements).

OC1.4.2 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 OC1.4.2 (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.

OC1.4.3 The **DSO** and **Demand Customers** shall inform the **TSO** of any changes to the information supplied under OC1.4.2 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**;

OC1.4.4 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.

OC1.5. 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**.

OC1.6 THE TSO DEMAND FORECASTS

OC1.6.1 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.

OC1.6.2 Taking into account the factors specified in OC1.6.1 the **TSO** uses **Demand** forecast methodology to produce forecasts of **Demand**.

OC1.6.3 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.

OC2 OPERATIONAL PLANNING

OC2.1 INTRODUCTION.....OC2-2

OC2.2 OBJECTIVEOC2-2

OC2.3 SCOPE.....OC2-3

OC2.4 OUTAGE SCHEDULING.....OC2-3

OC2.5 NOT USED.....OC2-7

**OC2.6 CHANGES TO THE COMMITTED OUTAGE PROGRAMME WITHIN THE IMPLEMENTATION YEAR
(YEAR 0).....OC2-7**

OC2.7 OTHER INFORMATION TO BE NOTIFIEDOC2-9

OC2 OPERATIONAL PLANNING

OC2.1 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).

OC2.2 OBJECTIVE

The primary objective of OC2 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, OC2 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**.

OC2 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.

OC2.7 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**.

OC2.3 SCOPE

Operational Planning applies to the **TSO** and to the following, each of which is a **User** under this OC2:

- (a) **Generators** which for the purposes of OC2 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)**.

OC2.4 OUTAGE SCHEDULING

OC2.4.1 Throughout OC2 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.

OC2.4.2 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**.

OC2.4.3 By the end of March in year 0, **Generators, Generator Aggregators** and **Demand Side Unit Operators** shall submit to the **TSO**, for each **Generation Unit, Aggregated Generating Unit** or **Demand Side Unit**, details of **Outages** and estimates of the **Forced Outage Probabilities** for inclusion in:

- (a) the **Committed Outage Programme (COP)** for year 1. Other than in the first year after the planning process has commenced, this will be based on the previous year's **Provisional Outage Programme** for year 2, which period through the passage of time has now become year 1, and any changes may only reflect the **Generator's, Interconnector Operator's, Generator Aggregator's**, and **Demand Side Unit Operator's** reasonable response to changed circumstances;
- (b) the **Provisional Outage Programme (POP)** for years 2 and 3.

In the case of **Aggregated Generating Units**, and **Demand Side Units** which consist of **Aggregated Demand Sites**, the **Generator Aggregator** or **Demand Side Unit Operator** shall provide the aggregated **Outages**, and upon request from the **TSO** the **Generator Aggregator** or **Demand Side Unit Operator** shall provide the **Outage** for each individual site, in a reasonable time period.

Generators, Interconnector Operators, Generator Aggregators and **Demand Side Unit Operators** shall specify with regard to each of their **Generation Units**,

Interconnector, Aggregated Generating Units or Demand Side Units, the start date and time and the duration of each **Outage**.

OC2.4.4 In scheduling **Outages**, and in relation to all other matters under OC2, 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.

OC2.4.5 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.

OC2.4.6 **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**.

OC2.4.7 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**.

OC2.4.8 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.

OC2.4.9 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**.

OC2.4.10 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.

OC2.4.11 Information relating to the **COP** and **POP** shall be exchanged on a regular basis with the **Other TSO**.

OC2.5 NOT USED

OC2.6 CHANGES TO THE COMMITTED OUTAGE PROGRAMME WITHIN THE IMPLEMENTATION YEAR (YEAR 0)

OC2.6.1 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.

OC2.6.2 Request initiated by the TSO

OC2.6.2.1 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**.

OC2.6.2.2 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**.

OC2.6.2.3 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.

OC2.6.3 Outage change initiated by a Generator, Interconnector Operator, Generator Aggregator or Demand Side Unit Operator

OC2.6.3.1 **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**.

OC2.6.3.2 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**

OC2.6.3.3 Where, in accordance with OC2.5, 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.

OC2.6.3.4 Where, in accordance with OC2.5, 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 OC2.6.3.1.

OC2.6.3.5 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**.

OC2.7 OTHER INFORMATION TO BE NOTIFIED

OC2.7.1 **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.

OC2.7.2 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 OC2.7.1. 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.

OC2.7.3 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.

OC2.7.4 **Generators** must immediately notify the **TSO** on making the decision to cancel a major **Outage** of a **Generation Unit**.

- OC2.7.4.1 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.
- OC2.7.4.1.2 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 decision not to proceed with the major **Outage**;
 - (c) assessments covering the risks of sudden and catastrophic failure.
- OC2.7.5 A **Generator** must immediately notify the **TSO** in the event of sudden and catastrophic failure of a **Generation Unit**.
- OC2.7.5.1 The **Generator** must report to the **TSO** the impact of the failure of the **Generation Unit** and the future operation of the **Generation Unit**.
- OC2.7.5.2 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**.

OC3 NOT USED

OC4 SYSTEM SERVICES

| | |
|--------------------------------------|---------------|
| OC4.1 INTRODUCTION | OC4-1 |
| OC4.2 SCOPE | OC4-1 |
| OC4.3 FREQUENCY CONTROL | OC4-2 |
| OC4.4 VOLTAGE CONTROL..... | OC4-8 |
| OC4.5 NETWORK CONTROL | OC4-14 |
| OC4.6 OPERATING MARGIN..... | OC4-18 |
| OC4.7 BLACK START | OC4-22 |

OC4 SYSTEM SERVICES

OC4.1 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.

OC4.2 SCOPE

OC4.2.1 OC4 applies to the **TSO** and to the following, each of which is a **User** under this OC4:

- (a) **Grid Connected Generators with Registered Capacity** greater than 2MW;
- (b) **Demand Customers**
- (c) The **Distribution System Operator (DSO)**; and
- (d) **Interconnector Operators.**

OC4.3 FREQUENCY CONTROL

OC4.3.1 INTRODUCTION

OC4.3.1.1 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.

OC4.3.2 OBJECTIVE

OC4.3.2.1 The objectives of OC4.3 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 CC8.2.1.

OC4.3.3 DESCRIPTION OF FREQUENCY CONTROL

OC4.3.3.1 **Frequency Control** occurs in two time scales, namely:

- (a) **Primary Frequency Control**; and
- (b) **Secondary Frequency Control**.

OC4.3.3.2 Primary Frequency Control

OC4.3.3.2.1 **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 OC5: **Demand Control**).

OC4.3.3.2.2 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.

OC4.3.3.2.3 **Frequency** deviations, outside the levels specified in CC8.2.1(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**.

OC4.3.3.3 **Secondary Frequency Control**

OC4.3.3.3.1 **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.

OC4.3.3.3.2 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.

OC4.3.4 **FREQUENCY RESPONSE SYSTEMS**

OC4.3.4.1 **REQUIREMENTS OF GENERATION UNIT GOVERNOR SYSTEMS**

OC4.3.4.1.1 In order that adequate **Frequency Regulation** is maintained on the **Transmission System** at all times, **Generators** are required to comply with the provisions of OC4.3.4.1.

OC4.3.4.1.2 Other than as permitted in accordance with OC4.3.4.3:

- (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;

- (c) 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**.

OC4.3.4.1.3 The **Generator** may only restrict governor action in such a manner as to contravene the terms of OC4.3.4.1.2 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**.

OC4.3.4.1.4 In the event that the **TSO** in accordance with OC4.3.4.1.3 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.

OC4.3.4.1.5 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,

OC4.3.4.1.6 Action required by **Generators** in response to high **Frequency**:

If **System Frequency** rises to or above 50.2 Hz each **Generator** will be required to ensure that its **CDGUs** has responded in order to contribute to containing and correction the high **System Frequency** by automatic 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.

OC4.3.4.2 REQUIREMENTS OF INTERCONNECTOR FREQUENCY RESPONSE SYSTEMS

OC4.3.4.2.1 In order that adequate **Frequency Control** is maintained on the **Transmission System** at all times, **Interconnectors** are required to comply with the provisions of OC4.3.4.2

OC4.3.4.2.2 Other than as permitted in accordance with OC4.3.4.2.3:

- (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**.

OC4.3.4.2.3 The **Interconnector Operator** may only restrict the action of the **Frequency Control** mode in such a manner as to contravene the terms of OC4.3.4.2.2 where:

- (a) The action is essential for the safety of personnel and/or to avoid damage to **Plant**, in which case the **Interconnector Operator** shall inform the **TSO** of the restriction without undue delay; or
- (b) in order to (acting in accordance with **Good Industry Practice**) secure the reliability of the **Interconnector**, in which case the **Interconnector Operator** shall inform the **TSO** of the restriction without undue delay; or
- (c) the restriction is agreed between the **TSO** and the **Interconnector Operator** in advance; or
- (d) the restriction is in accordance with a **Dispatch Instruction** given by the **TSO**.

OC4.3.4.2.4 In the event that the **TSO** in accordance with OC4.3.4.2.3 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.

OC4.3.4.2.5 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**.

OC4.3.4.2.6 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**.

OC4.3.4.2.7 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**.

OC4.3.4.2.8 The **TSO** having due regard to system security may instruct the **Interconnector Operator** to disable the **Frequency Control** mode of an **Interconnector** at any time, and this instruction must be carried out without delay.

OC4.3.5 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**.

OC4.3.6 AUTOMATIC GENERATOR CONTROL (AGC)

OC4.3.6.1 The secondary **Frequency** regulation system operational on the **Transmission System** is known as the "**Automatic Generator Control**" (**AGC**).

OC4.3.6.2 **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**.

- OC4.3.6.3 Other than as provided for in OC4.3.6.4 and OC4.3.6.5 all **Generation Units** and **Interconnectors** fitted with **AGC** shall operate under the control of **AGC** when within their **AGC Control Range**.
- OC4.3.6.4 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**.
- OC4.3.6.5 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**.
- OC4.3.6.6 **Generation Units** or **Interconnectors** not operating under **AGC** for reasons set out in OC4.3.6.4 and OC4.3.6.5 shall nevertheless continue to follow **MW Dispatch Instructions** as required by **SDC2**.

OC4.4 VOLTAGE CONTROL

OC4.4.1 INTRODUCTION

OC4.4.1.1 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**.

OC4.4.1.2 **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.

OC4.4.1.3 **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**.

OC4.4.2 OBJECTIVES

OC4.4.2.1 The objective of OC4.4 is to set out the control strategies used by the **TSO**, in conjunction with **Users** where appropriate, in controlling **Transmission System Voltages**.

OC4.4.2.2 OC4.4 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**.

OC4.4.2.3 OC4.4 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.

OC4.4.2.4 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 OC4.4 shall be read in conjunction with these provisions.

OC4.4.3 DESCRIPTION OF VOLTAGE CONTROL

OC4.4.3.1 **Voltage Control** is achieved by ensuring sufficient availability of dynamic and static reactive power from contributions listed in OC4.4.3.2. 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.

OC4.4.3.2 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:

OC4.4.3.2.1 The charging capacitance of the **Transmission System**.

OC4.4.3.2.2 **Customer Mvar Demand**.

OC4.4.3.2.3 **Transmission System Mvar losses**.

OC4.4.3.2.4 **Generation Unit Mvar production or absorption**.

OC4.4.3.2.5 **Interconnector Mvar production or absorption**.

OC4.4.3.2.6 **Voltage Control** facilities, such as capacitor banks and reactors.

OC4.4.3.3 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**.

OC4.4.3.4 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**.

OC4.4.4 VOLTAGE CONTROL POLICY

OC4.4.4.1 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.

OC4.4.5 METHODS UTILISED IN EXERCISING VOLTAGE CONTROL

OC4.4.5.1 **Transmission System Voltages** shall be continuously monitored by the **TSO**. Appropriate **Voltage** operating points shall be determined by the **TSO**, taking account of OC4.4.4 and in particular of **System** conditions pertaining at the time of operation.

OC4.4.5.2 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**.

OC4.4.5.3 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 OC4.4.5.5, in which event the **Generator** shall notify the **TSO** without delay.

OC4.4.5.4 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 OC4.4.5.5, in which event the **Interconnector Operator** shall notify the **TSO** without undue delay.

OC4.4.5.5 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.

OC4.4.5.6 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**.

OC4.4.5.7 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**.

OC4.4.5.8 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.

OC4.4.5.9 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**.

OC4.4.5.10 The extent to which **Voltage Control** mechanisms can be utilised may be limited by **System** conditions and other limitations of **Plant** and **Apparatus**.

OC4.4.5.11 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.

OC4.4.6 EMERGENCY or EXCEPTIONAL VOLTAGE CONTROL

OC4.4.6.1 Additional **Voltage Control** mechanisms may be utilised in the event of **System Emergency Conditions**. These shall include the following:

OC4.4.6.1.1 **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.

OC4.4.6.1.2 Changes in **System Voltage** can be achieved by instructing, as a form of **Dispatch Instruction** under OC4.4, **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.

OC4.4.6.1.3 **Demand** shedding may be used to prevent **Voltage** from contravening low **Voltage** limits (as further provided in OC5) at **Connection Points**.

OC4.4.6.1.4 **Interconnector Operators** may be requested to operate **Interconnectors** at Mvar production or absorption levels outside their currently declared **Technical Parameters**. This will be done by agreement between the **Interconnector Operator** and the **TSO** and **Interconnector Operators** will not be penalised for non-compliance with this clause.

OC4.5 NETWORK CONTROL

OC4.5.1 INTRODUCTION

OC4.5.1.1 In implementing the **Transmission Outage Programme**, in routine operation of the **Transmission System** and in responding to emergency and fault situations on the **Transmission System**, the **TSO** needs to carry out network switching and **Control Actions** which may from time to time affect the operations of **Users** or security of supply to **Users**.

OC4.5.1.2 The purpose of this OC4.5 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.

OC4.5.2 OBJECTIVE

OC4.5.2.1 The first objective of OC4.5 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.

OC4.5.2.2 The second objective of OC4.5 is to establish procedures whereby the **TSO** will:

- (a) where practicable, inform **Users** who will be or are likely to be significantly affected by network **Control Actions** of relevant details of intended **Control Actions** and the effect of those **Control Actions**;
- (b) consult with **Users** as appropriate in order to find out and take into consideration reasonable objections raised by **Users** so affected.

OC4.5.3 NETWORK CONTROL ACTIONS

OC4.5.3.1 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.

OC4.5.3.2 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**.

OC4.5.3.3 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**.

OC4.5.4 NOTIFICATION TO USERS OF NETWORK CONTROL

OC4.5.4.1 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.

OC4.5.4.2 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**.

OC4.5.4.3 Typical examples of actions notified in accordance with OC4.5.4.2 may include:

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**;

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**.

OC4.5.4.4 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 OC4.5.5 shall apply.

OC4.5.5 CONTROL UNDER FAULT OR EMERGENCY CONDITIONS

OC4.5.5.1 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 OC4.5.4 prior to the occurrence of the **Control Action**.

OC4.5.5.2 In the circumstances referred to in OC4.5.5.1 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

OC4.5.5.3 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.

OC4.5.5.4 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) The **TSO** may request that an **External System Operator** takes any available action to increase the **Active Power** transferred into the **Transmission System**, or reduce the **Active Power** transferred into its **External System** by way of **Emergency** assistance if the alternative is to instruct a Demand reduction on all or part of the **Transmission System**. Such request must be met by the **External System Operator** providing this does not require a reduction of Demand on its **External System**, or lead to a reduction in security on such **External System**.

OC4.5.6 DE-ENERGISATION OF USERS BY THE TSO

OC4.5.6.1 **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.

OC4.6 OPERATING MARGIN

OC4.6.1 INTRODUCTION

OC4.6.1.1 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**.

OC4.6.1.2 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.

OC4.6.1.3 OC4.6 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**.

OC4.6.1.4 Minimum connection and operating requirements for **Generators** and **Interconnectors** are outlined in the **Connection Conditions**.

OC4.6.1.5 Procedures for the **Monitoring** and **Testing** of **Operating Reserve** are outlined under OC10.

OC4.6.2 OBJECTIVE

OC4.6.2.1 The objective of OC4.6 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.

OC4.6.3 CONSTITUENTS OF OPERATING MARGIN

OC4.6.3.1 The **Operating Margin** consists of **Operating Reserve** (which is further broken down into 4 time-scales), **Replacement Reserve**, **Substitute Reserve** and **Contingency Reserve**.

OC4.6.3.2 **Operating Reserve**.

OC4.6.3.2.1 **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.

- OC4.6.3.2.2 **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 OC4.6.4.
- OC4.6.3.3 **Primary Operating Reserve (POR).**
- OC4.6.3.3.1 **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**) where the nadir occurs between 5 and 15 seconds after an **Event**.
- OC4.6.3.3.2 If the actual **Frequency** nadir is before 5 seconds or after 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**.
- OC4.6.3.4 **Secondary Operating Reserve (SOR)**
- OC4.6.3.4.1 **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**.
- OC4.6.3.5 **Tertiary Operating Reserve**
- OC4.6.3.5.1 **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**.
- OC4.6.3.5.2 **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**.
- OC4.6.3.6 **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**.
- OC4.6.3.7 **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**.
- OC4.6.3.8 **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.

OC4.6.4 DEFINITIONS ASSOCIATED WITH AN OPERATING RESERVE INCIDENT

OC4.6.4.1 Following the occurrence of a significant **Frequency** disturbance, the **TSO** shall monitor, in accordance with OC10.4, and analyse the adequacy of the provision of **Operating Reserve**. For the purposes of this performance analysis, the following criteria have been defined.

OC4.6.4.2 A significant **Frequency** disturbance event is deemed to have occurred if the **Frequency** falls below 49.70 Hz.

OC4.6.4.3 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.

OC4.6.4.4 The pre-incident **Frequency** value is the average **Transmission System Frequency** between 60 and 30 seconds prior to the **Event**.

OC4.6.4.5 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**.

OC4.6.5 OPERATING MARGIN POLICY

OC4.6.5.1 Contingency Reserve

OC4.6.5.1.1 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) historical **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**.

OC4.6.5.2 Operating Reserve

OC4.6.5.2.1 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;
- (b) 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.

OC4.6.5.3 The **TSO** shall keep records of significant alterations to the **Operating Reserve** policy so determined under OC4.6.6.2.

OC4.6.6 RESPONSIBILITIES OF THE TSO IN RESPECT OF OPERATING RESERVE

OC4.6.6.1 The **TSO** shall in accordance with **Prudent Utility Practice** make reasonable endeavours to **Dispatch** generation and otherwise operate the system in compliance with the **TSO's** determinations as to **Operating Margin** policies made from time to time.

OC4.6.6.2 The **TSO's** sole responsibility, having met its obligations under the preceding provisions of OC4.6, 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.

OC4.7 BLACK START

OC4.7.1 INTRODUCTION

OC4.7.1.1 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**.

OC4.7.2 OBJECTIVE

OC4.7.2.1 The objectives of OC4.7is to set out the requirements of **Black Start Stations** to enable recovery of the **Transmission System** from a **Partial Shutdown** or **Total Shutdown**:

OC4.7.3 REQUIREMENTS OF BLACK START STATIONS

OC4.7.3.1 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 OC4.7.3.

OC4.7.3.2 Other than as permitted in accordance with OC4.7.3.3:

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**).

OC4.7.3.3 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

OC5 DEMAND CONTROL

OC5.1 INTRODUCTION..... OC5-2

OC5.2 OBJECTIVE OC5-3

OC5.3 SCOPE..... OC5-3

**OC5.4 PROCEDURE FOR THE IMPLEMENTATION OF DEMAND CONTROL ON THE INSTRUCTIONS
OF THE TSO OC5- 4**

OC5.5 AUTOMATIC LOW FREQUENCY DEMAND DISCONNECTION OC5-5

OC5.6 AUTOMATIC FREQUENCY RESTORATION OC5-5

OC5.7 AUTOMATIC LOW VOLTAGE DEMAND DISCONNECTION..... OC5-6

OC5 DEMAND CONTROL

OC5.1 INTRODUCTION

OC5.1.1 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**.

OC5.1.2 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.

OC5.1.3 The procedures set out in OC5 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**.

OC5.1.4 Data relating to **Demand Control** shall include details relating to MW.

OC5.1.5 **Demand Control** shall not, so far as is possible, be exercised in respect of **Priority Customers**. OC5, therefore, applies subject to this exclusion.

OC5.1.6 **Demand Control** shall be exercised equitably in respect of **Customers** connected to the **Distribution System** and **Demand Customers**.

OC5.1.7 Explanation

OC5.1.7.1 **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.

OC5.1.7.2 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**.

OC5.2 OBJECTIVE

OC5.2.1 The overall objective of OC5 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 OC5.1.1, 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**.

OC5.3 SCOPE

OC5 applies to the **TSO** and to all **Users**, which term in this OC5 means:

- (a) The **Distribution System Operator**;
- (b) **Suppliers**; and
- (c) **Demand Customers**.

OC5.4 PROCEDURE FOR THE IMPLEMENTATION OF DEMAND CONTROL ON THE INSTRUCTIONS OF THE TSO

OC5.4.1 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**.

OC5.4.2 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**.

OC5.4.3 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.

OC5.4.4 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**.

OC5.4.5 The **Rota Load Shedding Plan** provides for disconnection and reconnection of defined blocks of demand on instruction from the **TSO**, In this way the **TSO** can instruct the necessary level of disconnection (and reconnection) required by the circumstances at the time. The **DSO** shall comply with instructions issued by the **TSO** in accordance with the **Rota Load Shedding Plan**, and in particular will not reconnect **Demand** other than in accordance with the **TSO's** instructions.

OC5.4.6 The **Rota Load Shedding Plan** shall also provide for the issue of information to **Customers** through the media of the expected duration of **Demand Control**, and which blocks of **Customers** are at most risk of disconnection at which times.

OC5.4.7 Both the **TSO** and the **DSO** will maintain records of the disconnection and reconnection of customers exercised under the **Rota Load Shedding Plan**, (and, for the avoidance of doubt, of any **Demand Control** exercised in accordance with OC5.4.3).

OC5.5 AUTOMATIC LOW FREQUENCY DEMAND DISCONNECTION

OC5.5.1 The **DSO** shall make arrangements that will enable automatic low **Frequency Disconnection** of a percentage of its total peak **Customer Demand** (based on **Annual SLR Conditions**) as specified by the **TSO**, in order to seek to limit the consequences of a major loss of **Generation** or an event on the total system which leaves part of the total system with a **Generation** deficit, provided that, so far as possible, **Demand** of **Generation Units** which is required to enable the **Generation Units** to start-up shall not be subject to automatic low **Frequency Disconnection**. The **TSO** retains the right to specify the **Frequency** settings on percentages of **Demand** subject to automatic low **Frequency Disconnection**.

OC5.5.2 The **Demand** of the **DSO** which is subject to automatic low **Frequency Disconnection** will be split into discrete MW blocks. The number, location, size and the associated low **Frequency** settings of these blocks, will be as specified by the **TSO** by week 39 in every three calendar years 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**.

OC5.5.3 **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 OC5.5 if it is providing low **Frequency Disconnection** at a higher level of **Frequency** as an **Ancillary Service**.

OC5.6 AUTOMATIC FREQUENCY RESTORATION

OC5.6.1 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.

OC5.6.2 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.

OC5.6.3 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 OC5.4.

OC5.6.4 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.

OC5.7 AUTOMATIC LOW VOLTAGE DEMAND DISCONNECTION

OC5.7.1 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.

OC5.7.2 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**.

OC5.7.3 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 OC5.7.2. 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 calendar years 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.

OC6 SMALL SCALE GENERATOR CONDITIONS

OC6.1 INTRODUCTION OC6-2

OC6.2 OBJECTIVE OC6-3

OC6.3 SCOPE..... OC6-3

OC6.4 OUTAGE SCHEDULING OC6-4

**OC6.5 CHANGES TO THE COMMITTED OUTAGE PROGRAMME WITHIN THE
IMPLEMENTATION YEAR OC6-4**

OC6.6 OTHER INFORMATION TO BE NOTIFIED OC6-6

OC6.7 NETWORK CONTROL OC6-6

OC6 SMALL SCALE GENERATOR CONDITIONS

OC6.1 INTRODUCTION

OC6.1.1 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.

OC6.1.2 OC6 formalises the mechanism for scheduling outages of **Users** specified in OC6.3.

OC6.1.3 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**.

OC6.1.4 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.

OC6.1.5 In addition to OC6, the Users specified in OC6.3 are required to comply with:

- Planning Conditions
- General Conditions
- Connection Conditions (Excluding CC.7.31.1(k) to (v) inclusive, C7.3.5, CC7.3.7, CC7.3.8, CC.12.2 (e) to (g) inclusive)
- OC7
- OC10 (excluding sections OC10.5.6; OC10.7.1; OC10.7.2; OC10.7.3; OC10.7.4; OC10.7.6), and
- OC11

OC6.2 OBJECTIVE

OC6.2.1 OC6 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.

OC6.2.2 In order to achieve this objective, OC6 defines the procedure for formal notification of **Outages** by **Generators** to the **TSO**.

OC6.2.3 OC6 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.

OC6.2.4 OC6 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.

OC6.3 SCOPE

OC6 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

OC6.4 OUTAGE SCHEDULING

OC6.4.1 Throughout OC6 the current year shall be defined as year 0, the following year as year 1, and so on.

OC6.4.2 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**.

OC6.4.3 In scheduling **Outages**, and in relation to all other matters under OC6, 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.

OC6.4.4 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.

OC6.4.5 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.

OC6.5 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.

OC6.5.1 Request initiated by the TSO

OC6.5.1.1 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**.

OC6.5.1.2 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**.

OC6.5.1.3 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.

OC6.5.2 Outage change initiated by a Generator

OC6.5.2.1 **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**.

OC6.5.2.2 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.

OC6.5.2.3 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

OC6.5.2.4 Where, in accordance with OC6.5, 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.

OC6.6 OTHER INFORMATION TO BE NOTIFIED

OC6.6.1 **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**.

OC6.6.2 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 OC6.6.1. 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.

OC6.7 NETWORK CONTROL

OC6.7.1 NETWORK CONTROL ACTIONS

OC6.7.1.1 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.

OC6.7.1.2 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**.

OC6.7.1.3 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**.

OC6.7.2 NOTIFICATION TO USERS OF NETWORK CONTROL

OC6.7.2.1 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.

OC6.7.2.2 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**.

OC6.7.2.3 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 OC6.7.3 shall apply.

OC6.7.3 CONTROL UNDER FAULT OR EMERGENCY CONDITIONS

OC6.7.3.1 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 OC6.7.2 prior to the occurrence of the **Control Action**.

OC6.7.3.2 In the circumstances referred to in OC6.7.3.1 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

OC6.7.3.3 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.

OC6.7.4 DE-ENERGISATION OF USERS BY THE TSO

OC6.7.4.1 **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;
- (i) any material breach of a **Connection Condition**; and
- (j) any action or inaction which places the **TSO** in breach of any legal or statutory or regulatory obligation.

OC6.7.4.2 Instructions to **De-energise** a **User** connected to the distribution system under the terms of OC6.7.4.1 may be issued by the **TSO** to the **DSO** who shall act on the instruction without undue delay.

OC7 INFORMATION EXCHANGE

OC7.1 NOTIFICATION OF EVENTS AND OPERATIONS..... OC7-2

OC7.1.1 INTRODUCTION..... OC7-3

OC7.1.2 OBJECTIVE..... OC7-3

OC7.1.3 SCOPE..... OC7-3

OC7.1.4 REQUIREMENT TO NOTIFY..... OC7-3

OC7.1.5 NOTIFICATION OF AN OPERATION..... OC7-3

OC7.1.6 FORM OF NOTIFICATION OF AN OPERATION..... OC7-3

OC7.1.7 RECORDING OF AN OPERATION..... OC7-4

OC7.1.8 TIMING IN RESPECT OF AN OPERATION..... OC7-4

OC7.1.9 NOTIFICATION OF EVENTS..... OC7-5

OC7.1.10 FORM OF NOTIFICATION OF AN EVENT..... OC7-5

OC7.1.11 PROVISION OF FURTHER INFORMATION..... OC7-5

OC7.1.12 RECORDING OF AN EVENT..... OC7-6

OC7.1.13 TIMING IN RESPECT OF AN EVENT..... OC7-6

OC7.2 OPERATIONAL COMMUNICATION AND DATA RETENTION..... OC7-7

OC7.2.1 INTRODUCTION..... OC7-7

OC7.2.2 OBJECTIVE..... OC7-7

OC7.2.3 SCOPE..... OC7-8

OC7.2.4 CONTACT LOCATIONS..... OC7-8

OC7.2.5 COMMUNICATION FACILITIES..... OC7-14

OC7.2.6 COMMUNICATION BETWEEN THE TSO AND THE USER..... OC7-16

OC7.2.7 DATA AND NOTICES..... OC7-17

OC7.2.8 DATA RETENTION..... OC7-18

OC7.1 NOTIFICATION OF EVENTS AND OPERATIONS

OC7.1.1 INTRODUCTION

OC7.1.1.1 OC7.1 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**.

OC7.1.1.2 The requirement to notify in OC7.1 relates generally to notification of what is expected to happen or what has happened. However, as OC7.1 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 OC7.1 in relation to the **Operation** or **Event** on the first **User System**.

OC7.1.1.3 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**.

OC7.1.1.4 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 OC7.1 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 OC7.1.

OC7.1.2 OBJECTIVE

The objective of OC7.1 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**.

OC7.1.3 SCOPE

OC7.1.3.1 OC7.1 applies to the **TSO** and to **Users**, which term in OC7.1 means:-

- (a) **Generators;**
- (b) **Interconnector Operators;**
- (c) **Dispatchable WFPSs;**
- (d) **Distribution System Operator;**
- (e) **Demand Customers;** and
- (f) **Demand Side Unit Operators.**

OC7.1.3.2 It is required that as part of the fulfilment of obligations under this OC7.1, 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.

OC7.1.4 REQUIREMENT TO NOTIFY

OC7.1.4.1 While in no way limiting the general requirements to notify set out in this OC7.1, the **TSO** and **Users** shall agree to review from time to time which **Operations** and **Events** are required to be notified.

OC7.1.5 NOTIFICATION OF AN OPERATION

OC7.1.5.1 The **TSO** will notify the **User**, (save in circumstances as provided for under OC7.1.5.2), 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 OC7.1 to any other person.

OC7.1.5.2 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.

OC7.1.5.3 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 OC7.1.

OC7.1.6 FORM OF NOTIFICATION OF AN OPERATION

OC7.1.6.1 A notification (and any response to any questions asked under OC7.1.6.3), 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.

OC7.1.6.2 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.

OC7.1.6.3 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.

OC7.1.7 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**.

OC7.1.8 TIMING IN RESPECT OF AN OPERATION

A notification under Section OC7.1.5 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.

OC7.1.9 NOTIFICATION OF EVENTS

OC7.1.9.1 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.

OC7.1.9.2 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**.

OC7.1.9.3 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.

OC7.1.10 FORM OF NOTIFICATION OF AN EVENT

OC7.1.10.1 A notification (and any response to any questions asked under Section OC7.1.10.3) of an **Event**, will describe the **Event**, pursuant to Section OC7.1.9 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

OC7.1.10.2 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.

OC7.1.10.3 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.

OC7.1.11 PROVISION OF FURTHER INFORMATION

When an **Event** has been reported to the **TSO** by a **Generator** or **Interconnector Operator** under OC7.1 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.

OC7.1.12 RECORDING OF AN EVENT

Notification of an **Event** pursuant to Section OC7.1.9 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**.

OC7.1.13 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 OC7.1, and in any event, except in an emergency, within fifteen minutes of such time.

OC7.2 OPERATIONAL COMMUNICATION AND DATA RETENTION

OC7.2.1 INTRODUCTION

OC7.2.1.1 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**.

OC7.2.2 OBJECTIVE

OC7.2.2.1 The objectives of OC7.2 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.

OC7.2.2.2 Pursuant to this OC7.2 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.

OC7.2.2.3 This OC7.2 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 OC7.2.

OC7.2.3 SCOPE

OC7.2.3.1 OC7.2 applies to the **TSO** and to **Users**, which term in OC7.2 means:

- (a) **Generators**;
- (b) **Interconnector Operators**;
- (c) **Dispatchable WFPS**;
- (d) **Distribution System Operator**;
- (e) **Demand Customers**; and
- (f) **Demand Side Unit Operator**.

OC7.2.4 CONTACT LOCATIONS

OC7.2.4.1 THE TSO

OC7.2.4.1.1 Other than where specifically provided for under Section OC7.2.4.1.2 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 OC7.2.6.2 the **Emergency Control Centre (ECC)**.

OC7.2.4.1.2 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.

OC7.2.4.1.3 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 OC7.2.4.1.2) in order to assist the **User** in communicating with the **TSO**.

OC7.2.4.2 GENERATORS

OC7.2.4.2.1 The **Generator** contact locations and personnel referred to in this Section OC7.2.4.2 shall be notified by the **Generator** to the **TSO** prior to connection and thereafter updated as appropriate.

OC7.2.4.2.2 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.

OC7.2.4.2.3 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**.

OC7.2.4.2.4 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 OC7.2.4.2.2 and OC7.2.4.2.3. 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.

OC7.2.4.2.5 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.

OC7.2.4.3 **Demand Customers**

OC7.2.4.3.1 The **Demand Customers** contact locations and personnel referred to in this Section OC7.2.4.3 shall be notified by the **Demand Customer** to the **TSO** prior to connection and thereafter updated as appropriate.

OC7.2.4.3.2 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**.

OC7.2.4.3.3 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**.

OC7.2.4.3.4 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 OC7.2.4.3.2 and OC7.2.4.3.3. 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.

OC7.2.4.4 DSO

OC7.2.4.4.1 The **DSO** contact locations and personnel referred to in this Section OC7.2.4.4 shall be notified by the **DSO** to the **TSO** prior to connection and thereafter updated as appropriate.

OC7.2.4.4.2 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.

OC7.2.4.4.3 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.

OC7.2.4.5 Dispatchable WFPs

- OC7.2.4.5.1 The **Dispatchable WFPS's** contact locations and personnel referred to in this Section OC7.2.4.5 shall be notified by the **Dispatchable WFPS** to the **TSO** prior to connection and thereafter updated as appropriate.
- OC7.2.4.5.2 The **Dispatchable WFPS** is required to provide a **Control Facility**. The **Dispatchable WFPS** shall ensure acting in accordance with **Good Industry Practice** that the **Control Facility** is staffed at appropriate staffing levels at all times.
- OC7.2.4.5.3 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 WFPS** 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 WFPS**:
- (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 WFPS** during **System Emergency Conditions**.
- OC7.2.4.5.4 At any point in time, a single person shall be designated by the **Dispatchable WFPS** 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 OC7.2.4.2.2 and OC7.2.4.2.3. 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.
- OC7.2.4.5.5 The **Responsible Manager** shall be authorised by the **Dispatchable WFPS** to perform the following functions on behalf of the **Dispatchable WFPS**:
- (a) to submit and revise an **Availability Notice** and other data under SDC1 for the **Dispatchable WFPS**;
 - (c) to communicate with respect to issues regarding **Outages** of the **Dispatchable WFPS**.

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

OC7.2.4.6 INTERCONNECTOR OPERATORS

OC7.2.4.6.1 The **Interconnector Operator** contact locations and personnel referred to in this section OC7.2.4.6 shall be notified by the **TSO** prior to connection and thereafter updated as appropriate.

OC7.2.4.6.2 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.

OC7.2.4.6.3 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**.

OC7.2.4.6.4 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 OC7.2.4.6.2 and OC7.2.4.6.3. 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.

OC7.2.4.6.5 The **Responsible Manager** shall be authorised by the **Interconnector Operator** to perform the following functions on behalf of the **Interconnector Operator**:

- (a) to make estimates in accordance with **Good Industry Practice** as to the **Availability, Ancillary Service** capability and **Operating Characteristics** of the **Interconnector**;
- (b) to make **Declarations** for the **Interconnector**;
- (c) to communicate with respect to issues regarding **Outages** of the **Interconnector**.

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

OC7.2.4.7 DEMAND SIDE UNIT OPERATORS

OC7.2.4.7.1 **Demand Side Unit Operators** are required to provide a **Control Facility**. The **Demand Side Unit Operator** shall ensure acting in accordance with **Good Industry Practice** that the **Control Facility** is staffed with appropriate staffing levels at all times.

OC7.2.4.7.2 For **Demand Side Unit Operator**, the **Control Facility** shall be staffed by a **Responsible Operator(s)** who shall respond to communications from the **TSO** without undue delay (except where otherwise provided for by agreement between the **Demand Side Unit Operator** and the **TSO**, such agreement not to be unreasonably withheld) and are of suitable experience and training and are authorised to perform functions on behalf of the **Demand Side Unit Operator** as follows:

- (a) to accept and execute **Dispatch Instructions**;
- (b) to receive and acknowledge receipt of requests, for amongst other matters, operation outside the **Declared** values of **Demand Side Unit MW Availability**.

OC7.2.4.7.3 At any point in time, a single person shall be designated by the **Demand Side Unit Operator** and notified to the **TSO** as the **Responsible Manager**. The **Responsible Manager** shall be responsible for dealing with the **TSO** on matters relating to the **Grid Code** other than as provided for in OC7.2.4.3.6 and OC7.2.4.3.7. 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.

OC7.2.4.7.4 The **Responsible Manager** shall be authorised by the **Demand Side Unit Operator** to perform the following functions on behalf of the **Demand Side Unit Operator**:

- (a) to make estimates in accordance with **Good Industry Practice** as to the **Demand Side Unit MW Availability**;
- (b) to make **Declarations** of the **Demand Side Unit MW Availability** for **Demand Side Unit Operator**; and
- (c) to communicate with respect to issues regarding **Outages** of each **Individual Demand Site** within the **Demand Side Unit**.

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

OC7.2.4.7.5 Unless otherwise agreed with the **TSO**, each **Individual Demand Site** comprising a **Demand Side Unit** shall have a **Responsible Operator** that must be capable of being contacted from the **Control Facility** of the **Demand Side Unit Operator** at all times and is capable of being at the **Individual Demand Site** within 1 hour of request to respond to any query or issue from the **Responsible Operator** at the **Control Facility** of the **Demand Side Unit Operator** or the **TSO**.

OC7.2.5 COMMUNICATION FACILITIES

OC7.2.5.1 The minimum communications facilities which are to be installed and maintained between the **TSO** and the **User** are defined in this Section OC7.2.5.

OC7.2.5.2 All equipment to be provided by **Users** under this Section OC7.2.5 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.

OC7.2.5.3 Supervisory Control and Data Acquisition (SCADA)

OC7.2.5.3.1 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.

OC7.2.5.3.2 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.

OC7.2.5.3.3 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.

OC7.2.5.4 Computer equipment

OC7.2.5.4.1 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**.

OC7.2.5.4.2 Each **User** shall be responsible for optimising the reliability and security of the computer equipment, referred to in OC7.2.5.4.1, including the provision, at no charge, of an uninterruptible power supply.

OC7.2.5.5 Telephone/Facsimile

OC7.2.5.5.1 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 OC7.2.5.5.

OC7.2.5.5.2 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 OC7.2.4.2.3, OC7.2.4.3.3, or OC7.2.4.4.3 (as appropriate) and answered without undue delay. **Users** shall be responsible for the provision at no charge of an uninterruptible power supply.

OC7.2.5.5.3 **Users** shall provide a Public Switched Telephone Network circuit to the **Communications and Control Room**.

OC7.2.5.5.4 **Users** shall provide no fewer than two separate Public Switched Telephone Network circuits to the **Control Facility**.

OC7.2.5.5.5 **Users** shall provide no fewer than one telefacsimile unit, connected to a dedicated Public Switched Telephone Network circuit at the **Control Facility**.

OC7.2.5.7 Access and Security

OC7.2.5.7.1 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.

OC7.2.5.8 Time Standards

OC7.2.5.8.1 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.

OC7.2.6 COMMUNICATIONS

OC7.2.6.1 Communication Between the TSO and the User

OC7.2.6.1.1 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**.

OC7.2.6.1.2 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.

OC7.2.6.1.3 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 OC7.2.5.

OC7.2.6.1.4 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.

OC7.2.6.2 COMMUNICATION BETWEEN THE TSO AND EXTERNAL TSO

OC7.2.6.2.1 For **Interconnectors**, the procedure for operational liaison by the **TSO** with the **External TSO** is set out in the **Interconnector Operating Protocol**.

OC7.2.6.2.2 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**.

OC7.2.7 DATA AND NOTICES

OC7.2.7.1 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.

OC7.2.7.2 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.

OC7.2.7.3 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.

OC7.2.7.4 All data items, where applicable, will be referenced to nominal **Voltage** and **Frequency** unless otherwise stated.

OC7.2.7.5 All **Operational Data** is to be supplied in accordance with the timetables set out in the **Grid Code**.

OC7.2.8 DATA RETENTION

OC7.2.8.1 **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.

OC7.2.8.2 The **TSO** and **Users** will keep all **Operational Data** confidential.

OC7.2.8.3 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 OC7.2.8.4). 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).

OC7.2.8.4 The **TSO** shall afford **Users** access to its records (and copies thereof) of **Operational Data** and/or data required to be maintained under OC7.2.8.3 on reasonable notice.

OC8 OPERATIONAL TESTING

OC8.1 INTRODUCTION OC8-2

OC8.2 OBJECTIVE OC8-2

OC8.3 SCOPE OC8-3

OC8.4 TESTS REQUIRED BY THE TSO OC8-3

OC8.5 TESTS REQUIRED BY THE USERS OC8-4

OC8.6 PROCEDURE FOR REQUESTING OPERATIONAL TESTS OC8-4

OC8.7 EVALUATION OF PROPOSED OPERATIONAL TESTS OC8-6

OC8.8 APPROVAL FOR OPERATIONAL TESTING OC8-6

OC8.9 SCHEDULING OF OPERATIONAL TESTS OC8-8

OC8.10 DISPATCHING OF OPERATIONAL TESTS OC8-8

OC8.11 TEST REPORTING OC8-9

OC8.12 DISPUTES OC8-10

OC8 OPERATIONAL TESTING

OC8.1 INTRODUCTION

OC8.1.1 OC8 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**

OC8.1.2 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 and **Demand Side Unit MW Availability**; and
- (b) the operations of **Users** and the quality and continuity of supply of electricity to **Users**.

OC8.1.3 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 OC8.1.2, are subject to central co-ordination and control.

OC8.1.4 To achieve the primary objective as outlined in OC8.2.1, OC8 sets out procedures for establishing and reporting **Operational Tests**.

OC8.2 OBJECTIVE

OC8.2.1 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**.

OC8.2.2 By way of example, tests that are typical of those which may be expected to be covered by OC8 are listed in OC8.4 to OC8.5. 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 OC8.

OC8.2.3 OC8 is not intended to deal with tests which may be called routinely by the **TSO** in order to assess compliance of **Users** with their design, operating and connection requirements as specified in the **Grid Code** and in each **User's Connection Agreement, Ancillary Services Agreements** and **System Support Agreement**, or to assess that **Generators or Interconnector Operators** are in compliance with their **Registered Data** as notified by **Declarations**, where appropriate, or to determine that **Generation Units or Interconnectors** are in compliance with **Dispatch Instructions**. These issues are covered under OC10 (**Monitoring, Testing and Investigation**).

OC8.3 SCOPE

OC8 applies to the **TSO** and to all **Users**, which term in this OC8 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**.

OC8.4 TESTS REQUIRED BY THE TSO

OC8.4.1 The **TSO** as operator of the **Transmission System** will in accordance with **Prudent Utility Practice**, need 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**.

OC8.4.2 **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.

OC8.4.3 The provisions of OC8.6, OC8.7, OC8.8, OC8.10.4 and OC8.11 shall not apply to **Operational Tests** required by the **TSO** under this OC8.4.

OC8.4.4 Where the **TSO** intends to carry out an **Operational Test** in accordance with this OC8.4 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 OC7 (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**.

OC8.4.5 Where a **User**, having been informed about an **Operational Test** under OC8.4.4 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.

OC8.5 TESTS REQUIRED BY THE USERS

OC8.5.1 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.

OC8.5.2 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**.

OC8.5.3 **Operational Tests** can comprise of a **Full-Day Test** and/or a **Within-Day Test**.

OC8.6 PROCEDURE FOR REQUESTING OPERATIONAL TESTS

OC8.6.1 **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**.

OC8.6.2 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:

- OC8.6.2.1 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**.
- OC8.6.2.2 the preferred time or times for the test;
- OC8.6.2.3 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;
- OC8.6.2.4 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).
- OC8.6.2.5 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.
- OC8.6.3 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**.

OC8.7 EVALUATION OF PROPOSED OPERATIONAL TESTS

OC8.7.1 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.

OC8.7.2 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.

OC8.7.3 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**.

OC8.8 APPROVAL FOR OPERATIONAL TESTING

OC8.8.1 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.

OC8.8.2 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

OC8.8.3 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.

OC8.8.3.1 On receipt of the proposed **Dispatch** procedure and schedule of the **Operational Test**, the **Test Proposer** shall notify the **TSO** without undue delay, of the **Test Proposer's** acceptance or rejection of the proposed **Dispatch** procedure and schedule for the test.

OC8.8.3.2 On notification of rejection of the proposed **Dispatch** procedure and schedule for the **Operational Test** by the **Test Proposer**, then the **Operational Test** shall not take place. The **Test Proposer** may enter into discussions with the **TSO** as to an alternative schedule for the **Operational Test**, or may request a different **Operational Test** or may request the **Operational Test** at an alternative time.

OC8.8.3.3 On notification of acceptance of the proposed **Dispatch** procedure and schedule for the **Operational Test** by the **Test Proposer**, the **TSO** shall inform other **Users** as to the scheduled time and nature of the test, if in the opinion of the **TSO** those **Users** will or may be significantly affected by the test, or otherwise as dictated by standing arrangements.

OC8.8.3.4 If **Operationally Affected Users** are not satisfied with the proposed **Operational Test**, they shall advise the **TSO** of their concerns. The **TSO** shall not cancel proposed **Operational Test** unless these objections are reasonable. If **Operationally Affected Users** are still not satisfied with the **Operational Test** being approved, then they may appeal the decision to the **CER** in accordance with OC8.12.

OC8.8.3.5 Notification by the **TSO** to the **Test Proposer** of the proposed **Dispatch** procedure and schedule for an **Operational Test**, or notification by the **Test Proposer** to the **TSO** of acceptance of the proposed **Dispatch** procedure and schedule, does not constitute a **Dispatch Instruction** from the **TSO** to the **Test Proposer**.

OC8.8.4 On rejection of the proposed **Operational Test** by the **TSO**, the **Test Proposer** may enter into discussions with the **TSO** as to an alternative schedule for the **Operational Test**, or may request a different **Operational Test** or may request the **Operational Test** at an alternative time. If the amended proposal for an

Operational Test is approved by the **TSO**, and the **User** requesting the **Operational Test** is a **Generator**, then OC8.8.3 shall apply.

OC8.8.5 If the **Test Proposer** is not satisfied that there are reasonable grounds for rejecting the proposed **Operational Test**, then they may appeal to the **CER** according to OC8.12.

OC8.9 SCHEDULING OF OPERATIONAL TESTS

OC8.9.1 **Operational Tests** will usually, but not necessarily, be scheduled by the **TSO** in accordance with SDC1 .

OC8.9.2 Where a **Full-Day Test** is requested by a **User**, the **User** shall submit a **Nomination Profile** consistent with planned **Operational Tests** as part of its **Commercial Offer Data** 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**.

OC8.9.3 The **TSO** shall use reasonable endeavours to prioritise **Operational Tests** where the **Test Proposer** has notified the **TSO** that **Operational Tests** are required in accordance with licence conditions, statutory regulations or safety codes or a delay in the execution of the tests may have an adverse material impact on a **User**.

OC8.10 DISPATCHING OF OPERATIONAL TESTS

OC8.10.1 **Dispatch Instructions** for **Operational Tests** shall be issued by the **TSO** in the normal manner for issuing **Dispatch Instructions** in accordance with **SDC2**.

OC8.10.2 The **TSO** shall use reasonable endeavours to ensure that scheduled **Operational Tests** are dispatched in accordance with the agreed **Dispatch** procedures.

OC8.10.3 Where the **TSO** foresees a requirement or likely requirement to cancel, postpone or otherwise significantly alter an agreed **Dispatch** procedure and schedule, then the **TSO** shall inform the **Test Proposer** as soon as reasonably possible. In this case the provisions of OC.8.10.4 and OC.8.10.5 apply.

OC8.10.4 Where the **TSO** assesses that the impact of an **Operational Test** on **Transmission System** security or on the continuity and quality of supply or operation of a **User** may or is likely to be significantly greater than originally

estimated, the **TSO** may contact the **Test Proposer** to discuss a revised test procedure or schedule.

OC8.10.5 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 OC8.10.4 prior to taking such action where the cancellation, interruption or postponement is for other than technical reasons.

OC8.10.6 If the **Test Proposer** wishes to cancel a **Full-Day Test** either before commencement of the test or during the test, the **TSO** must be notified by the **Test Proposer**, in accordance with OC7. **Availability Notices, Technical Parameters Notices** and **Dispatch Instructions** shall remain valid when **Operational Tests** are cancelled.

OC8.10.7 If the **Test Proposer** wishes to cancel a **Within-Day Test**, either before commencement of the test or during the test, the **TSO** must be notified by the **Test Proposer**, in accordance with OC7. The **TSO** will recompile the **Indicative Operations Schedule** and **Dispatch** the unit accordingly.

OC8.11 TEST REPORTING

OC8.11.1 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 OC8.6.2.3 have been completed.

OC8.11.2 At the conclusion of the **Operational Test**, the **Test Proposer** shall be responsible for preparing a written report on the **Operational Test** (the "**Final Report**") which shall be available within three months of the conclusion of the **Operational Test** to the **TSO**, **Operationally Effected Users** and the **CER** on request.

OC8.11.3 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.

OC8.11.4 The **Final Report** shall include a description of the **Plant** and/or **Apparatus** tested and a description of the **System Test** carried out together with the results, conclusions and recommendations as they relate to the **TSO** and **Operationally Effected Users**.

OC8.12 DISPUTES

OC8.12.1 **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 **CER** providing details of their objections.

OC8.12.2 The **Test Proposer** has right of appeal to the **CER** if it considers that rejection of the proposed **Operational Test** is unreasonable.

OC9 EMERGENCY CONTROL AND POWER SYSTEM RESTORATION

OC9.1 INTRODUCTION..... OC9-2
OC9.2 OBJECTIVEOC9-2
OC9.3 SCOPE.....OC9-3
OC9.4 SYSTEM ALERTSOC9-3
OC9.5 POWER SYSTEM RESTORATION OC9-4
OC9.6 DE-ENERGISATION OF THE USER’S PLANT BY THE TSOOC9-5

OC9 EMERGENCY CONTROL AND POWER SYSTEM RESTORATION

OC9.1 INTRODUCTION

OC9.1.1 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 OC9 provides for specific requirements to address such situations.

OC9.1.2 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.

OC9.1.3 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**.

OC9.1.4 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**.

OC9.2 OBJECTIVE

OC9.2.1 The objective of OC9 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.

OC9.3 SCOPE

OC9 applies to the **TSO** and to all **Users**, which term in this OC9 means:

- (a) **Generators** which for the purposes of OC9 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**.

OC9.4 SYSTEM ALERTS

OC9.4.1 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.

OC9.4.2 **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.

OC9.4.3 AMBER ALERTS

OC9.4.3.1 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.

OC9.4.3.2 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**.

OC9.4.3.3 Each **User** is responsible for internal procedures necessary to execute the standing procedures.

OC9.4.4 RED ALERTS

OC9.4.4.1 A **Red Alert** may be issued when, other than as provided for in OC10, 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**.

OC9.4.4.2 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.

OC9.4.4.3 Each **User** is responsible for internal procedures necessary to execute the standing procedures.

OC9.4.5 BLUE ALERTS

OC9.4.5.1 The issuing of a **Blue Alert** other than as provided for in 9.5.4, by the **TSO** signifies that either a **Partial Shutdown** or a **Total Shutdown** of the **Power System** has taken place.

OC9.4.5.2 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**.

OC9.4.5.3 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**.

OC9.5 POWER SYSTEM RESTORATION

OC9.5.1 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**.

OC9.5.2 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**.

OC9.5.3 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 OC9.5.2.

OC9.5.4 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.

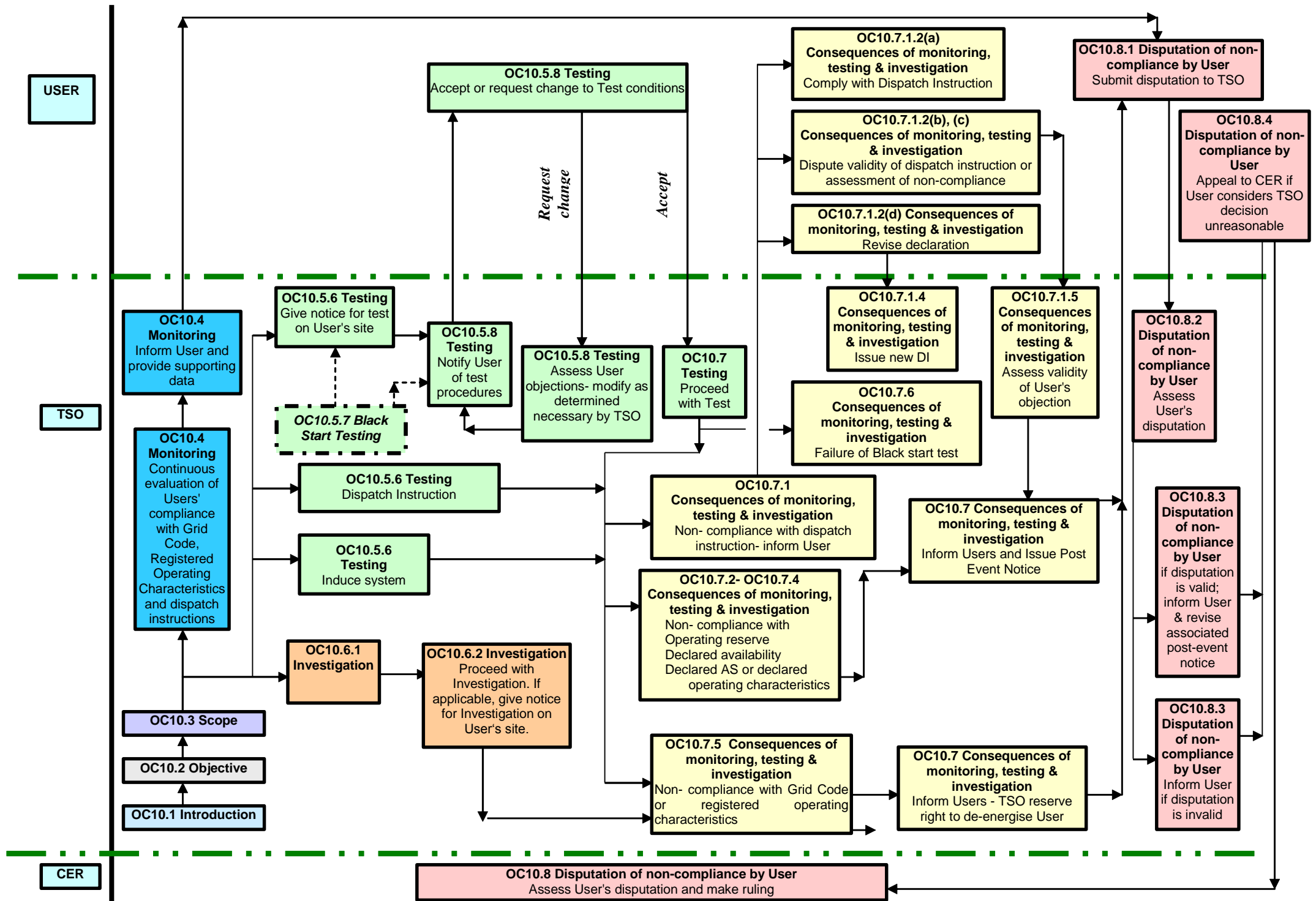
OC9.6 DE-ENERGISATION OF THE USER'S PLANT BY THE TSO

OC9.6.1 **De-Energisation** of a **User's Plant** and **Apparatus** is also provided for in OC4.5.6. 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**.

OC10 MONITORING, TESTING AND INVESTIGATION

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|--|----------------|
| OC10.1 INTRODUCTION..... | OC10-3 |
| OC10.2 OBJECTIVE | OC10-3 |
| OC10.3 SCOPE..... | OC10-4 |
| OC10.4 MONITORING | OC10-4 |
| OC10.5 TESTING..... | OC10-7 |
| OC10.6 INVESTIGATION | OC10-10 |
| OC10.7 CONSEQUENCES OF MONITORING, TESTING AND INVESTIGATION..... | OC10-11 |
| OC10.8 DISPUTATION OF ASSESSMENT OF NON-COMPLIANCE BY THE A USER..... | OC10-17 |



OC10 MONITORING, TESTING AND INVESTIGATION

OC10.1 INTRODUCTION

OC10.1.1 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**.

OC10.1.2 OC10 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 (OC8)**.

OC10.2 OBJECTIVE

OC10.2.1 The primary objectives of OC10 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**.

OC10.2.2 In order to achieve the primary objective set out in OC10.2.1, OC10 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 International Electro technical Commission Standards: 'Electromagnetic Compatibility-Limits-Limitation of emission of harmonic currents for equipment connected to medium and high voltage power supply systems [IEC/TR3 61000-3-6] and 'Electromagnetic Compatibility-Limits-Limitation of voltage fluctuation and flicker for equipment

connected to medium and high voltage power supply systems ' [IEC/TR3 61000-3-7];

- (d) whether **Users** are in compliance with protection requirements and protection settings under the **Grid Code, Users' Connection Agreements, Ancillary Service Agreements** and **System Support Agreements** between **Users** and the **TSO**;
- (e) whether **Generators** have the ability to generate on **Primary Fuel** and **Secondary Fuel** (where applicable) and have the ability to carry out on on-line fuel changeover ; **and**
- (f) whether **Generators** have the required **Secondary Fuel** stock levels at the **Generator Site** and **Off-Site Storage Location**.

OC10.3 SCOPE

OC10 applies to the **TSO** and to the following **Users**

- (a) **Generators** which, for the purposes of OC10, 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.

OC10.4 MONITORING

OC10.4.1 **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**.

- OC10.4.2 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.
- OC10.4.3 **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.
- OC10.4.4 Performance parameters that the **TSO** shall **Monitor** may include, but are not limited to, the following:
- OC10.4.4.1 compliance with **Dispatch Instructions**;
- OC10.4.4.2 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**.
- OC10.4.4.3 Compliance with **IEC Power Quality** standards; and
- OC10.4.4.4 Provision of static and dynamic **Reactive Power**; and
- OC10.4.4.5 Monitoring of **Primary Fuel** and **Secondary Fuel** capability, on-line changeover capability and fuel storage levels.
- OC10.4.5 Monitoring systems and procedures

OC10.4.5.1 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.

OC10.4.5.2 Compliance of **Demand Side Units** with **Dispatch Instructions**

The following validation will be performed in real time:

- (i) A **Demand Side Unit** shall be deemed compliant if the **SCADA** signal confirms that the **Demand Side Unit MW Response** is within 5% of the **Dispatch Instruction**.

The following validation will be performed post event:

- (iii) A **Demand Side Unit** shall be deemed to be compliant with the **Dispatch Instruction** if the difference between the **Demand Side Unit Energy Profile** and the metered **Demand** plus the **Demand Side Unit MW Response** is within 5% of the **Demand Side Unit Energy Profile**.
- (iv)
- (iii) For **Demand Side Units** which are not **Dispatched** but have been declared **Available** in an **Availability Notice**, the **Demand Side Unit** shall be deemed to be compliant with its declared **Demand Side Unit Energy Profile** if the difference between the **Demand Side Unit Energy Profile** and the metered **Demand** is within 5% of the **Demand Side Unit Energy Profile**.

OC10.5 TESTING

- OC10.5.1 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 OC10.5.7.
- OC10.5.2 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.
- OC10.5.3 A **Test** may require the **User** to carry out specific actions in response to a **Dispatch Instruction**.
- OC10.5.4 The results of a **Test** may be derived from the **Monitoring** of performance during the **Test**.
- OC10.5.5 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 OC10.5.8, that the **Generator** is in compliance with its **Declared** values;
 - (d) request **Start-Up** on **Secondary Fuel**, or on-line changeover at **Primary Fuel Switchover Output** from **Primary Fuel** to **Secondary Fuel** or from **Secondary Fuel** to **Primary Fuel** at **Secondary Fuel Switchover Output**; and
 - (e) having given the **Generator** one **Business Day's** notice send a representative to the **Generator's Site** to verify the **Secondary Fuel** stock levels both at the

onsite **Secondary Fuel** storage location and if required at the **Off-Site Storage Location**.

OC10.5.6 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.

OC10.5.7 Black start Testing

- OC.10.5.7.1 The **TSO** may require a **Generator** with a **Black Start Station** to carry out a test (a "**Black Start Test**") on a **CDGU** in a **Black Start Station** either while the **Black Start Station** remains connected to an external alternating current electrical supply (a "**Black Start Unit Test**") or while the **Black Start Station** is disconnected from all external alternating current electrical supplies (a "**Black Start Station Test**"), in order to demonstrate that a **Black Start Station** has a **Black Start Capability**.
- OC.10.5.7.2 Where the **TSO** requires a **Generator** with a **Black Start Station** to carry out a **Black Start Unit Test**, the **TSO** shall not require the **Black Start Test** to be carried out on more than one **CDGU** at that **Black Start Station** at the same time, and would not, in the absence of exceptional circumstances, expect any other **CDGU** at the **Black Start Station** to be directly affected by the **Black Start Unit Test**.
- OC.10.5.7.3 The **TSO** may require a **Generator** or **Interconnector Operator** with a **Black Start Station** to carry out a **Black Start Unit Test** at any time (but will not require a **Black Start Unit Test** to be carried out more than once in each calendar year in respect of any particular **CDGU** or **Interconnector** unless it can justify on reasonable grounds the necessity for further tests or unless the further test is a re-test, and will not require a **Black Start Station Test** to be carried out more than once in every two calendar years in respect of any particular **CDGU** unless it can justify on reasonable grounds the necessity for further tests or unless the further test is a re-test).
- OC.10.5.7.4 When the **TSO** wishes a **Generator** or **Interconnector Operator** with a **Black Start Station** to carry out a **Black Start Test**, it shall notify the relevant **Generator** or **Interconnector Operator** at least 7 **Business Days** prior to the time of the **Black Start Test** with details of the proposed **Black Start Test**.
- OC.10.5.7.5 All **Black Start Tests** shall be carried out at the time specified by the **TSO** in the notice given under OC.10.5.7.4 and shall be undertaken in the presence of a reasonable number of representatives appointed and authorised by the **TSO**, who shall be given access to all information relevant to the **Black Start Test**.

OC10.5.8 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**.

OC10.5.8.1 The **TSO** shall treat information collected from **Users** during **monitoring** and **testing** as confidential.

OC10.5.9 Results of **Testing** shall be dealt with in accordance with OC10.7

OC10.6 INVESTIGATION

OC10.6.1 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**.

OC10.6.2 **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**.

OC10.7 CONSEQUENCES OF MONITORING, TESTING AND INVESTIGATION

OC10.7.1 Non-compliance with a Dispatch Instruction issued by the TSO to a Generator, Interconnector Operator, Demand Side Unit Operator or Generator Aggregator.

OC10.7.1.1 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**.

OC10.7.1.2 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 OC10.7.1.1); 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.

OC10.7.1.3 If the **Generator, Interconnector Operator, Demand Side Unit Operator** or **Generator Aggregator** complies in accordance with OC10.7.1.2 (a), no further action shall arise.

OC10.7.1.4 In the event of the **Generator, Interconnector Operator, Demand Side Unit Operator** or **Generator Aggregator** making a revised **Declaration** under OC10.7.1.2 (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 OC10.7.1.1 as having failed to comply with a **Dispatch Instruction**.

OC10.7.1.5 In the event of OC10.7.1.2 (b) or OC10.7.1.2 (c) applying, the **TSO** shall consider the substance of the **Generator's, Interconnector Operator's, Demand Side Unit Operator's** or **Generator Aggregator's** dispute. 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** dispute, 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** dispute and such information shall be deemed to be **Operational Data**.

OC10.7.1.6 Where the **TSO**, acting reasonably, is of the view that a dispute 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 OC10.7.1.2, 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**.

OC10.7.1.7 Where the **TSO** gives a **Post Event Notice** under OC10.7.1.6, 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 OC10.7.1.1 as having failed to comply with a **Dispatch Instruction**.

OC10.7.1.8 In the event that the **Dispatchable Demand Customer** is deemed by the **TSO** in accordance with the provisions of this OC10 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 **Dispatchable Demand Customer** of the continued non-compliance. The **Dispatchable Demand Customer** shall take immediate action to remedy such non compliance. The terms of this OC10.7.1.8 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 until **Testing** is completed on compliance with **Dispatch Instructions**.

OC10.7.2 Non-compliance by a Generator and Interconnector Operator with Declared Operating Reserve

OC10.7.2.1 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;

OC10.7.2.2 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**.

OC10.7.2.3 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.

OC10.7.2.4 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.

OC10.7.3 Non-compliance by a Generator, Interconnector Operator, Demand Side Unit Operator or Generator Aggregator with an Availability Notice

OC10.7.3.1 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.

OC10.7.3.2 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**.

OC10.7.3.3 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.

OC10.7.4 Non-compliance by a Generator, Demand Side Unit Operator or Interconnector Operator with Declared Ancillary Services or Declared Technical Parameters

OC10.7.4.1 In the event that the performance of a **Generation Unit, Demand Side Unit Operator** or **Interconnector** is deemed by the **TSO** to be in non-compliance with its **Declared Ancillary Services** capability or **Operating Characteristics**, then the **TSO** shall notify the **Generator, Demand Side Unit Operator** or **Interconnector Operator** of the non-compliance, and having so informed the **Generator, Demand Side Unit Operator** or **Interconnector Operator** then the **TSO** shall by means of a **Post Event Notice** override the **Generator's Declaration, Demand Side Unit Operator's Declaration** or **Interconnector Operator's Declaration** in respect of **Ancillary Services** or **Operating Characteristics** as appropriate.

OC10.7.4.2 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.

OC10.7.5 Non-compliance by a User with a Connection Condition or Registered Operating Characteristics

OC10.7.5.1 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 OC10.7.5 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 OC9.6.

OC10.7.5.2 In the event that the performance of an **Interconnector** 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 **Interconnector Operator** of the non-compliance and the **Interconnector Operator** shall take immediate action to remedy such non compliance. The terms of this OC10.7.5 shall be without prejudice to the rights of the **TSO** to **De-energise** the **Interconnector** and **Apparatus** in accordance with the terms of OC9.6.

OC10.7.5.3 In the event that the performance of a **Demand Side Unit** is deemed by the **TSO** in accordance with the provisions of this OC10 to be in non-compliance with its **Operating Characteristics**, including **Demand Side Unit Energy Profile**, 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 OC10.7.5 shall be without prejudice to the rights of the **TSO** to **De-energise** the **Demand Site** and **Apparatus** in accordance with the terms of OC9.6.

OC10.7.6 Failure of a Black Start Test

OC10.7.6.1 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).

OC10.7.6.2 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**.

OC10.7.6.3 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.

OC10.7.6.4 If following the procedure in OC10.7.6.2 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 OC10.7.6.2), 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.

OC10.7.6.5 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 OC10.5.7.4 following the same procedure as for the initial **Black Start Test**. The provisions of this OC10.5.7 will apply to such test.

OC10.8 DISPUTATION OF ASSESSMENT OF NON-COMPLIANCE BY THE A USER

OC10.8.1 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**.

- OC10.8.2 If a **User** submits a disputation to the **TSO** under OC10.8.1, 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.
- OC10.8.3 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.
- OC10.8.4 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 **CER**.

OC11 SAFETY CO-ORDINATION

OC11.1 INTRODUCTION..... OC11-2

OC11.2 OBJECTIVE..... OC11-2

OC11.3 SCOPE..... OC11-3

OC11.4 THE SAFETY RULES..... OC11-3

OC11.5 SAFETY AT THE INTERFACE BETWEEN THE TRANSMISSION SYSTEM AND THE USER SYSTEMOC11-4

OC11 SAFETY CO-ORDINATION

OC11.1 INTRODUCTION

OC11.1.1 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**.

OC11.1.2 **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**.

OC11.1.3 It will also be necessary to facilitate work by third parties in close proximity to **Transmission System Plant** and **Apparatus**.

OC11.1.4 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.

OC11.1.5 In the event of a conflict between OC11 (Safety Co-ordination) and any other section of the **Grid Code**, OC11 shall take precedence.

OC11.2 OBJECTIVE

OC11.2.1 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**.

OC11.2.2 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.

OC11.2.3 The **Safety Rules** shall also cover work on live **Transmission System Plant** and **Apparatus**.

OC11.3 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)).

OC11.4 SAFETY RULES

OC11.4.1 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.

OC11.4.2 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.

OC11.4.3 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.

OC11.4.4 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.

OC11.5 SAFETY AT THE INTERFACE BETWEEN THE TRANSMISSION SYSTEM AND THE USER SYSTEM

OC11.5.1 There shall be a **Designated Operator** for each **User Site**.

OC11.5.2 **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**.

OC11.5.3 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**.

OC11.5.4 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.

OC11.5.5 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**.

OC11.5.6 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**. The **TSC** is the document under which the principal elements of the market for electricity operate. Every **User** which trades in electricity above certain minimum thresholds or their **Intermediary** shall be a party to the **TSC**. The **Market Operator** is a party to the **TSC**, as is the **TSO** and the **Other TSO**.
- (d) The obligation to submit data in relation to some of the information required to be provided to the **TSO** by this SDC1 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** under the provisions of 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 for:

- (a) **Availability**: the daily submission by a **User** to the **TSO** of an **Availability Notice** in respect of any 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**) and **Dispatchable WFPSs**);
 - (ii) **Pumped Storage Plant Demand**;
 - (iii) **Interconnector Availability** (in the case of the **Interconnector Owner**) and **Price** (in the case of an **Interconnector User**);

- (iv) **Demand Side Units;**
 - (v) in the case of **Generator Aggregators**, its **Aggregated Generating Units;** and
 - (vi) **Controllable WFPSs.**
- (b) **Technical Parameters:** the daily 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;
- (c) **Commercial Offer Data:** the daily notification of **Commercial Offer Data;**
- (d) **Revisions/Re-declarations:** revisions / **Re-declarations** of such information (other than **Commercial Offer Data** after **Gate Closure**) as provided for this in SDC1;
- (e) **Indicative Operations Schedule:** the production and issuing by the **TSO** of an **Indicative Operations Schedule** the day before the **Trading Day** as a statement of which:
- (i) **CDGUs;**
 - (ii) **Pumped Storage Plant Demand;**
 - (iii) **Interconnectors;**
 - (iv) **Demand Side Units;**
 - (v) **Aggregated Generating Units;** and/or
 - (vii) **Controllable WFPSs**

may be required.

SDC1.1.3 In this SDC1, the term "**Gate Closure**" shall mean 10.00 hours on the day preceding the relevant Trading Day to which the notice relates (D-1).

SDC1.1.4 **INTRA-DAY TRADING**

There are three **Gate Windows**, denoted EA1 (Ex-Ante 1), EA2 (Ex-Ante 2), and WD1 (Within-day 1), and three associated **Trading Windows**. The rules for **Users** to submit new or revised data related to the three associated **Trading Windows** are set out in the **TSC**.

The timings of the key events for **Intra-Day Trading** are set out in the table below.

| Gate Window | EA1 | EA2 | WD1 |
|--------------------------------|---|---|--------------------------------------|
| Gate Window Opening | 06:00 on D-29 | 09:30 on D-1 | 11:30 on D-1 |
| Gate Window Closure | 09:30 on D-1 | 11:30 on D-1 | 08:00 on D |
| Trading Windows | | | |
| Start of Trading Window | Start of Trading Day (Trading Period starting 06:00) | Start of Trading Day (Trading Period starting 06:00) | Trading Period starting 18:00 |
| End of Trading | End of Trading | End of Trading | End of Trading |

| | | | | | | |
|---------------|-----------------------------|--------------------------|-----------------------------|--------------------------|-----------------------------|--------------------------|
| Window | Day Period 05:30) | (Trading Starting | Day Period 05:30) | (Trading Starting | Day Period 05:30) | (Trading Starting |
|---------------|-----------------------------|--------------------------|-----------------------------|--------------------------|-----------------------------|--------------------------|

SDC1.2

OBJECTIVE

The objectives of SDC1 are:

- (a) to enable the **TSO**, in conjunction with the **Other TSO**, to prepare an **Indicative Operations Schedule** (utilising, amongst other things, a **Merit Order**) by 16.00 hours on the day preceding the relevant **Trading Day** (D-1) to be used in the **Scheduling** and **Dispatch** process for that **Trading Day**;
- (b) to thereby 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);
- (c) 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);
- (d) to ensure that there is sufficient capacity to meet the electrical power demand, and thereby in conjunction with the **Other TSO** to ensure that there is sufficient capacity to meet the demand on the Island of Ireland at all times and in both cases together with an appropriate margin of reserve;
- (e) to publish an **Indicative Operations Schedule** as provided for in this SDC1.

SDC1.3

SCOPE

SDC1 applies to the **TSO** and to the following **Users**:

- (a) **Generators** with regard to their: **CDGUs**; and **Controllable WFPs**.
- (b) **Pumped Storage Generators** with regard to their **Pumped Storage Plant Demand**;
- (c) **Interconnector Owners** with regard to their **Interconnectors**;
- (d) In respect of the submission of **Commercial Offer Data** under SDC1.4.4.5 only, **Interconnector Users** in respect of their **Interconnector Units**;
- (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 SDC1.

SDC1.4 PROCEDURE

SDC1.4.1 Availability Notice

SDC1.4.1.1 Requirement

- (a) Each **User** shall, by not later than the EA1 **Gate Window Closures** 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**, available transfer capacity and/or **Demand Side Unit MW Availability** (as the case may be) of each of its:
- (i) **CDGUs**;
 - (ii) **Controllable WFPSs**;
 - (iii) **Pumped Storage Plant Demand**;
 - (iv) **Interconnectors** (to be submitted by the **Interconnector Owner**);
 - (v) **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 SDC1.4.1.1 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.

SDC1.4.1.2 Content

- (a) The **Availability Notice** shall state the:
- (i) **Availability** of the relevant:
 - **CDGU**; or
 - **Controllable WFPSs**; or
 - (ii) the **Demand Side Unit MW Availability** of the **Demand Side Unit** or **Pumped Storage Plant Demand**; or
 - (iii) the available transfer capacity as defined in the **TSC** in respect of an **Interconnector**;
- 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 **Trading Period** in the following **Optimisation Time Horizon** (subject to revision under SDC1.4.5.1(a)). The **Availability Notice** submitted in relation to an **Optimisation Time Horizon** will supersede the previous one in relation to that

part of the previous **Optimisation Time Horizon** which is covered by the new one.

- (b) 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 WFPs** 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 **Trading 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 EA1 **Gate Window Closure** each day, with the exception of **Aggregators** and **Dispatchable Demand Customers**, 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 SDC1.4.5 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 WFPSs** or **Aggregated Generating Units** maintain, repair, operate and fuel the **CDGU** and/or **Controllable WFPS** 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, use reasonable endeavours to ensure that it does not at any time declare in the case of its **CDGU**, **Controllable WFPS**, or **Aggregated Generating Unit**, the **Availability** or **Technical Parameters** at levels or values different from those that the **CDGU**, **Controllable WFPS**, 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 WFPS** 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 WFPS** and/or the **Aggregated Generating Unit** or equipment necessary to the operation of the **CDGU**, the **Controllable WFPS** 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 WFPS** and/or the **Aggregated Generating Unit**); or
- (e) it is not lawful for the **Generator** to operate the **CDGU**, the **Controllable WFPS** and/or the **Aggregated Generating Units**.

SDC1.4.3.4 **Availability of Demand Side Units**

Each **Demand Side Unit Operator** shall, subject to the exceptions in SDC1.4.3.5, 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**.

SDC1.4.3.6 Changes in Availability:

- (a) **Increasing:** 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** 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.
- (b) **Controllable WFPS:** If a **Generator** or, where relevant a **Generator Aggregator**, in respect of a **Controllable WFPS**, 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 **Trading Period** following the specified time.

SDC1.4.3.7 **Decreasing:** When a **CDGU** and/or **Controllable WFPS** 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 WFPS** from a specified time. Such notice shall be construed as meaning that the **CDGU** and/or **Controllable WFPS** 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 WFPS** 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 WFPS** 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**.

SDC1.4.3.8 If an **Interconnector Owner** in respect of an **Interconnector** issues an **Availability Notice** increasing (from zero or otherwise) or decreasing the level of available transfer capacity on the **Interconnector** as a whole from a specified time, such notice shall, subject to SDC1.4.5.1(a), be effective immediately following the specified time.

SDC1.4.4 **Technical and Commercial Data Requirements**

SDC1.4.4.1 **Technical Parameters**

(a) (i) By not later than the EA1 **Gate Window Closure**, each **User** shall in respect of each:

- **CDGU**;
- **Controllable WFPS**;
- **Aggregated Generating Unit**,
- **Pumped Storage Plant 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 following **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**.

(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.

SDC1.4.4.2 **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 Energy Profile** 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 Trading 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 changes.

SDC1.4.4.3 **Not used.**

SDC1.4.4.4 **Other Relevant Data**

- (a) By not later than the EA1 **Gate Window Closure** 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 following **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.]

- (b) Where a **CDGU** is capable of firing on different fuels, then the **Generator** shall submit details in respect of each fuel for the **CDGU**. Each set of details shall contain the information set out in (a) above for each fuel and each shall be marked clearly to indicate to which fuel it applies.

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.

SDC1.4.4.5

Commercial Offer Data

- (a) Each:
- **Generator;**
 - **Pumped Storage Generator;**
 - **Interconnector User;**
 - **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 **Interconnector Units;**
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, **Commercial Offer Data** by the **Gate Window Closures** for the corresponding **Trading Windows** in accordance with the **TSC**. If no new **Commercial Offer Data** is submitted, the last accepted data will be used.

- (b) Each **Generator** shall in respect of each of its **Energy Limited Generating Units** submit an **Energy Limit** as well as the **Commercial Offer Data** by **Gate Window Closure** for the corresponding **Trading Window**. If no new data is submitted, the last accepted data will be used.
- (c) Each **Pumped Storage Plant** will, with respect to its **Pumped Storage Plant Demand**, submit its **Target Reservoir Level** by **Gate Window Closure** for the corresponding **Trading Window**. If no new data is submitted, the last accepted data will be used.

The **TSO** may require, by notice to the relevant **User**, the data referred to at SDC1.4.4.5 (a) to (c) 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**.

SDC1.4.5 Revisions/Re-declarations to data

SDC1.4.5.1 Availability

- (a) **Availability:** A **User** may, subject to SDC1.4.3 and as provided 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 **OC10** 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 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.

SDC1.4.5.2 **Technical Parameters and Additional Grid Code Characteristics**

- (a) Technical Parameters: If any of the data submitted to the **TSO** under SDC1.4.4.1 and SDC1.4.4.4 changes, a **User** shall, subject to SDC1.4.3, (in the case of data submitted under SDC1.4.4.1 by means of a **Technical Parameters Notice**) 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. The **User** must notify the **TSO** of any new **Other Relevant Data** of which it becomes aware at any time after any original submission, in writing.
- (b) Additional Grid Code Characteristics: 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 **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.
- (c) **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 **EA1 Gate Window Closure**. Revised **Energy Limits for Hydro Units** may be submitted at any time up until 18.00 hours on the **Trading Day** in writing per unit basis.

SDC1.4.5.3 The **TSO** shall, insofar as it is reasonably able, take account of such revisions or notifications submitted under SDC1.4.5 for **Scheduling** and **Dispatch** purposes.

- SDC1.4.6 (a) Defaults:
- (i) Insofar as any data submitted or deemed to have been submitted on any particular day in any **Availability Notice**, **Technical Parameters Notice** (such notice not being relevant to an **Interconnector Owner**), or 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 Window** or any other values that the **TSO** may reasonably deem appropriate.

- (ii) Insofar as an **Availability Notice** is not submitted, the **User** shall be deemed to have submitted an **Availability Notice** by **Gate Closure** stating that the **Availability** of the relevant **CDGU, Controllable WFPS, Demand Side Unit** and/or the **Aggregated Generating Units** for the whole of the following **Trading Window** will be the level of **Availability** and **Operating Mode** declared in respect of the final **Trading Period** of the current **Trading Window** or any other values that the **TSO** may reasonably deem appropriate.
 - (iii) Insofar as not submitted or revised, the applicable **Standing Technical Offer Data** for **Technical Parameters** shall apply for the next following **Trading Day**.
 - (iv) Insofar as not submitted or revised, the last notice relating to **Other Relevant Data** to have been submitted shall apply for the next following **Trading Day**.
 - (v) In respect of **Hydro Units**, the **Energy Limit** that applied to the previous **Trading Day** will be used.
- (b) 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.

SDC1.4.7 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 WFPS, 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.

SDC1.4.8 Compilation of the Indicative Operations Schedule

- SDC1.4.8.1 An **Indicative Operations Schedule** will be compiled daily by the **TSO** in conjunction with the **Other TSO** as further provided in this SDC1.4.8 as a statement of which **CDGUs** and/or **Controllable WFPS** and/or transfers across any **Interconnector** and/or **Demand Side Units** and/or **Pumped Storage Plant Demand** and/or **Aggregated Generating Units** and equivalent units in *Northern*

Ireland may be required to operate and their expected **MW Output** for the next following **Trading Day**.

SDC1.4.8.2 **Merit Order**

Subject as provided below, a **Merit Order** will be compiled by the **TSO** (in conjunction with the **Other TSO**) for each **Trading Window** 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 WFPSs, Pumped Storage Plant Demand, Demand Side Units, Aggregated Generating Units** or **Interconnector** tranche to **Schedule and Dispatch** in relation to their **Price Sets**. The **Merit Order** will be on the basis of ascending prices so that the **CDGU, Controllable WFPS, Pumped Storage Plant Demand, Demand Side Unit, Aggregated Generating Unit Price Set** or **Interconnector** tranche **Price Set** at the head of the **Merit Order** will be that which has the lowest **Incremental Price per MWh**, and that at the foot of the **Merit Order** shall be the one with the highest **Incremental Price per MWh**. Each **CDGU, Controllable WFPS, Pumped Storage Plant Demand, Demand Side Unit, Aggregated Generating Units** and/or **Interconnector** tranche shall appear in the **Merit Order** for each **Price Set** submitted.

SDC1.4.8.3 In compiling the **Indicative Operations Schedule** in conjunction with the **Other TSO**, the **TSO** will take account of and give due weight to the following factors (and the equivalent factors on the **Other Transmission System** will be so treated separately by the **Other TSO**):

- (i) **Transmission System** constraints from time to time, as determined by the **TSO**;
- (ii) Reserve constraints from time to time, as determined by the **TSO**;
- (iii) the need to provide an **Operating Margin** (by using the various categories of reserve as specified in **OC4.6 and CC7.3.1.1** (as the case may be), as determined by the **TSO** acting in conjunction with the **Other TSO**;
- (iv) **Transmission System** stability considerations;
- (v) the level of **MW Output** and availability covered by **Non Centrally Dispatched Generating Units**, by **Plant** subject to **Priority Dispatch** and by **Controllable WFPS**;
- (vi) the **Target Reservoir Levels** for **Pumped Storage** taken against the initial conditions at 0600 hours the previous day;
- (vii) the **Energy Limits** for **Hydro Units**;
- (viii) in respect of all **Plant**, the values of their **Technical Parameters** registered under this SDC1 and other information submitted under SDC1.4.4.4;
- (ix) the **Start-Up Cost** of each **CDGU** and/or **Controllable WFPS** and the **Shutdown Cost** of each **Demand Side Unit**;
- (x) the requirements, as determined by the **TSO**, for **Voltage Control** and **Mvar** reserves;
- (xi) **CDGU** and/or **Controllable WFPS** stability, as determined by the **TSO**;

- (xii) other matters to enable the **TSO** to meet its **Licence Standards** and the **Other TSO** to meet its equivalent;
- (xiii) the requirements as determined by the **TSO**, for maintaining **Frequency Control**;
- (xiv) **Monitoring** and/or **Testing** and/or **Investigations** to be carried out, or being carried out, under **OC10** (as the case may be), Testing to be carried out, or being carried out, at the request of a User under **OC8** and/or **Commissioning Testing** under the CC;
- (xv) **System Tests, Operational Tests and Commissioning Tests**;
- (xvi) the inability of any **CDGU** and/or **Controllable WFPS** to meet its full reserve capability;
- (xvii) **Inter-jurisdictional Tie Line** limits;
- (xviii) other facts as may be reasonably considered by the **TSO** to be relevant to the **Indicative Operations Schedule**;
- (xix) the inflexible characteristics as declared by the **Generator** and abnormal risks;
- (xx) losses on the **Transmission System** and on the **Other Transmission System**;
- (xxi) **Nomination Profiles** where relevant;
- (xxii) requirements within any **Constrained Group**;
- (xxiii) the fact that the **Interconnector** tranches in the unconstrained **Indicative Market Schedule** cannot be changed in the **Indicative Operations Schedule**;

SDC1.4.8.4

Taking account of and applying the factors referred to in SDC1.4.8.3, the **Indicative Operations Schedule** shall be compiled by the **TSO** in conjunction with the **Other TSO** to **Schedule** such **CDGUs, Controllable WFPS, Pumped Storage Plant Demand, Demand Side Units, Aggregated Generating Units** and/or such **Interconnector** tranches, and equivalent units or tranches 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 **Merit Order**, starting with the **CDGU, Controllable WFPS, Pumped Storage Plant Demand, Demand Side Units** and/or **Aggregated Generating Unit Price Set**, and the **Price Set** for equivalent units in **Northern Ireland**, together with **Interconnector** tranches in the unconstrained **Indicative Market Schedule** at the head of the **Merit Order**;
- (ii) as will in aggregate (after taking into account electricity delivered other than from **CDGUs, Controllable WFPSs, Aggregated Generating Units**, and/or **Interconnector** tranches and variation in **Demand** from **Pumped Storage Plant 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 WFPSs, Pumped Storage Plant Demand, Demand Side Units, Aggregated Generating Units** and **Interconnector** tranches) 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 SDC1.4.8.3 will mean that, in general, the strict **Merit Order** may not necessarily be followed.

SDC1.4.8.5

After the completion of the **Scheduling** process, but before the issue of **Indicative Operations Schedule**, the **TSO** may consider it necessary to make adjustments to the **MW Output** as determined by the **Scheduling** process. Such adjustments could be made necessary by 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 **Availability** or **Demand Side Unit MW Availability** and/or **Technical Parameters** of **CDGUs** and/or **Controllable WFPS** and/or **Aggregated Generating Units** and/or **Demand Side Units** notified to the **TSO** after the commencement of the **Scheduling** process;
- (b) changes to **Demand** forecasts on the Island of Ireland;
- (c) changes to wind power forecasts on the Island of Ireland;
- (d) changes to **Transmission System** constraints, emerging from the necessarily iterative process of **Scheduling** and network security assessment;
- (e) changes to **CDGU** and/or **Controllable WFPS** requirements following notification to the **TSO** of the changes in capability of a **Generator** to provide a **Special Action** as described in SDC2;
- (f) changes to **CDGU** and/or **Controllable WFPS** requirements within **Constrained Groups**, following re-appraisal of **System Demand** forecasts on the Island of Ireland within that **Constrained Group**;
- (g) 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**;
- (h) known (or emerging) limitations and/or deficiencies of the **Scheduling** process.

SDC1.4.8.6

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 WFPS**, **Pumped Storage Plant Demand**, **Demand Side Unit**, **Aggregated Generating Unit** and/or **Interconnector** transfers is/are chosen other than in accordance with the **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 SDC1.4.8.3 in order to seek to maintain the integrity of the **Transmission System**.

- SDC1.4.8.7 (a) The **Synchronising** and **De-Synchronising** times (and, in the case of **Pumped Storage Plant 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 WFPS**, **Pumped Storage Plant 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 WFPS**, **Pumped Storage Plant 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 WFPS**, **Pumped Storage Plant 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**, the **Scheduled** relevant effective time.
- (b) The provisions of SDC1.4.8.7(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 MW Response Time**.

SDC1.4.8.8 Content of **Indicative Operations Schedule**

The information contained in the **Indicative Operations Schedule** will indicate, where appropriate, on an individual **CDGU**, **Controllable WFPS**, **Pumped Storage Plant Demand**, **Demand Side Unit** and/or **Aggregated Generating Units** basis, the period and **Loading** for which it is **Scheduled** during the following **Trading Day**. 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** during the following **Trading Day**. If no fuel is contained in the **Indicative Operations Schedule**, then the most recently specified fuel shall be treated as having been indicated.

SDC1.4.8.9 Issue of **Indicative Operations Schedule**

- (a) The **Indicative Operations Schedule** associated with the **EA2 Trading Window** will be published for access by **Users** by 1600 hours each day preceding the relevant **Trading Window**, and the **Indicative Operations Schedule** associated with the within-day **WD1 Trading Window** will be published for access by **Users** by 1330 hours each day on the relevant **Trading Day**, provided that all the necessary information from the **Users** was made available by not later than **Gate Window Closure**. However, if on any occasion the **TSO** is unable to meet these times, 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 **Indicative Operations Schedule** preceding the relevant **Trading Window**, the **TSO** may issue revised **Indicative Operations Schedules** up until one hour before the start of the **Trading Window**.
- (b) The **TSO** may issue **Dispatch Instructions** to **Users** in respect of **CDGUs**, **Controllable WFPSs**, **Pumped Storage Plant Demand** and/or **Demand Side Units** and/or **Aggregated Generating Units** and/or **Interconnector** transfers before the issue of the **Indicative Operations**

Schedule for the **Trading Day** to which the **Dispatch** instruction relates if the length of **Notice to Synchronise** the relevant **CDGUs** and/or **Controllable WFPs**, **Pumped Storage Plant 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 WFPs** and/or **Pumped Storage Plant 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.

SDC1.4.8.10 Regulation

It is a requirement for running the **Transmission System** that all **Synchronised CDGUs** and/or **Controllable WFPs** 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**.

SDC1.4.8.11 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 WFPs** and/or **Pumped Storage Plant Demand** and/or **Demand Side Units** and/or **Aggregated Generating Units** by not later than **Gate Closure** on the day prior to the **Trading Day**.

SDC1 Appendix A Part 2 sets out the additional data items required in respect of an **Additional Grid Code Characteristics Notice**.

SDC1 – APPENDIX A

Part 1. Technical Parameters

[Note: The factors applicable to CDGUs below 10 MW apply to the EirGrid Grid Code only.]

| Technical Parameter | CDGU | | | | Control WFPS | DSU | | Agg. Gen | CDGU <10 MW | Pump Storage Demand |
|-------------------------------------|---------|--------------|------------|------------|--------------|------------------------|--------------------------|----------|-------------|---------------------|
| | Thermal | Hydr/ En Ltd | Disp. WFPS | Pump S Gen | | Individual Demand Site | Aggregate d Demand Sites | | | |
| Block Load Cold | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Block Load Hot | ✓ | | | | | | | | ✓ | |
| Block Load Warm | ✓ | | | | | | | | ✓ | |
| Demand Side Unit Energy Profile | | | | | | ✓ | ✓ | | | |
| Demand Side Unit MW Availability | | | | | | ✓ | ✓ | | | |
| Demand Side Unit MW Response Time | | | | | | ✓ | ✓ | | | |
| Deload Break Point | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| De-Loading Rate 1 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| De-Loading Rate 2 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Dwell Time Up 1 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Dwell Time Up 2 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Dwell Time Up 3 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Dwell Time Down 1 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Dwell Time Down 2 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Dwell Time Down 3 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Dwell Time Up Trigger Point 1 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Dwell Time Up Trigger Point 2 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Dwell Time Up Trigger Point 3 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Dwell Time Down Trigger Point 1 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Dwell Time Down Trigger Point 2 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Dwell Time Down Trigger Point 3 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| End Point of Start Up Period | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Energy Limit | | ✓ | | | | | | | | |
| Energy Limit Factor | | ✓ | | | | | | | | |
| Energy Limit Start | | ✓ | | | | | | | | |
| Energy Limit Stop | | ✓ | | | | | | | | |
| Forecast Minimum Output Profile | | | | ✓ | | | | | | ✓ |
| Forecast Minimum Generation Profile | ✓ | ✓ | ✓ | ✓ | | | | | ✓ | |
| Demand Side Unit MW Response Time | | | | | | ✓ | ✓ | | | |
| Load Up Break Point Cold (1) | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Load Up Break Point Cold (2) | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |

| Technical Parameter | CDGU | | | | Control WFPS | DSU | | Agg. Gen | CDGU <10 MW | Pump Storage Demand |
|--|---------|--------------|------------|------------|--------------|------------------------|--------------------------|----------|-------------|---------------------|
| | Thermal | Hydr/ En Ltd | Disp. WFPS | Pump S Gen | | Individual Demand Site | Aggregate d Demand Sites | | | |
| Load Up Break Point Hot (1) | ✓ | | | | - | | | | ✓ | |
| Load Up Break Point Hot (2) | ✓ | | | | | | | | ✓ | |
| Load Up Break Point Warm (1) | ✓ | | | | | | | | ✓ | |
| Load Up Break Point Warm (2) | ✓ | | | | | | | | ✓ | |
| Loading Rate Cold (1) | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Loading Rate Cold (2) | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Loading Rate Cold (3) | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Loading Rate Hot (1) | ✓ | | | | | | | | ✓ | |
| Loading Rate Hot (2) | ✓ | | | | | | | | ✓ | |
| Loading Rate Hot (3) | ✓ | | | | | | | | ✓ | |
| Loading Rate Warm (1) | ✓ | | | | | | | | ✓ | |
| Loading Rate Warm (2) | ✓ | | | | | | | | ✓ | |
| Loading Rate Warm (3) | ✓ | | | | | | | | ✓ | |
| Max Ramp Down Rate (shall be a number greater than zero) | | | | | | ✓ | ✓ | | | |
| Max Ramp Up Rate (shall be a number greater than zero) | | | | | | ✓ | ✓ | | | |
| Maximum Down Time | | | | | | ✓ | ✓ | | | |
| Maximum Generation / Registered Capacity | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Maximum On Time | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Maximum Storage Capacity | | | | ✓ | | | | | | |
| Minimum Down Time | | | | | | ✓ | ✓ | | | |
| Minimum Generation | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Minimum off time | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Minimum on time | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Minimum Storage Capacity | | | | ✓ | | | | | | ✓✓ |
| (Other relevant technical parameters) | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | |
| Pumping capacity | | | | ✓ | | | | | | ✓ |
| Ramp Down Break Point 1 | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | |
| Ramp Down Break Point 2 | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | |
| Ramp Down Break Point 3 | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | |
| Ramp Down Break Point 4 | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | |
| Ramp Down Rate 1 | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | |
| Ramp Down Rate 2 | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | |
| Ramp Down Rate 3 | | ✓ | ✓ | ✓ | ✓ | | | ✓ | | |
| Ramp Down Rate 4 | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | |
| Ramp Down Rate 5 | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | |
| Ramp Up Break Point 1 | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | |
| Ramp Up Break Point 2 | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | |

| Technical Parameter | CDGU | | | | Control WFPS | DSU | | Agg. Gen | CDGU <10 MW | Pump Storage Demand |
|------------------------------------|---------|-------------|------------|------------|--------------|------------------------|------------------------|----------|-------------|---------------------|
| | Thermal | Hydr/En Ltd | Disp. WFPS | Pump S Gen | | Individual Demand Site | Aggregate Demand Sites | | | |
| | | | | | - | | | | - | - |
| Ramp Up Break Point 3 | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | |
| Ramp Up Break Point 4 | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | |
| Ramp Up Rate 1 | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | |
| Ramp Up Rate 2 | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | |
| Ramp Up Rate 3 | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | |
| Ramp Up Rate 4 | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | |
| Ramp Up Rate 5 | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | |
| Short Term Maximisation Capability | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Soak Time Cold (1) | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Soak Time Cold (2) | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Soak Time Hot (1) | ✓ | | | | | | | | ✓ | |
| Soak Time Hot (2) | ✓ | | | | | | | | ✓ | |
| Soak Time Trigger Point Cold (1) | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Soak Time Trigger Point Cold (2) | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Soak Time Trigger Point Hot (1) | ✓ | | | | | | | | ✓ | |
| Soak Time Trigger Point Hot (2) | ✓ | | | | | | | | ✓ | |
| Soak Time Trigger Point Warm (1) | ✓ | | | | | | | | ✓ | |
| Soak Time Trigger Point Warm (2) | ✓ | | | | | | | | ✓ | |
| Soak Time Warm (1) | ✓ | | | | | | | | ✓ | |
| Soak Time Warm (2) | ✓ | | | | | | | | ✓ | |
| Synchronous Start-Up Time Cold | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Synchronous Start-Up Time Hot | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Synchronous Start-Up Time Warm | ✓ | | | | | | | | ✓ | |
| Target Reservoir Level Percentage | | | | ✓ | | | | | | ✓ |
| Start of Restricted Range 1 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| End of Restricted Range 1 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| Start of Restricted Range 2 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |
| End of Restricted Range 2 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | |

[Part 2. Additional data items required in an Additional Grid Code Characteristics Notice]

Table (i)

| Variable | Applies to |
|---|--|
| Declared POR | CDGUs, excluding Dispatchable WFPSS |
| Declared SOR | CDGUs, excluding Dispatchable WFPSS |
| Declared TOR1 | CDGUs, excluding Dispatchable WFPSS |
| Declared TOR2 | CDGUs, excluding Dispatchable WFPSS |
| Declared Replacement Reserve | CDGUs, excluding Dispatchable WFPSS |
| Minimum MW for POR | CDGUs, excluding Dispatchable WFPSS |
| Minimum MW for SOR | CDGUs, excluding Dispatchable WFPSS |
| Minimum MW for TOR1 | CDGUs, excluding Dispatchable WFPSS |
| Minimum MW for TOR2 | CDGUs, excluding Dispatchable WFPSS |
| Minimum MW for Replacement Reserve | CDGUs, excluding Dispatchable WFPSS |
| POR Decrement Rate | CDGUs, excluding Dispatchable WFPSS |
| SOR Decrement Rate | CDGUs, excluding Dispatchable WFPSS |
| TOR1 Decrement Rate | CDGUs, excluding Dispatchable WFPSS |
| TOR2 Decrement Rate | CDGUs, excluding Dispatchable WFPSS |
| Replacement Reserve Decrement Rate | CDGUs, excluding Dispatchable WFPSS |
| Governor Droop | CDGUs, excluding Dispatchable WFPSS |

Table (ii)

| | |
|--|--|
| Black Start Capability (yes/no) | CDGUs, excluding Dispatchable WFPSS |
| Declared Reactive Power (Consumption) | CDGUs, excluding Dispatchable WFPSS |
| Declared Reactive Power (Production) | CDGUs, excluding Dispatchable WFPSS |
| Correction Factor (Mvar consumption) | CDGUs, excluding Dispatchable WFPSS |
| Correction Factor (Mvar Production) | CDGUs, excluding Dispatchable WFPSS |
| Export Adjustment Factor 1 | CDGUs, excluding Dispatchable WFPSS |
| Export Adjustment Factor 2 | CDGUs, excluding Dispatchable WFPSS |
| Unit Loss Factor | CDGUs, excluding Dispatchable WFPSS |

SDC1 ANNEX I

Explanatory Note of differences between SDC1 in the SONI Grid Code and EirGrid Grid Code

This annex is an explanatory note only and does not form part of the Grid Code.

1. General Differences in wording

The table below summarises the general differences in wording between the form of SDC1 in the SONI Grid Code and the form of SDC1 in the EirGrid Grid Code, which appear repeatedly throughout SDC1.

| Terms used in SONI Grid Code | Equivalent terms used in EirGrid Grid Code (where different) | Reason |
|-------------------------------------|---|--|
| System Support Services | Ancillary Service(s) | The existing arrangements for Ancillary Services and System Support Services are continuing until further notice. |
| System Support Services Agreement | Ancillary Service(s) Agreement | These agreements will continue to stay in place with their existing names |
| CCGT Module | CCGT Unit | This is the phrase currently used to describe the individual parts of a Combined Cycle Plant CCGT Module is an important concept in Northern Ireland and is reflected in many other agreements. EirGrid is keeping the phrase CCGT Unit, as it more closely describes the concept of an individual unit and EirGrid has formerly used CCGT Module to describe the whole CCGT Installation. |
| Prudent Operating Practice | Prudent Utility Practice | Each Code uses a different phrase for this concept. |
| Planned Outage | Schedule Outage | Each Code uses a different phrase for this concept. |
| Planned Maintenance Outage | Short Term Scheduled Outage | Each Code uses a different phrase for this concept. |

2. Specific differences in wording between equivalent provisions in both Grid Codes

The table below provides a list of the other specific differences in wording between equivalent provisions of SDC1 in both Grid Codes.

| Provision | SONI Grid Code | EirGrid Grid Code | Reason |
|------------------|----------------------------------|--|--|
| SDC1.4.2.2(b) | Reference is made to "PCA2.3.4" | Reference is made to "PCA.4.3 of the Planning Code Appendix" | These are the respective requirements for the provision of the CCGT Installation data. |
| SDC1.4.3.4 | Reference is made to "NI System" | Reference is made to "Network" | NI System refers to both the NI Transmission System and NI |

| | | | |
|-----------------|--|---|--|
| | | | Distribution System and Network refers to the Ireland Transmission System and Distribution System |
| SDC1.4.5.1(b) | Reference is made to "OC11" | Reference is made to "OC10" | These are the respective requirements for Testing Monitoring and Investigation |
| SDC1.4.5.1(d) | Reference is made to a User acting in accordance with its obligations under "SDC1.4.3 and Appendix B to this SDC1" | Reference is made to a User acting in accordance with its obligations under "SDC1.4.3" only | SONI has separate requirements for Availability and Technical Parameter related issues in respect of PPA Generation. |
| SDC1.4.6(a)(ii) | | The EirGrid Grid Code contains the following additional words at the end of the paragraph: <i>"or any other values that the TSO may reasonably deem appropriate"</i> | Difference is due to different requirements in both jurisdictions. |
| SDC1.4.8.1 | Reference is made to "the Republic of Ireland". | Reference is made to "Northern Ireland". | Reference is being made in each Grid Code to the other jurisdiction. |
| SDC1.4.8.3(i) | Reference is made to the "Transmission System and Distribution System constraints" | Reference is made to the "Transmission System constraints" only. | EirGrid will not be in a position to take Distribution Constraints into account in determining the IOS. |
| SDC1.4.8.3(iii) | Reference is made to "OC3" | Reference is made to "OC4.6 and CC7.3.1.1" | These are the respective references to Operating Margin. |
| SDC1.4.8.3(xiv) | Reference is made to "OC11" and then to "OC11.8" | Reference is made to "OC10" and then to "OC8" | These are the respective references to Testing Monitoring and Investigation and Operational Testing. |
| SDC1.4.8.3(xiv) | Reference is made to "Commissioning/Acceptance Testing" | Reference is made to "Commissioning/Testing" | These are the respective terms used in each Grid Code |

| | | | |
|--|--|--|--|
| SDC1.4.8.3(xv) | Reference is made to “System Tests” only | Reference is made to “System Tests, Operational Tests and Commissioning Tests” | The EirGrid Grid Code definition of System Tests excludes Operational and Commissioning Tests whereas the SONI definition includes them. |
| SDC1.4.8.4 | Reference is made to “the Republic of Ireland”. | Reference is made to “Northern Ireland”. | Reference is being made in each Grid Code to the other jurisdiction. |
| SDC1.4.8.4(i) | Reference is made to “the Republic of Ireland”. | Reference is made to “Northern Ireland”. | Reference is being made in each Grid Code to the other jurisdiction. |
| SDC1.4.8.5(d) | Reference is made to the “Transmission System and Distribution System constraints” | Reference is made to the “Transmission System constraints” only. | EirGrid will not be in a position to take Distribution Constraints into account in determining the IOS. |
| SDC1 Appendix A Part 1 – CDGUs < 10 MW | No technical parameters are required from Autonomous Generating units. | Various factors are applicable to Autonomous Generating Units. | This is to reflect different requirements in both codes. |
| SDC1 Appendix A Part 2 | Part 2 refers to factors applicable to the SONI Grid Code only | Part 2 refers to factors applicable to the EirGrid Grid Code only | The two System Operators require some data items specific to that system and they are detailed here. |

3. Provisions applicable to one Grid Code only

The table below provides a list of the provisions of SDC1 which exist in one Grid Code only.

| Provisions used in SONI Grid Code only | Reason |
|---|---|
| SDC1.1.4 | SONI has extra requirements due to the presence of PPA Generation in Northern Ireland. |
| SDC1.4.3: Introductory sentence | |
| SDC1.4.4: Introductory sentence | |
| SDC1.4.8.3(xxiv) | |
| SDC1 Appendix B | |
| SDC1.4.2.2(f) | The CCGT Matrix can be amended in the SONI Grid Code as per a specific requirement in the Planning Code Appendix, whereas the EirGrid |

| | |
|---------------|---|
| | Code can be amended as per any Planning Code data. |
| SDC1.4.4.2(i) | This provision is necessary to deal with conversion factors applicable to PPA Generators in Northern Ireland. |
| SDC1.4.4.3 | There are differences in how Reserve capabilities are notified to both SONI and EirGrid. |

| | |
|--|--|
| Provisions used in EirGrid Grid Code only | |
| SDC1.4.4.2 (h) | There are differences in how Operating Reserve capabilities are notified to both SONI and EirGrid. |
| SDC1.4.4.2(c) | The SONI Grid Code addresses the issue of conversion factors in a different way by cross-referring to the Planning Code. |

SDC2 SCHEDULING AND DISPATCH CODE NO.2

CONTROL SCHEDULING AND DISPATCH

SDC2.1 **INTRODUCTION**

SDC2.1.1 **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**. The **TSC** is the document under which the principal elements of the market for electricity operate. Every **User** which trades in electricity above certain minimum thresholds is required to be a party to the **TSC**. The **Market Operator** is a party to the **TSC**, as is the **TSO** and the **Other TSO**.
- (d) 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** under the provisions of 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) 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 WFPSs**);
- (b) **Pumped Storage Generators** in respect of their **Pumped Storage Plant Demand**;
- (c) **Interconnector Owners** in respect of their **Interconnectors**;

- (d) **Demand Side Unit Operators** in respect of their **Demand Side Units**; and
- (e) **Generator Aggregators** in respect of their **Aggregated Generating Units**.

Controllable WFPSs are not currently subject to **Dispatch Instructions**.

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 **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) **Interconnector Owners** with regard to their **Interconnectors**;
- (d) **Demand Side Unit Operators** in relation to their **Demand Side Units**; and
- (e) **Generator Aggregators** in respect of their **Aggregated Generating Units**.

Each of which (other than the **TSO**) is a “**User**” under this SDC2.

SDC2.4 PROCEDURE

SDC2.4.1 Information Used

SDC2.4.1.1 The information which the **TSO** shall use in assessing which **CDGU, Demand Side Unit, Interconnector** transfers, **Pumped Storage Plant Demand** and/or **Aggregated Generating Units** to **Dispatch**, will be:

- (a) the **Availability Notices**;
- (b) the **Merit Order** as derived under SDC1;
- (c) the other factors to be taken into account under SDC1 and which were used by the **TSO** to compile the **Indicative Operations Schedule**; and

- (d) 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 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, and Pumped Storage Plant 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 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 SDC1.4.8.2, SDC1.4.8.3 and SDC1.4.8.4, then the **TSO** will select first for **Dispatch** the one which in the **TSO's** reasonable judgement is most appropriate in all the circumstances.

SDC2.4.2 Dispatch Instructions

SDC2.4.2.1 Introduction

Dispatch Instructions relating to the **Trading Day** will normally be issued at any time during the period beginning immediately after the issue of the first **Indicative Operations Schedule** in respect of that **Trading Day**. 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 Aggregated Generating Units** prior to the issue of an **Indicative Operations Schedule** which includes that **CDGU, Demand Side Unit, Interconnector, Pumped Storage Plant Demand and/or Aggregated Generating Units**.

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 **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.
- (d) the **Interconnector Owner** for the **Dispatch** of the **Interconnector** transfers.
- (e) The **TSO** may issue **Dispatch Instructions** for any **CDGU**, **Demand Side Unit**, **Interconnector** transfers, **Pumped Storage Plant 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 **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** 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 **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 **OC10**, or testing at the request of a **User** under **OC8.5**, or **Commissioning Testing** under the CC;

[Note: Please note that the SONI Grid Code will be referring to “OC11” and “OC11.8”, whereas the EirGrid Grid Code will be referring to “OC10” and “OC8.5”.]

- (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) **Under Test Flags**: **Dispatch Instructions** will, where appropriate, contain a flag to indicate that a unit is under **Within Day Test** and the part of the **Dispatch Instruction** subject to the flag will not be deemed to be a **Dispatch Instruction** for settlement purposes;

- (m) 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**, 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 **OC4.3** shall be deemed to have followed a **Dispatch Instruction** issued by the **TSO**.
- (c) (i) In the event of a temporary loss of the **NI Control Centre/National Control Centre** as described under **OC9**, 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 **OC8.5** or a **System Test** at the request of the relevant **Generator** under **OC8.6**, to the extent that such **Dispatch Instructions** are consistent with the procedure agreed (or otherwise determined) for conducting the test or **System Test** (as the case may be).

(d) For the avoidance of doubt, any **Dispatch Instructions** issued by the **TSO** for the purposes of carrying out a test at the request of the relevant **Generator** under **OC8.5** or a **System Test** at the request of the relevant **Generator** under **OC8.6** 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** 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 formally acknowledged immediately by the **User** at the **Control Facility** by **Electronic Interface** or, with the **TSO's** prior consent, by telephone, by return facsimile transmission, in the manner agreed between the **User** and the **TSO** or a reason must be given as soon as possible for non-acceptance, which may (subject to SDC2.4.2.9) only be to avoid, in the **User's** reasonable opinion, an imminent risk of injury to persons or material damage to property (including the **CDGU**) or because they are not in accordance with the applicable **Availability Notice**, or **Technical**

Parameters, or Additional Grid Code Characteristics Notices or do not reflect **Other Relevant Data** submitted by the **User** pursuant to SDC1.

- (b) In the event that in carrying out the **Dispatch Instructions**, an unforeseen problem arises, giving rise, in the **User's** reasonable opinion, to an imminent risk of injury to persons or material damage to property (including the **CDGU**) the **TSO** must be notified as soon as possible by telephone.

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** (other than an **Open Cycle Gas Turbine**) and the **Generator** identifies that such **CDGU** will not be **Synchronised** within **+/- 10 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 **Synchronising** time of the **CDGU** (other than an **Open Cycle Gas Turbine**) is different from the instructed time by more than 15 minutes but less than 1 hour, this will constitute a **Short Notice Re-declaration** by the **CDGU** for that **Generator**.
- (e) If the **Synchronising** time of the **CDGU** (other than an **Open Cycle Gas Turbine**) is different from the instructed time by more than 1 hour, this will constitute a **Re-declaration** for the **CDGU** by the **Generator**.

SDC2.4.2.12

Implementation of Instructions by Users

When a **User** has received a **Dispatch Instruction** given by the **TSO**, it will react by responding to that **Dispatch Instruction** given by the **TSO** without undue delay, and, in any event, within one minute in accordance with the instruction *or in the case of **Dispatch Instructions** for **Mvars** within two minutes of the instruction*, including those **Dispatch Instructions** issued pursuant to SDC2.4.2.9. Instructions indicating a target **MW Output** at the **Target Frequency** will be complied with by **Users** notwithstanding any tolerance bands set out in any **Testing** requirement or elsewhere in the **Grid Code**.

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** to the **Dispatch Instructions** of the **TSO** or unless it occurs automatically as a result of **Special Protection Schemes** or **Low Frequency Relay** operations. Subject to the exception set out below in this SDC2.4.2.13, **Demand Side Unit Operators** will only reduce or increase their **Demand Side Unit MW Response** to the **Dispatch Instructions** of the **TSO** or unless it occurs automatically as a result of **Special Protection Schemes** or **Low Frequency Relay** operations.

- (b) **De-Synchronisation** may otherwise only take place without the **TSO's** prior agreement if it is to avoid, in the **Generator's** reasonable opinion, an imminent risk of injury to persons or material damage to property (including the **CDGU**). **Demand Side Units**, who cannot maintain the provision of any **Demand Side Unit MW Response**, may otherwise only take place without the **TSO's** prior agreement if it is to avoid, in the **Demand Side Unit Operator's** reasonable opinion, an imminent risk of injury to persons or material damage to property (including the **Demand Side Unit**).
- (c) If one of these exceptions occur, then the **TSO** must be informed that it has taken place as soon as possible.

SDC2.4.2.14 The **TSO** may suspend the issue of **Dispatch Instructions** to **User's Plant** in accordance with the **Merit Order** (having taken account of and applied the factors referred to in SDC1.4.8.3) to the extent that the conditions in SDC1.4.8.6 or SDC2.4.2.4(m) arise. When necessary the **TSO** will issue **Dispatch Instructions** for a **Black Start**.

SDC2.4.2.15 **User Plant Changes**

Each **User** at its **Control Facility** will, without delay, notify the **TSO** by **Electronic Interface**, telephone or by facsimile transmission of any change or loss (temporary or otherwise) to the operational capability of its **Plant** including any changes to the **Technical Parameters** and/or **Additional Grid Code Characteristics Notice** data of each of the **User's Plant** (in the case of **Technical Parameters**, by the submission of a **Technical Parameters Revision Notice**) indicating (where possible) the magnitude and the duration of the change. In the case of **CDGUs** already **Synchronised** to the **System**, each **Generator**, in respect of its **Generating Units**, must also state whether or not the loss was instantaneous.

SDC2.4.2.16 Each **Generator**, in respect of its **Generating Units**, will operate its **Synchronised CDGUs** with **AVRs** and **Var** limiters in service at all times (where required pursuant to **CC7.3 and SDC2.B.7**) unless released from this obligation in respect of a particular **CDGU** by the **TSO**.

SDC2.4.2.17 Each **Generator**, in respect of its **Generating Units**, shall request the **TSO's** agreement for one of its **CDGUs** at that **Generating Plant** to be operated without the **AVR** or **Var** limiter in service. The agreement of the **TSO** will be dependent on the risk that would be imposed on the **System**. However, a **Generator** may, in any event, take such action in relation to that **CDGU** as is reasonably necessary to avoid, in the **Generator's** reasonable opinion, an imminent risk of injury to persons or material damage to property (including the **CDGU**).

SDC2.4.2.18 **Minimum Demand Regulation ("MDR")**

Synchronised CDGUs must at all times be capable of reducing **MW Output** sufficient to allow a sufficient **Regulating Margin** for adequate **Frequency Control**. The **TSO** will monitor the **MW Output** data of the **Indicative Operations Schedule** against the forecast **Demand** to see whether the level of **MDR** for any period is insufficient, and may take any shortfall into account in **Dispatch**.

SDC2.4.3 **Special Actions**

The **TSO** may also issue **Dispatch Instructions** for **Special Actions** (either pre- or post-fault) to a **User** in respect of any of its **Plant** in the event that the **TSO** in its reasonable opinion believes that such instructions are necessary in order to ensure that the **Licence Standards** are met. **Special Actions** will generally involve a

Load change, a **Load** reduction change or a change in required **Notice to Synchronise** (or, in the case of a **Demand Side Unit** or **Pumped Storage Plant Demand**, 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 Units

- 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) the **MW Output** (or **Demand Side Unit MW Response**) to which it is instructed;
 - (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.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**"
- SDC2.A.3.2 If the start time is 1415 hours, it would be, for example:
"Time 1400 hours. Unit 1 to 205 **MW**, 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"

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 **Synchronising** time 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 start 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 (ie. 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 5 minutes after the time specified in a **Notice to Synchronise**, the **TSO** may issue a **Failure to Follow Notice to Synchronise Instruction**. If a **Generator** requests to **Synchronise** a **CDGU** more than 15 minutes before the 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 **Notice to Synchronise** time. If the **TSO** accepts the request to **Synchronise** more than 15 minutes before the original **Notice to Synchronise** time, the **TSO** will not amend the original **Notice to Synchronise** time but the **Generator** shall be entitled to **Synchronise the CDGU**, and the **CDGU** shall be deemed to have met the original **Notice to Synchronise** time.

SDC2.A.4.1.5 When in respect of a **CDGU** a **Generator** receives a **Failure to Follow Notice to Synchronise Instruction** the original **Notice to Synchronise** is deemed never to have been issued and the **CDGU** is not entitled to **Synchronise**. The **TSO** will then decide whether or not to instruct again the **Generator to Synchronise** the **CDGU**, and will notify the **Generator** in relation to that **CDGU** accordingly.

SDC2.A.4.1.6 When a **CDGU** trips before reaching **Minimum Generation** a **Failure to Reach Minimum Generation Instruction** will be issued. The **Failure to Reach Minimum Generation Instruction** will negate the **Notice to Synchronise** received by the **CDGU**. The **TSO** will then decide whether or not to instruct the **CDGU to Synchronise** again, and will notify the **Generator** in relation to that **CDGU** accordingly.

SDC2.A.4.2 **CDGUs De-Synchronising**

SDC2.A.4.2.1 The **Dispatch Instruction** will normally follow the form, for example:

"Time 1300 hours. Unit 1, **Shutdown**"

If the instruction start time is for 1400 hours the form will be, for example:

"Time 1300 hours. Unit 1, **Shutdown**, start at 1400 hours"

Both the above assume **De-Loading Rate** at declared **Technical Parameters**. Otherwise the message will conclude with, for example:

"... and **De-Synchronise** at 1500 hours"

SDC2.A.5 **Frequency Control**

SDC2.A.5.1 All the above **Dispatch Instructions** will be deemed to be at the instructed **Target Frequency**, i.e. where a **CDGU** is in the **Frequency Sensitive Mode** instructions refer to target **MW Output** at **Target Frequency**. **Target Frequency** changes will always be given to the **Generator** by telephone or **Electronic Interface** and will normally only be 49.95, 50.00, 50.05Hz.

*The adjustment of **MW Output** of a **CDGU** for **System Frequency** other than an average of 50 Hz, shall be made in accordance with the current **Declared** value of **Governor Droop** for the **CDGU**.*

SDC2.A.5.2 **CDGUs** required to be **Frequency** insensitive will be specifically instructed as such. The **Dispatch Instruction** will be of the form for example:

"Time 2100 hours. Unit 1, to **Frequency** insensitive mode"

SDC2.A.5.3 **Frequency Control** instructions may be issued in conjunction with, or separate from, a **Dispatch Instruction** relating to **MW Output**.

SDC2.A.6 **Emergency Load Drop**

The **Dispatch Instruction** will be in a pre-arranged format and normally follow the form, for example:

"Time 2000 hours. Emergency **Load** drop of "X"**MW** in "Y" minutes"

SDC2.A.7 **Voltage Control Instruction**

[Note: Voltage is used as a defined term in the EirGrid code but not in the SONI Code.]

In order that adequate **System Voltage** profiles are maintained under normal and fault conditions a range of **Voltage Control** instructions will be utilised from time to time, for example:

- (a) Operate to target **Voltage** of 117 kV;
- (b) Maximum production or absorption of **Reactive Power** (at current instructed **MW Output**)
- (c) Increase reactive output by 10 **Mvar** (at current instructed **MW Output**);

- (d) Change **Reactive Power** to 100 **Mvar** production or absorption;
- (e) Increase **CDGU Generator** step-up transformer tap position by [one] tap or go to tap position [x];
- (f) 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**.
- (g) Achieve a target **Voltage** of 210 kV and then allow to vary with **System** conditions; and
- (h) Maintain a target **Voltage** of 210 kV until otherwise instructed. Tap change as necessary.”

In relation to **Mvar Dispatch** matters, **Mvar** production is an export onto the **System** and is referred to as “lagging **Mvar**”, and **Mvar** absorption is an import from the **System** and is referred to as “leading **Mvar**”.

It should be noted that the excitation control system constant **Reactive Power** level control mode or constant **Power Factor** output control mode will always be disabled, unless agreed otherwise with the **TSO**.

SDC2.A.8 Instruction to change fuel

When the **TSO** wishes to instruct a **Generator** to change the fuel being burned in the operation of one of its **CDGUs** from one **Dispatched Fuel** (or fuel) to another (for example from 1% sulphur oil to 3% sulphur oil), the **Dispatch Instruction** will follow the form, for example:

"Time 1500 hours. Unit 2 change to 3% fuel at 1700 hours".

SDC2.A.9 Instruction to change fuel for a dual firing CDGU

When the **TSO** wishes to instruct a **Generator** to change the fuel being burned in the operation of one of its **CDGUs** which is capable of firing on two different fuels (for example, coal or oil), from one **Designated Fuel** (or fuel) to another (for example, from coal to oil), the instruction will follow the form, for example:

"Time 1500 hours. Unit 1 generate using oil at 1800 hours".

SDC2.A.10 Maximisation Instruction to CDGUs

When the **TSO** wishes to instruct a **Generator** to operate a **CDGU** at a level in excess of its **Availability** in accordance with SDC2.4.2.4(i), the instruction will follow the form, for example:

"**Maximisation Instruction.** Time 1800 hours. Unit GT2 to 58 **MW.**"

SDC2.A.11 Emergency Instruction

*If a **Dispatch Instruction** is an **Emergency Instruction** the **Dispatch Instruction** will be prefixed with the words. This is an **Emergency Instruction**. It may be in a pre-arranged format and normally follow the form, for example:*

*This is an **Emergency Instruction**. Reduce **MW Output** to "X"**MW** in "Y" minutes, **Dispatch Instruction** timed at 2000 hours.*

SDC2.A.12 Dispatching a Demand Side Unit to a Demand Side Unit MW Response

SDC2.A.12.1 For **Demand Side Units**, the **Dispatch Instruction** issue time will always have due regard for the **Demand Side Unit MW Response 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.

The instruction will follow the form, for example:

"Time 1300 hours. Unit 1, **Demand Side Unit MW Response** at 1400 hours"

SDC2 - APPENDIX B

[Note: This Appendix applies to the EirGrid Grid Code only.]

Dispatch Instructions for Generator Reactive Power

- SDC2.B.1** The **Mvar Output** of any **CDGU** in respect of which a **Dispatch Instruction** is given under SDC2.4.2.4(b) shall, in accordance with its declared **Technical Parameters**, be adjusted to the new target **Mvar** level so **Instructed**, within, a tolerance of +/- 2% of the target or +/- 2 **Mvar**, whichever is greater. The **Reactive Power** output of a **CDGU** shall not be adjusted (other than under **AVR** action) except in response to a **Dispatch Instruction** from the **TSO**.
- SDC2.B.2** **Generators** having achieved the new target **Mvar Output**, should not attempt to sustain this level of **Mvar Output** as the **System Voltage** varies but should, rather, allow the **Reactive Power** output to vary under **AVR** control in accordance with the then applicable **Declarations of Ancillary Service** capabilities and **Technical Parameters**.
- SDC2.B.3** While a **Reactive Power Dispatch Instruction** shall normally specify a new **Mvar** target for a **CDGU**, the **TSO** may also from time to time instruct **Generators** to perform one or more tap changes on the generator step-up transformer of a **CDGU**. The **Dispatch Instructions** for tap changes may be a **Simultaneous Tap Change Instruction** whereby the tap change shall be effected by the **Generator** in response to a **Dispatch Instruction** from the **TSO** issued simultaneously to relevant **Power Stations**. The **Dispatch Instruction**, which is normally preceded by advance warning, shall be effected within 1 minute of receipt from the **TSO** of the **Dispatch Instruction**.
- SDC2.B.4** **Dispatch Instructions** in relation to **Reactive Power** may include target voltage levels to be achieved by the **CDGU** on the **Transmission System** at **Grid Connection Point** (or on the **User System** at the **User System Entry Point** in the case of an **Embedded Generator**, namely on the higher voltage side of the **Generator** step-up transformer). Where a **CDGU** is **Instructed** to a specified target voltage, the **Generator** shall achieve that target within a tolerance of 1 kV by tap changing on the **Generator** step-up transformer unless otherwise agreed with the **TSO**. Under normal operating conditions, once this target voltage level has been achieved, the **Generator** shall not tap change again without prior consultation with and agreement of the **TSO**.
- SDC2.B.5** Under certain conditions such as low **System Voltage**, a **Dispatch Instruction** to maximum **Mvar** production at **Instructed MW Output** may be given and the **Generator** shall take appropriate action to maximise **Mvar** production unless constrained by plant operational limits or safety grounds relating to personnel or plant.
- SDC2.B.6** Under certain conditions such as high **System Voltage**, a **Dispatch Instruction** to maximum **Mvar** absorption at **Instructed MW Output** may be given and the **Generator** shall take appropriate action to maximise **Mvar** absorption unless constrained by plant operational limits or safety grounds relating to personnel or plant.
- SDC2.B.7** The excitation system, unless otherwise agreed with the **TSO**, shall be operated only in its constant terminal voltage mode of operation with var limiters in service, with any constant **Reactive Power** output control mode or constant **Power Factor** output control mode always disabled, unless agreed otherwise with the **TSO**.
- SDC2.B.8** A **Dispatch Instruction** relating to **Reactive Power** will be implemented without delay and, notwithstanding the provisions of SDC2.4.2.12 and subject as provided in this Appendix B will be achieved not later than 2 minutes after the **Dispatch Instruction** time, or such longer period as the **TSO** may **Instruct**.

- SDC2.B.9 Where **Dispatch Instructions** relating to **Active Power** and **Reactive Power** are given together, and to achieve the **Reactive Power** output would cause the **CDGU** to operate outside **Technical Parameters** as a result of the **Active Power Dispatch Instruction** being met at the same time, then the adjustment of the **Reactive Power** output may be delayed until the operating limits no longer prevent the change. In any case the **Active and Reactive Power Dispatch Instruction** shall be followed without undue delay.
- SDC2.B.10 In circumstances where the **TSO** issues new **Dispatch Instructions** in relation to more than one **CDGU** at the same **Power Station** at the same time tapping will be carried out by the **Generator** one tap at a time either alternately between (or in sequential order, if more than two), or at the same time on, each **CDGU**, as the case may be.
- SDC2.B.11 Where the **Dispatch Instructions** require more than two taps per **CDGU** and that means that the **Dispatch Instructions** cannot be achieved within 2 minutes of the time of the **Dispatch Instructions** (or such longer period at the **TSO** may have Instructed), the **Dispatch Instructions** shall each be achieved with the minimum of delay after the expiry of that period;
- SDC2.B.12 On receiving a new **MW Dispatch Instruction**, no tap changing shall be carried out to change the **Mvar Output** unless there is a new **Mvar Dispatch Instruction**.
- SDC2.B.13 Where a **Dispatch Instructions** to **Synchronise** is given, or where a **CDGU** is **Synchronised** and a **MW Dispatch Instruction** is given, a **Mvar Dispatch Instruction** consistent with the **CDGU's** relevant parameters may be given. In the absence of a **Mvar Dispatch Instruction** with an instruction to **Synchronise**, the **Mvar Output** should be 0 **Mvar**.
- SDC2.B.14 Where a **Dispatch Instructions** to **De-Synchronise** is given, a **Mvar Dispatch Instruction**, compatible with shutdown, may be given prior to **De-Synchronisation** being achieved. In the absence of a separate **Mvar Dispatch Instruction**, it is implicit in the **Dispatch Instructions** to **De-Synchronise** that **Mvar** output should at the point of synchronism be 0 **Mvar** at **De-Synchronisation**.
- SDC2.B.15 A **Dispatch Instruction** relating to **Reactive Power** may be given in respect of **CCGT Units** within a **CCGT Installation** where running arrangements and/or **System** conditions require, in both cases where connection arrangements permit.
- SDC2.B.16 On receipt of a **Dispatch Instruction** relating to **Reactive Power**, the **Generator** may take such action as is necessary to maintain the integrity of the **CDGU** (including, without limitation, requesting a revised **Dispatch Instruction**), and shall contact the **TSO** without delay.
- SDC2.B.17 Under **System** fault conditions it is possible for **AVR** action to drive **Reactive Power** output for a **CDGU** outside of its **Declared Operating Characteristic** limits. The **Generator** shall immediately inform the **TSO** of the situation. However if the **Generator** reasonably believes that the situation may be dangerous to personnel or **Plant**, then limited action may be taken to improve the situation.

SDC 2 ANNEX I

Explanatory Note of differences between SDC2 in the SONI Grid Code and EirGrid Grid Code

This annex is an explanatory note only and does not form part of the Grid Code.

1. General Differences in wording

The table below summarises the general differences in wording between the form of SDC2 in the SONI Grid Code and the form of SDC2 in the EirGrid Grid Code, which appear repeatedly throughout SDC2.

| Terms used in SONI Grid Code | Equivalent terms used in EirGrid Grid Code (where different) | Reason |
|------------------------------|--|--|
| System Support Services | Ancillary Service(s) | The existing arrangements for Ancillary Services and System Support Services are continuing until further notice. |
| CCGT Module | CCGT Unit | This is the phrase currently used to describe the individual parts of a Combined Cycle Plant CCGT Module is an important concept in Northern Ireland and is reflected in many other agreements. EirGrid is keeping the phrase CCGT Unit, as it more closely describes the concept of an individual unit and EirGrid has formerly used CCGT Module to describe the whole CCGT Installation. |
| voltage | Voltage | "Voltage" is a defined term in the EirGrid Grid Code but not in the SONI Grid Code. |
| emergency | Emergency | "Emergency" is a defined term in the EirGrid Grid Code but not in the SONI Grid Code. |

2. Specific differences in wording between equivalent provisions in both Grid Codes

The table below provides a list of the other specific differences in wording between equivalent provisions of SDC1 in both Grid Codes.

| Provision | SONI Grid Code | EirGrid Grid Code | Reason |
|---------------|---|--|---|
| SDC2.1.2(a) | Reference is made to "but not Pumped Storage Demand" after the words "Pumped Storage Generation". | | Reference to these words in the SONI Grid Code is made for clarity reasons. |
| SDC2.4.2.4(g) | Reference is made to "OC11" and "OC11.8" | Reference is made to "OC10" and "OC8.5" and to the word "Acceptance" after "Commissioning" | These are the respective requirements in relation to testing, monitoring and investigations |
| SDC2.4.2.4(h) | Reference is made to "OC10" | Reference is made to "OC8.4" | These are the respective System Tests requirements |

| | | | |
|------------------|--|---|--|
| SDC2.4.2.5 | Reference is made to “radio telephones” in the list of means of communications of a Dispatch Instruction | No reference is made to “radio telephones” and in addition, after the words “Frequency Relay” the EirGrid Grid Code also refers to “or any other automatic Primary Frequency Control Scheme (excluding governor response)”. | These are respective requirements regarding the form of a Dispatch Instruction |
| SDC2.4.2.5(b) | Reference is made to “SDC3.6.1” | Reference is made to “OC4.3” | These are the respective requirements in relation to actions required in response to high frequency |
| SDC2.4.2.5(c)(i) | Reference is made to “OC7” | Reference is made to “OC9” | These are the respective references in respect of temporary losses at the TSOs’ Control Centres |
| SDC2.4.2.8(c) | Reference is made to “OC11.8” and “OC10.4” | Reference is made to “OC8.5” and “OC8.6” | These are the respective requirements in respect of testing and System Tests |
| SDC2.4.2.8(d) | Reference is made to “OC11.8” and “OC10.4” | Reference is made to “OC8.5” and “OC8.6” | These are the respective requirements in respect of testing and System Tests |
| SDC2.4.2.10(a) | Reference is made to “radio telephones” in the list of means of communication | No reference is made to “Radio telephones” | The reference to “radio telephones” is specific to the means of communication under the SONI Grid Code. |
| SDC2.4.2.11(c) | Reference is made to “+15/-5 minutes” | Reference is made to “+/- 10 minutes” | These are the respective delays in synchronising times which trigger an obligation on a Generator to notify the TSO of the delay in synchronising times. |
| SDC2.4.2.12 | No reference is made to Dispatch Instructions for Mvars | Reference is made to “or in the case of a Dispatch Instruction for Mvars within two minutes of the instruction” after the words “in accordance with the instruction” | The EirGrid Grid Code has several specific requirements for the dispatch of Generator Reactive Power. |
| SDC2.4.2.16 | Reference is made to | Reference is made to | These are the |

| | | | |
|------------|--|----------------------------------|--|
| | “CC.S1.5” | “CC7.3 and SDC2.B.7” | respective requirements for Generating Unit Control arrangements |
| SDC2.A.2.2 | Reference is made to “Designated Fuel” and “Declared Fuel” | Reference is only made to “fuel” | This is due to the PPA specific fuel terminology in the SONI Grid Code |

3. Provisions applicable to one Grid Code only

The table below provides a list of the provisions of SDC1 which exist in one Grid Code only.

| Provisions used in SONI Grid Code only | Reason |
|---|--|
| SDC2.1.3 | This paragraph cross-refers to Appendices C and D which both deal with specific issues applicable to PPA Generation only. |
| SDC2.4.1.4 | This provision is necessary in the SONI Grid Code to specify that specific CCGT requirements contained in the Generating Unit Agreements, Power Station Agreements and System Support Services Agreements prevail over the requirements of the Grid Code in case of inconsistency. |
| SDC2.4.2.3 | This paragraph is necessary to deal with issues specific to PPA Generation, and in particular the fact that for PPA Generation, a Dispatch Instruction may include an automatic instruction of Spinning Reserve. |
| SDC2.4.2.4(c) – final sentence | This final sentence is specific to the SONI Grid Code as it cross-refers to Appendix C that sets out the different terminology and requirements relating to fuel for PPA Generation. |
| SDC2.4.2.4(n) | This is a SONI Grid Code only requirement in respect of instructions to change Generator Transformer tap positions |
| SDC2.A.1 – second paragraph | This is a SONI Grid Code only provision which provides that for PPA CCGT Modules and Units, provisions in the Power Purchase Arrangements and SSSAs prevail over Grid Code requirements where there is an inconsistency. |
| SDC2 Appendix C | This appendix deals with fuel provisions which apply to PPA Generation only. |
| SDC2 Appendix D | This appendix deals with additional provisions which apply to PPA Generation only. |

| Provisions used in EirGrid Grid Code only | |
|--|---|
| SDC2.4.2.3 | This paragraph is necessary in order to deal with the EirGrid specific requirement that a Dispatch Instruction may include an automatic instruction of Operating Reserve. |
| SDC2.4.2.4(b)(iv) | This paragraph is EirGrid specific as it cross-refers to Appendix B which sets out EirGrid specific requirements for Generator Reactive Power |

| | |
|--|--|
| | Dispatch. |
| SDC2.A.5.1 – second paragraph | This provision deals with EirGrid specific requirements in respect of MW Output adjustment of a CDGU for System Frequency. |
| SDC2.A.7 (d) to (h) and final 2 paragraphs | These additional paragraphs deal with EirGrid specific Generator Reactive Power dispatch requirements |
| SDC2.A.11 | This additional paragraph deals with EirGrid specific Dispatch Instructions in relation to emergencies. |
| SDC2 Appendix B | This appendix deals with the EirGrid specific requirements for the Dispatch of Generator Reactive Power |

**WFPS1 CONTROLLABLE WIND FARM POWER STATION GRID CODE
PROVISIONS**

WFPS1.1 INTRODUCTIONWFPS1-2
WFPS1.2 OBJECTIVEWFPS1-2
WFPS1.3 SCOPEWFPS1-2
WFPS1.4 FAULT RIDE THROUGH REQUIREMENTSWFPS1-5
WFPS1.5 TRANSMISSION SYSTEM FREQUENCY REQUIREMENTSWFPS1-7
WFPS1.6 TRANSMISSION SYSTEM VOLTAGE REQUIREMENTSWFPS1-14
WFPS1.7 SIGNALS, COMMUNICATIONS & CONTROL.....WFPS1-19

WFPS 1 CONTROLLABLE WIND FARM POWER STATION GRID CODE PROVISIONS

WFPS1.1 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 **Wind Turbine Generators (WTG)** 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 WFPSs**. This section of the **Grid Code** gives the specific requirements for **Controllable WFPSs** and **WFPS Extensions** to pre-existing **Controllable WFPSs** where an extension to a **WFPS** shall be classified as one of the following two types:

- (a) Transmission Connected Type A
A **WFPS Extension** which is not separately controllable.

- (b) Transmission Connected Type B
A **WFPS Extension** which is separately controllable will be considered as a unique **WFPS** with the exception of its requirements to **WFPS1.6 Transmission System Voltage Requirements** which will be tested in aggregate with the existing **Controllable WFPS**.

Transmission Connected Type A **WFPS Extensions** and Transmission Connected Type B **WFPS Extensions** will be subject to full **Grid Code** Compliance testing at the discretion of the **TSO**. Where a **Controllable WFPS** has been granted derogations or exemptions from the **Grid Code** any **WFPS Extension** to that **Controllable WFPS** will be a Transmission Connected Type B **WFPS Extension**.

WFPS1.2 OBJECTIVE

The primary objective of WFPS1 is to establish the technical rules which **Controllable WFPSs** and **WFPS Extensions** must comply with in relation to their connection to and operation on the **Transmission System**.

WFPS1.3 SCOPE

WFPS1.3.1 WFPS1 applies to the following **Users**:

- (a) The **TSO**;
- (b) **Grid Connected Controllable WFPSs**; and
- (c) **Grid Connected Controllable WFPS Extensions**.

WFPS1.3.2 In addition to WFPS1, **Controllable WFPSs** 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
 - CC7.3.1.1(a) to (h) and (j) to (u)
 - CC7.3.1.2
 - CC7.3.5
 - CC7.3.6
 - CC7.3.7
 - CC7.3.8
 - CC.12.2
 - CC.12.3
- OC1
- OC2
- OC4 excluding:
 - OC4.3.4
 - OC4.4.5.3
 - OC4.4.5.4
 - OC4.4.5.5
- OC6
- OC7 excluding
 - OC7.2.4.2
- OC8
- OC9
- OC10 excluding
 - OC10.5.7
 - OC10.7.1
 - OC10.7.2
 - OC10.7.3
 - OC10.7.4
 - OC10.7.6
- OC11
- SDC1

Dispatchable WFPSs are also required to comply with SDC2.

In the **Grid Code**, where applicable, for the purposes of **Controllable WFPSs** references to **Generation Unit** or **Generator** should be interpreted to mean **Controllable WFPS**.

WFPS1.4 FAULT RIDE THROUGH REQUIREMENTS

WFPS1.4.1 A **Controllable WFPS** 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 WFPS1.1*.

Fault Ride Through Capability of Wind Farm Power Stations

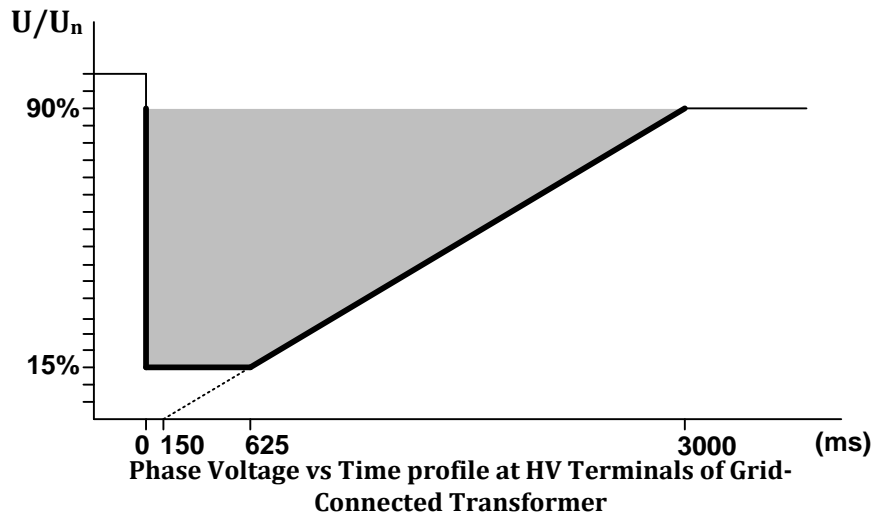


Figure WFPS1.1 - Fault Ride-Through Capability of Controllable WFPSs

WFPS1.4.2 In addition to remaining connected to the **Transmission System**, the **Controllable WFPS** shall have the technical capability to provide the following functions:

- a) During **Transmission System Voltage Dips**, the **Controllable WFPS** shall provide **Active Power** in proportion to retained **Voltage** and provide reactive current to the **Transmission System**, as set out in WFPS1.4.2(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 CC8.3.1, or for at least 500 ms, whichever is the sooner. The **Controllable WFPS** 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 WFPS** shall provide at least 90 % of its maximum **Available Active Power** 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 WFPS** shall provide at least 90% of its

maximum **Available Active Power** 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 WFPS1.4.2(a) and WFPS1.4.2(b). The reactive current response of the **Controllable WFPS** 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 WFPS**, with a **Rise Time** no greater than 100ms and a **Settling Time** no greater than 300ms. For the avoidance of doubt, the **Controllable WFPS** may provide this reactive response directly from individual **WTGs**, or other additional dynamic reactive devices on the site, or a combination of both.

- d) The **Controllable WFPS** 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 WFPS** 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.

- e) The **TSO** may seek to reduce the magnitude of the dynamic reactive response of the **Controllable WFPS** 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 WFPS**. The **Controllable WFPS** and the **TSO** shall agree on the required changes, and the **Controllable WFPS** shall formally confirm that any requested changes have been implemented within 120 days of received the **TSO's** formal request.

WFPS1.5 TRANSMISSION SYSTEM FREQUENCY RANGES

WFPS1.5.1 Controllable WFPSs shall have the capability to:

- a) operate continuously at normal rated output at **Transmission System Frequencies** in the range 49.5 Hz to 50.5 Hz;
- b) remain connected to the **Transmission System** at **Transmission System Frequencies** within the range 47.5 Hz to 52.0 Hz for a duration of 60 minutes;
- c) remain connected to the **Transmission System** at **Transmission System Frequencies** within the range 47.0 Hz to 47.5 Hz for a duration of 20 seconds required each time the **Transmission System Frequency** is below 47.5 Hz;
- d) remain connected to the **Transmission System** during rate of change of **Transmission System Frequency** of values up to and including 0.5 Hz per second.

No additional **WTG** shall be started while the **Transmission System Frequency** is above 50.2 Hz.

WFPS1.5.2 ACTIVE POWER MANAGEMENT

A **Wind Farm Control System** shall be installed by the **Controllable WFPS** to allow for the provision of **Active Power Control** and **Frequency Response** from the **Controllable WFPS**. The **Wind Farm Control System** and **Frequency Response System** shall provide the functionality as specified in this section WFPS1.5.2.

WFPS1.5.2.1 Active Power Control

The **Wind Farm Control System** shall be capable of operating each **WTG** at a reduced level if the **Controllable WFPS's Active Power** output has been restricted by the **TSO**. In this **Active Power Dispatch Mode**, the **Wind Farm 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 **Wind Farm Control System**, as advised by the **TSO**, as per WFPS1.5.4. The **TSO** acknowledges that if the **Active Power** output of the **Controllable WFPS** is initially less than the **Design Minimum Operating Level**, and if the **Controllable WFPS** is expected to increase its **Active Power** output, then it may not be able to achieve the specified

ramp rate at first, due to **WTGs** going through a start-up sequence. In such a case, **WTGs** 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.

WFPS1.5.3 FREQUENCY RESPONSE

WFPS1.5.3.1 In **Wind Following Mode**, the **Frequency Response System** shall have the capabilities as displayed in the *Power-Frequency Response Curve* in *Figures WFPS1.2*, where the power and frequency ranges required for points A, B, C, D, E are defined below in *Table WFPS1.1 and Table WFPS1.2*. The **Frequency Response System** shall adjust the **Active Power** output of the **Controllable WFPS** according to a **Governor Droop**, settable by the **TSO** in a range from 2% to 10% and defaulting to 4%, when operating in the ranges outside the deadband range F_B - F_C in the *Power-Frequency Response Curve*. **Controllable WFPS Frequency Response** and **Governor Droop** shall be calculated with respect to **Registered Capacity**. A **Controllable WFPS** can only give a low frequency response if the **Active Power Control Setpoint** is less than the **Available Active Power**.

WFPS1.5.3.2 When in **Active Power Control Mode**, the **Controllable WFPS** shall always operate in **Frequency Sensitive Mode** with a **Governor Droop** as set out in WFPS1.5.3.1 and with a deadband of +/-15mHz, or as otherwise agreed with the **TSO**.

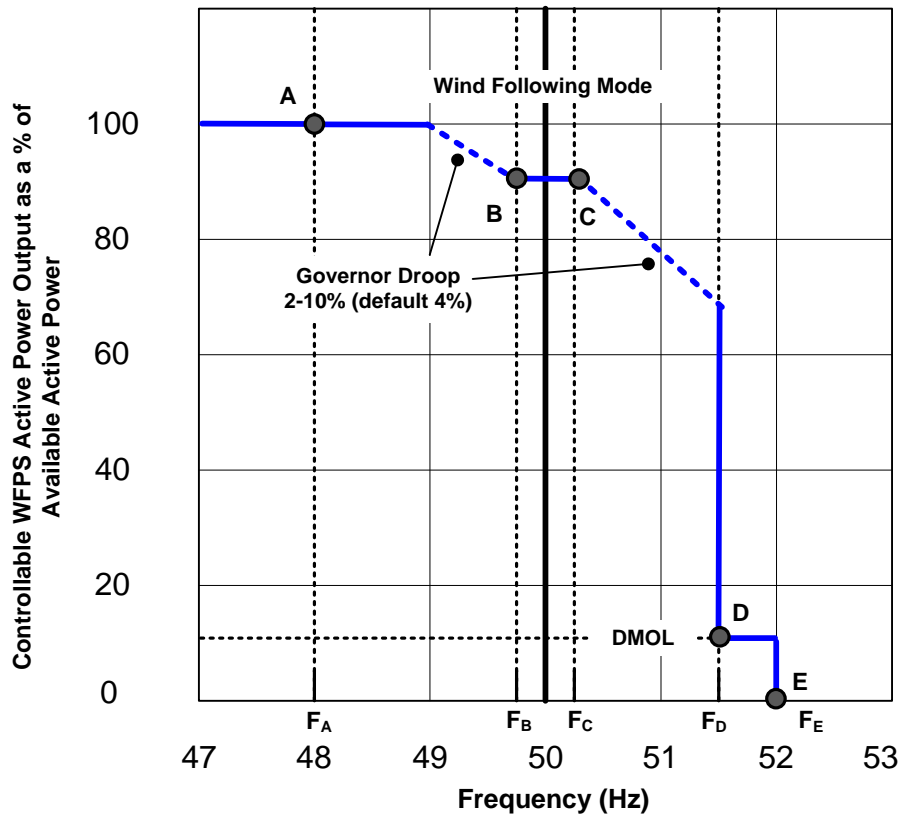


Figure WFPS1.2 –Example of Power-Frequency Response Curve for **Wind Following Mode**

WFPS1.5.3.3 When acting to control **Transmission System Frequency**, the **Controllable WFPS** 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 WFPS** in **Active Power Dispatch Mode**, when the **Transmission System Frequency** goes outside the deadband set out in WFPS1.5.3.2.

WFPS1.5.3.4 When the **Transmission System Frequency** is in the range F_C - F_D , the **Controllable WFPS** shall ensure that its **Active Power Output** does not increase beyond the **Active Power** value of the **Controllable WFPS** when the **Transmission System Frequency** first exceeded F_C , due to an increase in **Available Active Power** in that period.

WFPS1.5.3.5 If the **Frequency** drops below F_A , then the **Frequency Response System** shall act to maximise the **Active Power** output of the **Controllable WFPS**, 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 WFPS** 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 WFPS** to zero. Any **WTG** 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.

WFPS1.5.3.6 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 WFPS** depending on system conditions and **Controllable WFPS** location. These settings are defined in *Table WFPS1.1* below.

| Point | Transmission System Frequency (Hz) | Controllable WFPS Active Power Output (% of Available Active Power) |
|-------|---|--|
| A | F_A | P_A |
| B | F_B | Minimum of : P_B or Active Power Control Set-point (converted to a % of Available Active Power) |
| C | F_C | Minimum of: P_C or Active Power Control Set-point (converted to a % of Available Active Power) |
| D | F_D | Minimum of: P_D or Active Power Control Set-point (converted to a % of Available Active Power) |
| E | F_E | $P_E = 0\%$ |

Table WFPS1.1: Transmission System Frequency and % Available Active Power Settings for the Points 'A', 'B', 'C', 'D' and 'E' illustrated in Figure WFPS1.2

Two settings for each of F_A , F_B , F_C , F_D , F_E , P_A , P_B , P_C , P_D and P_E shall be specified by the **TSO** at least 120 **Business Days** prior to the **Controllable WFPS's** scheduled **Operational Date** (refer to WFPS1.5.3.11 below). The **Controllable WFPS** shall be responsible for implementing the appropriate settings during **Commissioning**.

WFPS1.5.3.7 The table below, *Table WFPS1.2*, shows the **Transmission System Frequency** and **Active Power** ranges for F_A , F_B , F_C , F_D , F_E , P_A , P_B , P_C , P_D and P_E .

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

Table WFPS1.2: Transmission System Frequency & Active Power ranges appropriate to Figure WFPS1.2.

For the **Transmission System Frequency** values in *Table WFPS1.2* above, $F_A \leq F_B \leq F_C \leq F_D = F_E$.

WFPS1.5.3.8 Alterations to the **Controllable WFPS's Active Power** output, triggered by **Transmission System Frequency** changes, shall be achieved by proportionately altering the **Active Power** output of all available **WTGs** as opposed to switching individual **WTGs** on or off, insofar as possible.

WFPS1.5.3.9 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 WFPS's** appropriate **Active Power** output by taking account of the **Controllable WFPS's Available Active Power** or **Controlled Active Power**.

WFPS1.5.3.10 If the **Transmission System Frequency** rises to a level above 'D'-'E', as defined by the *Power-Frequency Response Curve in Figure WFPS1.2*, the **TSO** accepts that **WTGs** may disconnect. Any **WTG** 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).

WFPS1.5.3.11 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 WFPS's** scheduled **Operational Date**. The **Controllable WFPS** 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 WFPS** a minimum of two weeks notice if changes to either of the curve's parameters (*i.e.* F_A , F_B , F_C , F_D , F_E , P_A , P_B , P_C , P_D or P_E), are required. The **Controllable WFPS** shall formally confirm that any requested changes have been implemented within two weeks of receiving the **TSO's** formal request.

WFPS1.5.4 RAMP RATES

WFPS1.5.4.1 The **Wind Farm Control System** shall be capable of controlling the ramp rate of its **Active Power** output. There shall be three ramp rate capabilities, designated **Wind Following Ramp Rate**, **Active Power Control Set-Point Ramp Rate**, and **Frequency Response Ramp Rate**. The **Wind Farm 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**; **Wind Following Ramp Rate**. The **Wind Following Ramp Rate** shall be used during **Start-Up**, normal operation, and **Shutdown**. The **TSO** shall specify the **Wind 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 WFPS** agreed with the **TSO** and with the characteristics as set out in WFPS1.5.2.2.2. The **TSO** acknowledges that rapidly changing wind speeds may cause temporary deviations from the ramp rate settings of the **Controllable WFPS**, but these deviations should not be allowed to exceed 3% of **Registered Capacity**.

WFPS1.5.4.2 It shall be possible to vary the **Wind 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.

WFPS1.5.4.3 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 WFPS's** scheduled **Operational Date**. The **Controllable WFPS** 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 WFPS** a minimum of two weeks notice if a

change is required. The **Controllable WFPS** shall formally confirm that any requested changes have been implemented within two weeks of receiving the **TSO's** formal request.

WFPS1.6 TRANSMISSION SYSTEM VOLTAGE REQUIREMENTS

WFPS1.6.1 TRANSMISSION SYSTEM VOLTAGE RANGE

Controllable WFPSs 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.

WFPS1.6.2 AUTOMATIC VOLTAGE REGULATION

WFPS1.6.2.1 **Controllable WFPSs** 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.

WFPS1.6.2.2 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**:

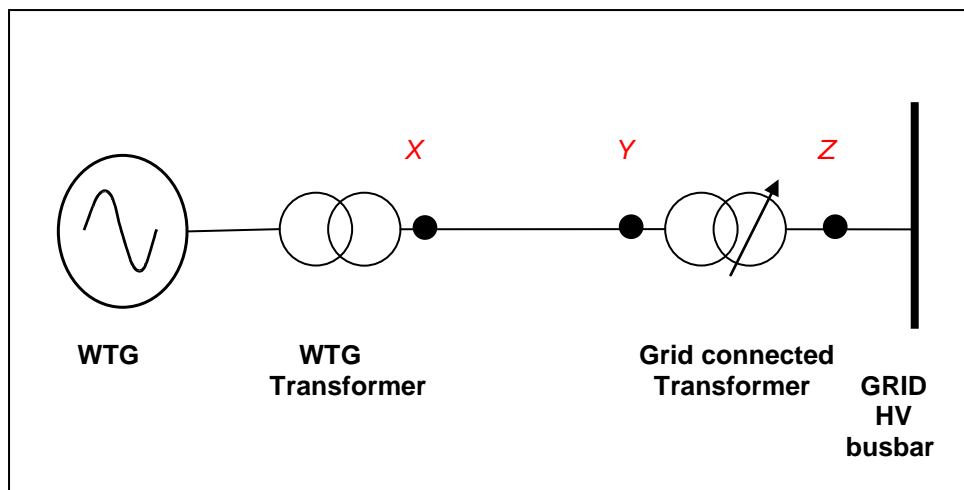
- a) The **Controllable WFPS** shall be capable of receiving a **Power Factor** control (PF) set-point to maintain the **Power Factor** set-point at the **Connection Point**;
- b) The **Controllable WFPS** shall be capable of receiving a **Reactive Power** control (Q) set-point to maintain the **Reactive Power** set-point at the **Connection Point**;
- c) The **Controllable WFPS** 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 WFPS's Reactive Power** output, without violating the **Voltage Step Emissions** limits as set out in the IEC standard 61000-3-7:1996 *Assessment of Emission limits for fluctuating loads in MV and HV power systems*.

A change to the **Power Factor** control (PF) set-point, **Reactive Power** control (Q) set-point or **Voltage Regulation** (kV) **Set-Point** shall be implemented by the **Controllable WFPS** within 20 seconds of receipt of the appropriate signal from the **TSO**, within its reactive power capability range as specified in WFPS1.6.3.

WFPS1.6.2.3 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 **Controllable WFPS's** scheduled **Operational Date**. The **Controllable WFPS** 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 WFPS** a minimum of two weeks notice if a change is required. The **Controllable WFPS** shall formally confirm that any requested changes have been implemented within two weeks of receiving the **TSO's** formal request.

WFPS1.6.2.4 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 WFPS** 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.

WFPS1.6.2.5 *Figure WFPS1.3* shows the relevant points appropriate to the **Voltage Regulation System** for a **Controllable WFPS**. X is the HV side of the **WTG** transformer, Y is the lower voltage side of the **Grid Connected Transformer** and Z is the **Connection Point**.



*Figure WFPS1.3 - Locations for **Voltage Regulation** set-point (Z) and the **Power Factor** range (Y). The HV side of the **WTG** transformer is (X).*

WFPS1.6.3 REACTIVE POWER CAPABILITY

WFPS1.6.3.1 **Controllable WFPSs** 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 WFPS1.4*, as measured at the **Connection Point**.

Referring to *Figure WFPS1.4*:

Point A represents the minimum Mvar absorption capability of the **Controllable WFPS** at 100% **Registered Capacity** and is equivalent to 0.95 power factor leading;

Point B represents the minimum Mvar production capability of the **Controllable WFPS** at 100% **Registered Capacity** and is equivalent to 0.95 power factor lagging;

Point C represents the minimum Mvar absorption capability of the **Controllable WFPS** 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 WFPS** 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 WFPS** at the cut-in speed of the individual **WTGs**;

Point F represents the minimum Mvar production capability of the **Controllable WFPS** at the cut-in speed of the individual **WTGs**;

The **TSO** accepts that the values of Points E and F may vary depending on the number of **WTGs** generating electricity in a low-wind scenario;

Figure WFPS1.4 represents the minimum expected **Reactive Power** capabilities of the **Controllable WFPS**. The **Controllable WFPS** 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 point Y for any **Voltage** at the **Connection Point** (Point Z) within the ranges specified in WFPS1.6.1.

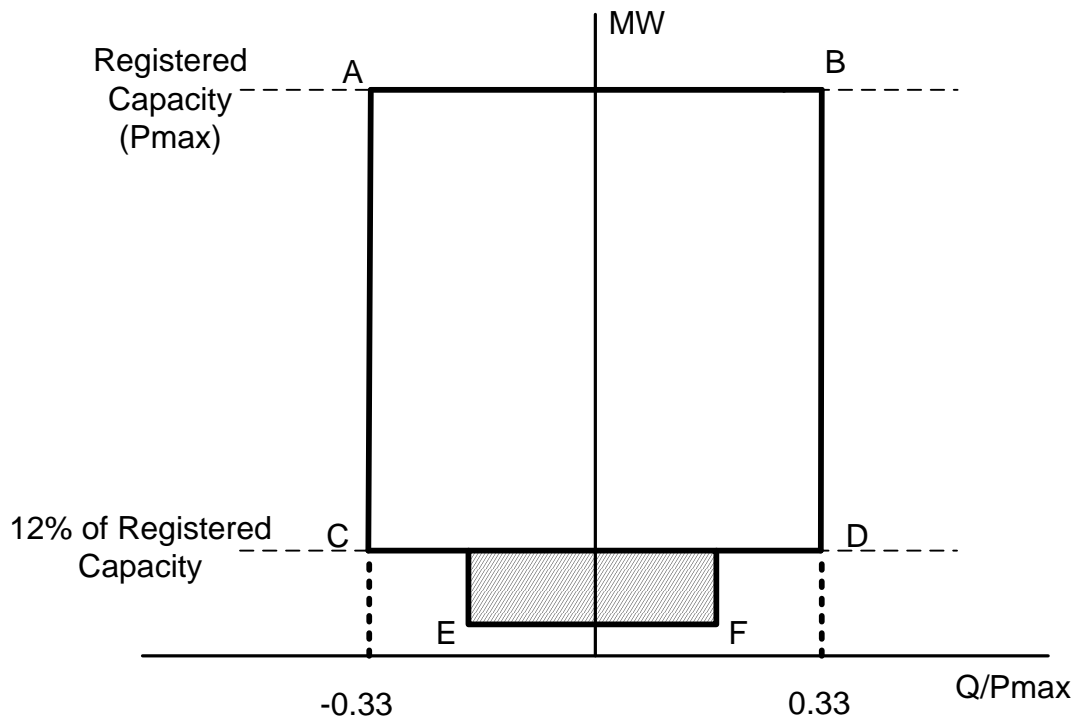


Figure WFPS1.4 – Minimum **Reactive Power** Capability of **Controllable WFPS**

WFPS1.6.3.2 For **Controllable WFPSs** 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 WFPS** shall be identified during the **TSO's Connection Offer** process.

WFPS1.6.3.3 The total charging of the **Controllable WFPS 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 WFPS1.6.1, then the **Reactive Power** requirements will need to be altered.

WFPS1.6.4 **VOLTAGE STEP EMISSIONS**

IEC 61000-3-7:1996 *Assessment of Emission limits for fluctuating loads in MV and HV power systems*, gives a table of the emission limits for **Voltage** changes as a function of the number of changes, R, per hour. This standard shall also apply to **Controllable WFPSs**.

WFPS1.6.5 **CONTROLLABLE WFPS'S GRID CONNECTED TRANSFORMER**

WFPS1.6.5.1 All relevant references in the **Grid Code** to **Generator Transformers** shall be interpreted to mean the **Controllable WFPS's Grid Connected Transformer** rather than the individual **WTG** transformers. For **Controllable WFPSs** where the **Connection Point** is remote from the **Controllable WFPS**, **Grid Connected Transformer** shall be interpreted to mean the HV transformer located at the **Controllable WFPS**.

WFPS1.6.5.2 **Controllable WFPSs** shall provide on-load tap-changing (OLTC) facilities for all **Grid Connected Transformers**. All **Controllable WFPSs** shall liaise with the **TSO** on the design specification for the performance of the tap-changing facility of the **Grid Connected Transformer**.

WFPS1.6.5.3 The **Controllable WFPS'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.

WFPS1.7 SIGNALS, COMMUNICATIONS & CONTROL

WFPS1.7.1 SIGNALS FROM THE CONTROLLABLE WFPS TO THE TSO

Signals from **Controllable WFPSs** to the **TSO** shall be broken up into a number of logical groups. There shall be different requirements for **Controllable WFPSs** depending on the **Controllable WFPS's MEC**. The following groups shall apply:

- **Signals List #1** - applies to all **Controllable WFPSs**;

In addition, **Controllable WFPSs** 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.

WFPS1.7.1.1 **Signals List #1**

The **Controllable WFPS** shall make the following signals available at the designated **TSO Telecommunication Interface Cabinet** for that **Controllable WFPS**:

- 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) **Voltage Regulation Set-point** (in kV);
- g) On/off status indications for all **Reactive Power** devices exceeding 5 Mvar¹;
- h) Circuit-breaker and disconnect position indication shall be required. These may include indications from MV circuit-breakers on individual **WTG** circuits. Signals from individual **WTG** 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 WFPS's** scheduled **Operational Date**;

¹ Typically the position indication from capacitor/ SVC circuit breakers

- 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 WFPS**.

For the **Controllable WFPS'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**.

WFPS1.7.1.2 Signals List #2

WFPS1.7.1.2.1 **Controllable WFPSs** 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 WFPS**:

| | <u>[Units, Range]</u> |
|---|-----------------------|
| a) Wind speed (at hub height) - measurand signal; | [m/s, 0-70] |
| b) Wind direction (at hub height) - measurand signal; | [deg, 0-360] |
| c) Air temperature- measurand signal; | [deg C, -40-70] |
| d) Air pressure- measurand signal. | [mBar, 735-1060] |

WFPS1.7.1.2.2 The meteorological data signals shall be provided by a dedicated **Meteorological Mast** located at the **Controllable WFPS** site or, where possible and preferable to do so, data from a means of the same or better accuracy. For **Controllable WFPSs** where the **WTG** are widely dispersed over a large geographical area and rather different weather patterns are expected for different sections of the **Controllable WFPS**, the meteorological data shall be provided from a number of individual **Meteorological Masts**, or where possible and preferable to do so, data from a source of the same or better reliability for groups of **WTG** (e.g. 1 set of meteorological data for each group of XX **WTG** within the **Controllable WFPS**). It is expected that **WTG** within an individual group shall demonstrate a high degree of correlation in **Active Power** output at any given time. The actual signals required shall be specified by the **TSO** at least 120 **Business Days** prior to the **Controllable WFPS's** scheduled **Operational Date**.

WFPS1.7.1.3 Signals List #3

WFPS1.7.1.3.1 **Controllable WFPSs** with a **MEC** in excess of 10 MW shall make the following signals available at the designated **TSO Telecommunication Interface Cabinet** for that **Controllable WFPS**:

- a) **Controllable WFPS 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 %).

WFPS1.7.1.3.2 For **Controllable WFPSs** with a **MEC** in excess of 10 MW, where the **WTG** are widely dispersed over a large geographical area and rather different weather patterns are expected for different sections of the **Controllable WFPS**, the above data set (ref. WFPS1.7.1.3.1) shall be provided for a number of groups of **WTG** (e.g. 1 signal for each group of XX **WTG** within the **Controllable WFPS**). It is expected that **WTG** within an individual group shall demonstrate a high degree of correlation in **Active Power** output at any given time. The actual signals required shall be specified by the **TSO** at least 120 **Business Days** prior to the **Controllable WFPS's** scheduled **Operational Date**.

WFPS1.7.1.4 Signals List #4

The **Controllable WFPS** shall make the following signals available at the designated **TSO Telecommunication Interface Cabinet** for that **Controllable WFPS**:

- a) **Controllable WFPS Active Power Control Set-point** value (MW);
- b) **Controllable WFPS Active Power Control** status indication (ON/OFF).

WFPS1.7.1.5 Signals List #5

The **Controllable WFPS** shall make the following signals available at the designated **TSO Telecommunication Interface Cabinet** for that **Controllable WFPS**:

- a) **Frequency Response System** mode signal (i.e. *Power-Frequency Response Curve 1 or 2*);
- b) **Frequency Response System** status indication (ON/OFF).
- c) **Frequency Response System Governor Droop** value.

WFPS1.7.1.6 Time Delays and Data Quality

WFPS1.7.1.6.1 Digital signal changes from the **Controllable WFPS** 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 **WFPS1.7.1.2.1**, which shall be updated within 5 seconds and with an error of 2.5% or less.

WFPS1.7.2 CONTROL SIGNALS FROM THE TSO TO CONTROLLABLE WFPS

WFPS1.7.2.1 The control signals described in WFPS1.7.2 shall be sent from the **TSO** to the **Controllable WFPS**. The **Controllable WFPS** shall be capable of receiving these signals and acting accordingly.

WFPS1.7.2.2 Active Power Control

An **Active Power Control Set-point** signal shall be sent by the **TSO** to the **Wind Farm Control System**. This set-point shall define the maximum **Active Power** output permitted from the **Controllable WFPS**. The **Wind Farm 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 WFPS** is required to make it possible for the **TSO** to remotely enable/disable the **Active Power Control** function in the **Wind Farm Control System**. The associated status indication is described in WFPS1.7.1.4.

WFPS1.7.2.3 Frequency Response

This signal shall be sent by the **TSO** to the **Controllable WFPS** 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 WFPS** is required to make it possible for the **TSO** to remotely enable/disable the **Frequency Response System**. The associated status indication is described in WFPS1.7.1.5.

The **Controllable WFPS** shall make it possible for the **TSO** to set the **Governor Droop** value of the **Frequency Response System** in values from 2% to 10%.

WFPS1.7.2.4 Voltage Regulation

This signal shall allow the **TSO** to send a **Voltage Regulation Set-point** for **Voltage Regulation** purposes. This signal shall be in the form of a single analogue value and a strobe pulse to enable.

WFPS1.7.2.5 **Black Start Shutdown**

Means shall be provided by the **Controllable WFPS** to facilitate the disconnection of the **Controllable WFPS** 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 WFPS** shall be required to trip the circuit-breaker(s) at the **Controllable WFPS's Connection Point** and shutdown the **Controllable WFPS** 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 WFPS's** scheduled **Operational Date**. **Controllable WFPSs** may only be reconnected (i.e. made live) when the **Network** is fully restored following instruction from the **TSO**² and only earlier if the **TSO** deems it acceptable to do so.

WFPS1.7.2.6 **Time Delays and Data Quality**

WFPS1.7.2.6.1 Digital output commands from the **TSO Telecommunication Interface Cabinet** shall be relayed to the **Controllable WFPS** equipment within 1 second. Set-point output signals shall be relayed within 5 seconds and with an error of 0.5% or less.

WFPS1.7.3 **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 WFPS'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.

WFPS1.7.4 **DATA AND COMMUNICATIONS SPECIFICATIONS**

WFPS1.7.4.1 The location of the **TSO Telecommunication Interface Cabinet** shall be agreed between the **TSO** and the **Controllable WFPS** at least 120 **Business Days** prior to the **Controllable WFPS's** scheduled **Operational Date**. A standard interface for signals will be made available to the **Controllable WFPS** by the **TSO**.

² Typically this instruction will be in the form of a Blackstart Shutdown OFF command

WFPS1.7.4.2 The necessary communications links, communications protocol and an individual **Controllable WFPS** signal list shall be specified by the **TSO** at least 120 **Business Days** prior to the **Controllable WFPS'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.

WFPS1.7.4.3 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**.

WFPS1.7.4.4 If **Active Power Control, Frequency Response** or **Voltage Regulation** facilities for the **Controllable WFPS** become unavailable, the **Controllable WFPS** shall contact the **TSO** without undue delay.

WFPS1.7.4.5 Where signals or indications required to be provided by the **Controllable WFPS** under WFPS1.7.1 and WFPS 1.7.2 become unavailable or do not comply with applicable standards due to failure of the **Controllable WFPS's** technical equipment or any other reason under the control of the **Controllable WFPS**, the **Controllable WFPS** shall, acting in accordance with **Good Industry Practice**, restore or correct the signals and/or indications as soon as possible.

WFPS1.7.5 WIND POWER FORECASTS

WFPS1.7.5.1 Should the **TSO** determine that wind power forecasts as produced by the **Controllable WFPS** are required, the **TSO** shall inform the **Controllable WFPS** and the wind power forecasts shall be provided by the **Controllable WFPSs**. 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.

WFPS1.7.5.2 **Controllable WFPSs** shall engage fully with the **TSO** to ensure that the necessary information is available to the **TSO** for the production of wind generation forecasts with the appropriate level of accuracy by the **TSO**. Where this engagement involves the provision of data by the **Controllable WFPS** 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.

WFPS1.7.6 CONTROLLABLE WFPS MW AVAILABILITY DECLARATIONS

Controllable WFPSs shall submit **Controllable WFPS MW Availability Declarations** whenever changes in **Controllable WFPS 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

1. Acronyms
2. Units
3. Definitions

Glossary-2

Glossary-3

Glossary-5

ACRONYMS

| | |
|-----------------------|--|
| AC | Alternating Current |
| AFR | Automatic Frequency Restoration |
| AGC | Automatic Generator Control |
| 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 Européen de Normalisation Electrotechnique |
| CER | Commission for Energy Regulation |
| CO₂ | Carbon Dioxide |
| COP | Committed Outage Programme |
| DC | Direct Current |
| DCC | Distribution Control Centre |
| DI | Dispatch Instruction |
| DMOL | Design Minimum Operating Level |
| DSO | Distribution System Operator |
| DWFPS | Dispatchable Wind Farm Power Station |
| ECC | Emergency Control Centre |
| ESB | Electricity Supply Board |
| ESO | External System Operator |
| ETSO | European Transmission System Operators |
| GC | General Conditions |
| GCRP | Grid Code Review Panel |
| GS | Generation Schedule |
| GT | Gas Turbine |
| HV | High Voltage |
| HVDC | High Voltage Direct Current |
| IEC | International Electrotechnical Committee |
| IOP | Indicative Outage Programme |
| ITU | International Telecommunications Union |
| JGCRP | Joint Grid Code Review Panel |
| LV | Low Voltage |
| MEC | Maximum Export Capacity |
| MO | Market Operator |
| MV | Medium Voltage |

| | |
|--------------|---|
| NCC | National Control Centre |
| NCDGU | Non-Centrally Dispatched Generating Unit |
| NIAUR | Northern Ireland Authority for Utility Regulation |
| NIE | Northern Ireland Electricity |
| OC | Operating Code |
| OLTC | On load Tap Changer |
| POP | Provisional Outage Programme |
| POR | Primary Operating Reserve |
| PSP | Pumped Storage Plant |
| RMS | Root Mean Square |
| RTU | Remote Terminal Unit |
| SCADA | Supervisory Control and Data Acquisition |
| SDC | Scheduling and Dispatch Code |
| SEM | Single Electricity Market |
| TSC | Trading and Settlement Code |
| SLR | Special Load Reading |
| SONI | System Operator Northern Ireland |
| SOR | Secondary Operating Reserve |
| SVC | Static Var Compensator |
| TAO | Transmission Asset Owner |
| TRM | Transmission Reliability Margin |
| TOR | Tertiary Operating Reserve |
| TSO | Transmission System Operator |
| TTC | Total Transfer Capacity |
| UFR | Under Frequency Relay |
| Un | Nominal Voltage |
| VO | Voluntary Outage |
| WFPS | Wind Farm Power Station |
| WTG | Wind Turbine Generator |

UNITS

| | |
|------------|-----------------|
| A | Amp(s) |
| °C | Degrees Celsius |
| GW | Giga Watt |
| GWh | Giga Watt hour |
| hPa | hecto Pascal |
| Hz | Hertz |
| kA | kilo Ampere |
| kW | kilo Watt |
| kWh | kilo Watt hour |

| | |
|--------------|-------------------------------------|
| kV | Kilo Volt |
| MWh | Mega Watt hour |
| MW | Mega Watt |
| TWh | Tera Watt hour |
| MVA | Mega Volt Ampere |
| Mvar | Mega Volt Ampere reactive / Megavar |
| Mvarh | Megavar hour |
| var | Volt Ampere reactive |

DEFINITIONS

| | |
|--|--|
| Act | The Electricity Regulation Act 1999. |
| Active Energy | <p>The electrical energy produced, flowing or supplied by an electric circuit during a time interval, being the integral with respect to time of the instantaneous Active Power, measured in units of Watt-hours or standard multiples thereof, i.e.:</p> <p>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)</p> |
| Active Power | <p>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:</p> <p>1000 Watts = 1 kW; 1000 kW = 1 MW; 1000 MW = 1 GW.</p> |
| Active Power Control | The automatic change in Active Power output from a Controllable WFPS in a response to an Active Power Control Set-point received from the TSO . |
| Active Power Control Mode | A mode of operation of a Controllable WFPS where the Controllable WFPS has been instructed by the TSO to maintain its Active Power output at the Active Power Control Set-Point . |
| Active Power Control Set-point | The maximum amount of Active Power in MW, set by the TSO , that the Controllable WFPS is permitted to export. |
| Active Power Control Set-Point Ramp Rate | The rate of increase or decrease of Active Power output of a Controllable WFPS in response to an Active Power Control Set-point instruction. |
| Additional Grid Code Availability Notice | A notice submitted by a User to the TSO pursuant to SDC1.4.2 relating to additional data on Availability . |
| Additional Grid Code Characteristics Notice | A notice to be submitted to the TSO pursuant to SDC1.4.4.2 relating to additional technical data. |
| AGC Control Range | The range of loads over which AGC may be applied. |

| | |
|---|--|
| AGC Maximum Load | The upper limit of the AGC Control Range . |
| AGC Minimum Load | The lower limit of the AGC Control Range . |
| Aggregate Interconnector Ramp Rate | The maximum Ramp Up Rate for an Interconnector or maximum Ramp Down Rate as determined by the TSO . |
| Aggregated Demand Site | A group of Individual Demand Sites represented by a Demand Side Unit Operator , which together are capable of a Demand Side Unit MW Capacity equal to or above 4 MW (and which is therefore subject to Central Dispatch from the TSO). Each Individual Demand Site comprising an Aggregated Demand Site shall be in one currency zone and shall have a Demand Side Unit MW Capacity of no greater than 10 MW. Unless otherwise specified, information submitted in respect of an Aggregated Demand Site shall always be at an aggregated level. |
| Aggregated Generating Unit | A group of Generating Units represented by a Generator Aggregator , each of which must not have a Registered Capacity greater than 10 MW. An Aggregated Generating Unit with a total Registered Capacity of 4 MW or more shall be subject to Central Dispatch, but one with a total Registered Capacity of less than 4 MW may be subject to Central Dispatch subject to agreement with the TSO . Unless otherwise specified by the TSO or otherwise in the Grid Code , information submitted in respect of an Aggregated Generating Unit shall always be at an aggregated level. |
| Aggregated Maximum Export Capacity | In the case of a Generator Aggregator , the aggregated value (in MW , MVA , kW and/or kVA) provided in each Connection Agreement (or connection agreement to the Distribution System , as the case may be) for the Generating Units for which the Generator Aggregator is responsible. |
| Aggregator | Either a Generator Aggregator or a Demand Side Unit Operator in respect of an Aggregated Demand Site . |
| Alert | A Red Alert , an Amber Alert or a Blue Alert or other Alert warning as agreed pursuant to OC9 (Emergency Control and Power System Restoration) |
| Amber Alert | An alert issued by the TSO to the Users when a single Event would give rise to a reasonable possibility of failure to meet the Power System Demand , or of Frequency or Voltage departing significantly from normal or if multiple Events are probable due to |

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| | prevailing weather conditions. |
| Ancillary Service | A service, other than the production of electricity, which is used to operate a stable and secure Power System including. Reactive Power, Operating Reserve, Frequency Control and Blackstart Capability . |
| Ancillary Service Agreement | The bilateral agreement between the TSO and the User , which contains the detail specific to the User's provision of Ancillary Services . |
| Annual SLR Conditions | 12.30 and 18.00 on the second Tuesday of January or any other day nominated by DSO . |
| Apparatus | An item of equipment in which electrical conductors are used, supported or of which they may form part and includes meters, lines, cables and appliances used or intended to be used for carrying electricity for the purpose of supplying or using electricity. |
| Apparent Power | The product of voltage and of alternating current measured in units of volt-amperes and standard multiples thereof. |
| Automatic Frequency Restoration | A system for reconnecting Demand Customers automatically following a low frequency Event on the Transmission System , once the frequency has recovered. |
| Automatic Generator Control (AGC) | A control system installed between the NCC and a Power Station whereby MW set points can be adjusted remotely by the TSO to reflect the Dispatch Instruction |
| Automatic Low Voltage Demand Disconnection (ALVDD) | The automatic disconnection of Demand Customers when the Voltage or the rate of change of voltage has violated acceptable limits as determined by the TSO . |
| Automatic Voltage Regulation | Automatic maintenance of a Generation Unit's terminal voltage or Interconnector's Reactive Power output at a desired setpoint |
| Automatic Voltage Regulator | A continuously acting automatic closed loop control system acting on the excitation system so as to maintain a Generation Unit's terminal voltage at a desired setpoint. |
| Autonomous Generating Units | A Generating Unit that is not subject to Central Dispatch or subject to Active Power control by the relevant TSO . |
| Autoproducer | Persons to whom electrical Energy is provided and by whom the electrical Energy is generated essentially for their own use, by means of a direct connection to the Transmission System . |

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| Auxiliaries | Any item of Plant and/or Apparatus not directly a part of the boiler plant or Generating Unit , but required for the boiler plant's or Generating Unit's functional operation. 'Auxiliary' shall be defined accordingly. |
| Auxiliary Diesel Engine | A diesel engine driving a Generating Unit which can supply a Unit Board or Station Board , which can start without an electrical power supply from outside the Power Station within which it is situated. |
| Auxiliary Fuel | A fuel other than a Primary Fuel which may be used for start up purposes or for support of combustion or Maximisation when the Generation Unit is producing Energy |
| Auxiliary Load | The electrical Demand of the Generation Unit's Auxiliary Plant required for the operation of the Generation Unit . |
| Auxiliary Plant | Any item of Plant and/or Apparatus not directly a part of the boiler plant or Generation Unit , but required for the boiler plant's or Generation Unit's functional operation. |

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| <p>Availability</p> | <p>At any given time the measure of Active Power a Generation Unit(s) is capable of delivering to the Connection Point and the term “Availabilities” shall be construed accordingly. This can be calculated as a gross figure.</p> <p>In terms of a Demand Side Unit the measure at any given time of the Active Power the Demand Side Unit is capable of delivering to the System.</p> <p>At any given time the measure of Active Power an Interconnector is capable of importing to or exporting from the Connection Point and the term “Availabilities” shall be constructed accordingly. This can be calculated as a gross figure.</p> |
| <p>Availability Notice</p> | <p>A notice to be submitted to the TSO pursuant to SDC1.4.1.1.</p> |
| <p>Availability Factor</p> | <p>The ratio of the Energy that could have been produced during a specified period of time by a Generation Unit operating in accordance with its Availability, and the Energy that could have been produced during the same period by that Generation Unit operating at its Registered Capacity. Availability Factor can alternatively be reported in gross terms.</p> |
| <p>Available Active Power</p> | <p>The amount of Active Power that the Controllable WFPS could produce based on current wind conditions. The Available Active Power shall only differ from the actual Active Power if the Controllable WFPS has been curtailed, constrained or is operating in a restrictive Frequency Response mode.</p> |
| <p>Black Start</p> | <p>The procedure necessary for a recovery from a Total Shutdown or Partial Shutdown.</p> |
| <p>Black Start Capability</p> | <p>Ability in respect of a Black Start Station, for at least one of its Centrally Dispatched Generation Units or Interconnector to start-up from Shutdown, without importing energy from the Transmission System, and to energise a part of the Transmission System and be Synchronised or energised (for Interconnectors) to the Transmission System upon instruction from the TSO.</p> |
| <p>Black Start Shutdown</p> | <p>In the event of a Partial Shutdown or Total Shutdown of the Transmission System, the Controllable WFPS shall be sent a Black Start Shutdown signal by the TSO and upon receipt of the signal, the Controllable WFPS shall trip the circuit breaker(s) at the</p> |

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| | Connection Point and shutdown the Controllable WFPS in a controlled manner. |
| Black Start Station | A Power Station and/or Interconnector which is registered pursuant to Grid Code as having a Black Start Capability |
| Block Load | The level of output that a Generating Unit immediately produces following Synchronisation . For avoidance of doubt, Block Load can equal 0 MW. |
| Block Load Cold | Block Load during a Cold Start . |
| Block Load for an Interconnector | The level of output, in either flow direction, that an Interconnector immediately produces following energisation. For avoidance of doubt, Block Load can equal 0 MW and can be different in either flow direction. |
| Block Load Hot | Block Load during a Hot Start . |
| Block Load Warm | Block Load during a Warm Start . |
| Blue Alert | An alert issued by the TSO signifying that either a Partial Shutdown or a Total Shutdown of the Power System has taken place. |
| Business Day | Monday through Friday excluding public holidays and holidays observed by ESB . |
| Cancelled Start | A response by a Generator to an instruction from the TSO cancelling a previous instruction to Synchronise to the Transmission System . |
| Capacity | The rated continuous load-carrying ability, expressed in megawatts (MW) or megavolt-amperes (MVA) of generation, transmission, or other electrical equipment. |
| Capacity Adequacy | When there is sufficient Generation Capacity to meet the Demand and Reserve requirements. |
| Capacity Adequacy Indicator | An indication issued by the TSO for each weekly peak of the year based on Availability and Demand forecasts whether or not there is sufficient Generation Capacity to meet Demand . |
| Capacity Shortfall Warning | A warning issued by the TSO that based on Availability and Demand forecasts there is insufficient Generation Capacity to meet the peak Demand . |
| CCGT Installation Matrix | The matrix which must be submitted by a Generator under the Planning Code and which is used by the TSOs for Scheduling |

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| | and Dispatch purposes under the SDCs as a “look up” table determining which CCGT Units will be operating at any given MW Dispatch level subject to any updated Availability information submitted by a Generator to a TSO under SDC1 . |
| CCGT Installation | A collection of Generation Units comprising one or more Combustion Turbine Units and one or more Steam Units where, in normal operation, the waste heat from the Combustion Turbine Units is passed to the water/steam system of the associated Steam Unit or Steam Units and where the component Generation Units within the CCGT Installation are directly connected by steam or hot gas lines which enable those Units to contribute to the efficiency of the combined cycle operation of the CCGT Installation . |
| CCGT Unit | A Generation Unit within a CCGT Installation |
| Central Dispatch | <p>The process of Scheduling and issuing Dispatch Instructions directly to a Control Facility by the TSO pursuant to the Grid Code.</p> <p>All Dispatchable WFPs, Interconnectors, Pumped Storage Plant Demand, Demand Side Units, and Aggregated Generating Units are subject to Central Dispatch. In relation to all other Generation Units, thresholds apply as follows:</p> <ul style="list-style-type: none"> ▪ 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 |

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| | relating to the submission of Commercial Offer Data . |
| Centrally Dispatched Generating Unit | A Generating Unit within a Power Station subject to Central Dispatch , which comprises, unless specified otherwise in relation to a particular use of the term, a Thermal Plant including a CCGT Installation , a Dispatchable WFPS , Hydro Unit and Pumped Storage Plant in respect of its Pumped Storage Generation . |
| Cold Start | Any Synchronisation of a Generating Unit that has previously not been Synchronised for a period of time longer than its submitted Warm Cooling Boundary . |
| Collector Network | The network of cables and overhead lines within a Controllable WFPS used to convey electricity from individual WTGs to the Connection Point . |
| Combustion Turbine Unit | A Generation Unit which compresses the inlet air and feeds fuel to the combustion chamber. The fuel and air burn to form hot gases which in turn forces these hot gases into the turbine, causing it to spin. The turbine can be fuelled by natural gas, by distillate or by other such fuels as technology may allow. |
| Commercial Energy Metering | Metering which is utilised to measure Energy for Tariff charging purposes. |
| Commercial Offer Data | Data submitted by a User or an Intermediary to the MO pursuant to the TSC in relation to prices and, where applicable, Nominated Profile for certain Users . |
| Commissioning | Activities involved in undertaking the Commissioning Test or implementing the Commissioning Instructions pursuant to the terms of the Connection Agreement or as the context requires the testing of any item of users equipment required pursuant to this Grid Code prior to connection or re-connection in order to determine that it meets all requirements and standards for connection to the Transmission System . It also includes activities that determine the new values of parameters that apply to it following a material alteration or modification and in addition those activities involved in undertaking the Commissioning Tests or implementing the Commissioning Instructions as the context requires. |
| Commissioning Instructions | A step-by-step test procedure for a Commissioning Test . |
| Commissioning Test | Testing of a CDGU , Controllable WFPS , Pumped Storage Plant Demand , Demand Side Units , Aggregated Generating Units , |

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| | | 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 WFPS, Pumped Storage Plant Demand, Demand Side Units, Aggregated Generating Units, Interconnector or of an item of User's Equipment and the term "Commissioning Testing" shall be construed accordingly. |
| Committed Programme | Outage | A programme of Outages of the Generator's Generation Units and of Interconnectors prepared by the TSO pursuant to Section OC2 and covering year 1. |
| Committed Project Planning Data | | Data relating to a User Development once the offer for a Connection, Use of System Agreement and/or supplemental agreements are accepted. |
| Common Section | | Those parts of the Grid Code which are under common governance in both the Grid Code and the Other Grid Code , as further provided in the Grid Code . |
| Communications and Control Room | | The communications and control room to be provided by the User in accordance with the Connection Agreement |
| Connection Agreement | | The bilateral agreement between the TSO and the User , which contains the detail specific to the User's connection to the Transmission System . |
| Connection Conditions | | The section of this Grid Code which is identified as the Connection Conditions . |
| Connection Date | | The date on which the Commissioning Instructions have to the TSO's satisfaction been properly implemented in respect of every part of the User's Equipment , following which the TSO shall, as soon as reasonably practicable notify the User to that effect, specifying the date of completion of such implementation |
| Connection Offer | | A quotation letter together with the unsigned Connection Agreement which forms the TSO's offer for connection of the Facility to the Transmission System as the result of an application for connection of the Facility . |
| Connection Point | | The physical point where the User's Plant Apparatus or System is joined to the Transmission System or the Distribution |

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| | System. |
| Connection Site | The site at which the Plant and Apparatus of the User at the User's side of the Connection Point is to be installed including the land, spaces, roads and any surfaces. |
| Constrained Group | A group of Generating Units located within a constrained part of the System as determined by the TSO . |
| Contingency | The unexpected failure or Outage of a system component, such as a Generation Unit , transmission line, circuit breaker, switch, or other electrical element. A Contingency also may include multiple components, which are related by situations leading to simultaneous component outages. |
| Contingency Reserve | The margin of available Generation Capacity over forecast System Demand which is required in the period of 24 hours ahead down to real time, to cover against uncertainties in availability of Generation Capacity and against Demand forecast errors or variations |
| Control Action | An action, such as switching, whereby the Transmission System is operated. |
| Control Centre | A location used for the purpose of monitoring, control and operation of the Transmission System or a User System other than a Generator's System . |
| Control Facility | A location used for the purpose of Monitoring , control and operation of the User 's Plant and Apparatus and for accepting Dispatch Instructions via Electronic Interface . |
| Control Phase | The Control Phase follows on from the Programming Phase and starts with the issue of the Generation Schedule for the next day and covers the period down to the real time |
| Control Synchronising | The coupling (by manual or automatic closing of the circuit breaker) of two asynchronous Systems by means of synchroscope. |
| Controllable WFPS | A site containing at least one WTG can automatically act upon a remote signal from the TSO to change its Active Power output. |
| Controllable Availability | WFPS The amount of MW the Controllable WFPS can produce given favourable wind conditions. |
| Controllable Availability Declaration | WFPS MW A measure of the maximum Active Power output which can be produced by a Controllable WFPS given favourable wind |

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| | conditions. Account shall be taken of partial and/or full outages of individual WTG within the Controllable WFPS . |
| Controllable WFPS Operator | The operator of the Controllable WFPS . |
| Controlled Active Power | The amount of Active Power that a Controllable WFPS is permitted to export based on the Active Power Control Set-point signal sent by the TSO . |
| Critical Fault Clearance Time | The longest fault duration not leading to out-of-step conditions such as pole-slipping in a Generating Unit following a Fault Disturbance . Critical Fault Clearance Time will vary according to the active and reactive power output of the Generating Unit . The minimum Critical Fault Clearance Time for a particular Fault Disturbance is likely to occur when the Generating Unit is at maximum Active Power output and maximum leading Reactive Power output. |
| Current Source Technology | Current source inverters include all static devices generating an AC current from a rectified DC current source. The intermediate DC current is kept constant with a controlled rectifier and high inductance reactors, while the AC output is of variable Frequency and Voltage . |
| Customer | A person to whom electrical power is provided (whether or not this is the same person who provides the electrical power). |
| Customer Demand Management | Reducing the supply of electricity to a Customer or disconnecting a Customer in a manner agreed for commercial purposes between a Supplier and its Customers |
| Cycle Operating Mode | The Open Cycle Mode or combine cycle Operating Mode of a CCGT Installation which may need to be specified pursuant to a Dispatch Instruction under SDC2.4.2.4(j). |
| Declaration | A notice prepared by the User in respect of a User's Plant submitted to the TSO in accordance with the requirements of SDC1 and setting out the values (and times applicable to those values) of Availability , Ancillary Services capabilities, Operating Characteristics , and " Declared " shall be construed accordingly. |
| Declared Operating Characteristics | The Operating Characteristics which the Generator shall have informed the TSO under the provisions of SDC1 and which shall |

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| | reasonably reflect the true Operating Characteristics of the Generation Unit |
| De-energise | Disconnect from the Transmission System utilising circuit switches etc to isolate the Plant and/or Apparatus , and “ De-energised ” and “ De-energising ” shall be construed accordingly. |
| Deload Break Point | The point at which due to technical reason a Generating Unit may need to pause during its MW Output reduction process. |
| De-Loading Rate | The rate at which a Generation Unit reduces MW Output from Minimum Generation to zero when it is instructed to cease output. There are up to two possible deloading rates, which shall be named accordingly: De-Loading Rate 1 and De-Loading Rate 2 . |
| Demand | The amount of electrical power consumed by the Power System comprising of both Active and Reactive Power , unless otherwise stated. |
| Demand Control | All or any of the methods of achieving a Demand reduction or an increase in Demand as set out in OC5. |
| Demand Control Alert | A warning issued by the TSO when the TSO anticipates that it will or may instruct the DSO to implement Demand reduction. |
| Demand Customer | A person to whom electrical Energy is provided by means of a direct connection to the Transmission System . Autoproducers are to be considered both Generators and Demand Customers . |
| Demand Disconnection | Disconnection of Demand Customers |
| Demand Side Unit | An Individual Demand Site or Aggregated Demand Site with a Demand Side Unit MW Capacity of at least 4 MW. The Demand Side Unit shall be subject to Central Dispatch . |
| Demand Side Unit Energy Profile | The estimated total Energy requirement for an Individual Demand Site or aggregated consumption for each Individual Demand Site which form part of an Aggregated Demand Site for each Trading Period in the following Optimisation Time Horizon period and which must be submitted to the TSO in the Availability Notice under SDC1.4.4.2. |
| Demand Side Unit MW Availability | The forecasted change in Active Power which can be achieved in one currency zone by a Demand Side Unit for each Trading Period in the following Optimisation Time Horizon period and |

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| | which must be submitted by the User to the TSO in an Availability Notice under SDC1.4.1.2. |
| Demand Side Unit MW Capacity | The maximum change in Active Power that can be achieved by a Demand Side Unit by totalling the potential increase in on-site Active Power Generation and the potential decrease in on-site Active Power Demand at each Individual Demand Site . |
| Demand Side Unit MW Response | The proportion (in MW) of the Demand Side Unit MW Capacity that is delivered at a given time following a Dispatch Instruction from the TSO . This value will be zero unless dispatched by the TSO . |
| Demand Side Unit MW Response Time | The time as specified by the Demand Side Unit Operator in the Technical Parameter and is the time it takes for the Demand Side Unit Operator to be able to implement the Demand Side Unit MW Response from receipt of the Dispatch Instruction from the TSO . |
| Demand Side Unit Operator | A person who operates a Demand Side Unit , with an aggregated Demand Side Unit MW Capacity not less than 4 MW. |
| De-maximisation Instruction | An instruction issued by the TSO to Generators to cease Maximisation . |
| Design Minimum Operating Level (DMOL): | The minimum Active Power output of Controllable WFPS where all WTGs are generating electricity and capable of ramping upwards at any of the specified ramp rates (given available wind), and shall not be greater than 12% of Registered Capacity . |
| Designated Operator | The operators approved in writing by the relevant User as competent to carry out the procedures in the agreed Operation Instructions for parties connecting to the Transmission System |
| De-Synchronise | The act of taking a Generation Unit which is Synchronised to the Transmission System off the Transmission System to which it has been Synchronised and the term “ De-Synchronised ”, and other like terms, shall be construed accordingly. |
| De-Synchronising | The act of taking a Generating Unit off the Network , to which it has been Synchronised , and like terms shall be construed accordingly. |
| Disconnection | The physical separation of Users (or Customers) from the Transmission System or a User System as the case may be. |
| Dispatch | The issue by the TSO of instructions to a Generator, Pumped |

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| | 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 tranche pursuant to SDC2 and the term " Dispatched " shall be construed accordingly. |
| Dispatch Instruction | An instruction given by the TSO to a CDGU, Demand Side Unit, Interconnector tranche and/or Pumped Storage Plant Demand to that User's approved Control Facility to change the output, fuel or manner of operation of the CDGU, Demand Side Unit, Interconnector tranche and/or Pumped Storage Plant Demand . " Instruct " and " Instructed " shall be construed accordingly. |
| Dispatchable WFPS | A Controllable WFPS which must have a Control Facility in order to be dispatched via an Electronic Interface by the TSO . |
| Disputes Resolution Procedure | The procedures described in the Connection Agreement, Use of System Agreement and Ancillary Services Agreement relating to disputes resolution. |
| Distribution Control Centre | Control Centre of the Distribution System Operator |
| Distribution System | The system consisting (wholly or mainly) of electric circuits, transformers and switchgear which are operated by and used for the distribution of electricity from Grid Supply Points or Generating Units or other entry points to the point of delivery to Customers or other Users and any Plant and Apparatus and meters used in connection with the distribution of electricity, but not including any part of the Transmission System . |
| Distribution System Operator (DSO) | An entity unit within ESB which is responsible for, amongst other things, the planning, development, operation and maintenance of the Distribution System . |
| Disturbance | An unplanned event that produces an abnormal System condition. |
| Disturbing Loads | A load on the System that adversely affects Power Quality . |
| DSO Connection Agreement | The bilateral agreement between the DSO and the DSO Demand Customer , which contains the detail specific to the DSO Demand Customer's connection to the Distribution System . |
| DSO Demand Customer | A person to whom electrical Energy is provided by means of a direct connection to the Distribution System . |

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| Dwell Time Down | The duration for which the Generating Unit must remain at the Dwell Time Down Trigger Point during a change in its MW Output while ramping down between instructed MW Output and Minimum Generation . |
| Dwell Time Down Trigger Point | A constant MW level at which a Generating Unit must remain while ramping down between instructed MW Output and Minimum Generation . There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter. |
| Dwell Time Up | The duration for which the Generating Unit must remain at the Dwell Time Up Trigger Point during a change in its MW Output while ramping up between Minimum Generation and instructed MW Output . |
| Dwell Time Up Trigger Point | A constant MW level at which a Generating Unit must remain while ramping up between Minimum Generation and instructed MW Output . There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter. |
| Earthing | A way of providing a connection between conductors and earth by an Earthing Device . |
| Earthing Device | A means of providing a connection between a conductor and earth being of adequate strength and capability for the intended purpose. |
| Effect of Parallel Flows | The effect of the flow of electricity on an electric system's transmission facilities resulting from scheduled electric power transfers between two electric systems. Electric power flows on all interconnected parallel paths in amounts inversely proportional to each paths resistance. |
| Electronic Alert System | The primary means by which an Alert is transmitted by the TSO to Users (or to certain Users only) in accordance with OC9 . |
| Electronic Interface | A system, in accordance with the requirements of the TSO's data system, at the Control Facility , providing an electronic interface between the TSO and a User , for issuing and receiving instructions, including Dispatch Instructions as provided for in the Grid Code and established pursuant to an agreement between the TSO and the User . |

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| Embedded Generation | Generation Units within a Power Station which are directly connected to a Distribution System or the system of any other User , such connection being either a direct connection or a connection via a busbar of another User but with no other Connection to the Transmission System |
| Emergency | Any abnormal system condition that requires automatic or immediate manual action to prevent or limit loss of transmission facilities or generation supply that could adversely affect the reliability of the Transmission System |
| Emergency Control Centre (ECC) | A site, remote from the National Control Centre , providing at least the minimum level of control capabilities necessary for secure operation of the Power System , to be utilised in the event that an emergency situation or major failure of facilities at the National Control Centre prevents operation from the National Control Centre , or otherwise as determined by the TSO (e.g. for NCC maintenance, testing or training). |
| Emergency Instruction | A Dispatch instruction issued by the TSO , pursuant to SDC2.11 to a CDGU or an Interconnector which may require an action or response which is outside the limits implied by the then current Declarations . |
| End of Restricted Range | The end point in MW of a Forbidden Zone . There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter. |
| End Point of Start-up Period | The time after which the rate of change of the Generating Unit Output is not dependent upon the initial Warmth of the Generating Unit . |
| Energise | The movement of any isolator, breaker or switch so as to enable active power and reactive power to be transferred to and from the Facility through the Generator's Plant and Apparatus and " Energised " and " Energising " shall be construed accordingly. |
| Energy | The electrical energy produced, flowing or supplied by an electrical circuit during a time interval and being the integral with respect to time of the instantaneous Active Power , measured in units of Watt-hours or standard multiples thereof. |
| Energy Limit | The target amount of Energy to be generated by an Energy Limited Generating Unit within the Trading Day . |

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| Energy Limit Factor | A factor between zero and one, which is applied to the Energy Limit for use in calculating the scheduled Energy of Energy Limited Generating Units in the period between the end of the Trading Day and the end of the Optimisation Time Horizon period. |
| Energy Limit Start | 06:00 hours on the Trading Day . |
| Energy Limit Stop | 06.00 hours on the day following the Trading Day . |
| Energy Limited Generating Unit | A Hydro Unit with a limit on the Energy it can deliver in a specified time period. |
| ESB Networks Electrical Safety Rules | The current version of the document prepared by ESB and entitled “ESB Networks Electrical Safety Rules” |
| ESB Power Generation Electrical Safety Rules | The current version of the document prepared by ESB and entitled “ESB Power Generation Electrical Safety Rules”. |
| Estimated Registered Data | Those items of Planning Data which either upon connection will become Registered Data , or which for the purposes of the Plant and/or Apparatus concerned as at the date of submission are Registered Data , but in each case which for the seven succeeding the TSO financial years will be an estimate of what is expected. |
| Event | An unscheduled or unplanned occurrence on, or relating to either the Transmission System or a User's System , including faults, incidents and breakdowns. |
| External Interconnection | Apparatus for the transmission of electricity to (from) the Transmission System or the Other Transmission System from (to) a transmission or distribution system located outside the island of Ireland. |
| External System | In relation to an External System Operator means the transmission or distribution system which it operates which is located outside the island of Ireland and any Apparatus or Plant which connects that system to the External Interconnection and which is owned or operated by such External System Operator . |
| External System Operator | A person who operates an External System which is connected to the Transmission System or the Other Transmission System by an External Interconnection . |
| Externally Interconnected | The operator of an electrical transmission or distribution system outside the island of Ireland which is connected to the |

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| Party | Transmission System by an External Interconnection . |
| Extraordinary AVR Response | Any response to a Voltage Dip that requires an extraordinary response from normal behaviour of the Automatic Voltage Regulator of a Generation Unit . For the avoidance of doubt any action of an Automatic Voltage Regulator , which results in anything other than an adjustment of the excitation field current is deemed to be an Extraordinary AVR Response . Where such schemes, including fast valving, are being considered by a Generator they need to be formally agreed with the TSO before implementation, such agreement not to be unreasonably withheld. |
| Extraordinary Governor Response | Any response to a Voltage Dip that requires an extraordinary response from normal behaviour of the Governor Control System of a Generation Unit . For the avoidance of doubt any action other than Governor Control System with respect to Frequency dips is deemed to be an Extraordinary Governor Response . Where such schemes, including fast valving, are being considered by a Generator they need to be formally agreed with the TSO before implementation, such agreement not to be unreasonably withheld. |
| Facility | The User's facility located at the Connection Site including the User's Plant and Apparatus plus the Plant and Apparatus to be installed at the User's side of the Connection Point necessary to effect the connection |
| Flexible Outage | An Outage scheduled in the Committed Outage Programme as a Flexible Outage which is not within four Business Days of the scheduled start date and time |
| Failure to Follow Notice to Synchronise Instruction | An instruction given by the TSO to a Generator in respect of its CDGU confirming that it has failed to Synchronise more than 5 minutes after the time specified in the Notice to Synchronise . |
| Failure to Reach Minimum Generation Instruction | An instruction given by the TSO to a Generator in respect of its CDGU confirming that it has De-Synchronised where it has tripped before reaching Minimum Generation . |
| Fault Disturbance | Any type of fault including, but not limited to, single line to ground, line to line and three-phase short-circuits, in any single item of Plant |

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| | anywhere in the Transmission System where the operation of the TSO protection will not disconnect the Generator Plant from the existing or planned Transmission System under normal or Scheduled Outages conditions. For the avoidance of doubt this Fault Disturbance can include bus zone protection. |
| Fault Inception | The point in time at which the Transmission System Voltage at the Connection Point goes outside the range as defined in CC.8.3.2, on any or all phases. At nominal voltages less than 110 kV, this shall be the point in time at which the Voltage under construction is less than 0.9pu of the nominal Voltage . |
| Fault Ride-Through | The ability of a Generating Unit to stay Synchronised to the Transmission System during and following a Fault Disturbance . |
| Fault Ride-Through Time | The required fault duration that a Generating Unit shall ride through for a particular Fault Disturbance , and is equivalent to the Critical Fault Clearance Time . |
| Forbidden Zone | A MW range within which a Generator or Interconnector cannot operate in a stable manner due to an inherent technical limitation of the machine. |
| Forced Outage Probability | The probability, in percentage terms, of a Generation Unit or an Interconnector not being available to provide Energy or Ancillary Services . |
| Forecast Minimum Generation Profile | The User's forecast of the average level of Minimum Generation , in MW , for the User's Plant for each Trading Period in the Optimisation Time Horizon . |
| Forecast Minimum Output Profile | The User's forecast of the average level of minimum MW Output , in MW , for a Pumped Storage Plant for each Trading Period in the Optimisation Time Horizon . |
| Forecast Statement | A statement as defined in Section 38 of the Act |
| Frequency | The number of alternating current cycles per second (expressed in Hertz) at which a System is running. |
| Frequency Control | The control of the Frequency on the Power System . |
| Frequency Deadband | A Frequency range within which the Governor Control System is not expected to respond to changes in Transmission System Frequency . The purpose of the Frequency Deadband is to filter |

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| | out noise and not to restrict the normal Frequency response of the Governor Control System . |
| Frequency Demand Disconnection | Disconnection of Demand Customers when Frequency falls to a particular threshold. |
| Frequency Event | An event where the Transmission System Frequency deviates to a value below 49.5Hz. |
| Frequency Regulation | The automatic adjustment of Active Power output by a Generation Unit , initiated by free governor action in response to continuous minor fluctuations of Frequency on the Power System . |
| Frequency Response | The automatic adjustment of Active Power output from a Generation Unit(s) or Interconnector in response to Frequency changes |
| Frequency Response Ramp Rate | The minimum rate of increase or decrease of Active Power output of a Controllable WFPS when acting to control Transmission System Frequency . |
| Frequency Response System | A facility providing the means to automatically adjust the Active Power output from a Generation Unit(s) in response to changes in Frequency . |
| Frequency Sensitive Mode | The operation of a Generating Unit whereby its generation level is varied automatically to compensate for variations in the Frequency of the System . |
| Full-Day 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: <ul style="list-style-type: none"> (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 |
| Gas Turbine Unit | A Generation Unit driven by gas.. |
| Gate Closure | 10.00 hours on the day preceding the relevant Trading Day to which a notice relates. |
| Gate Window | The period of time within which data transactions may be submitted and accepted for use in the associated market scheduling and pricing software run, as set out in the TSC . There are three Gate Windows and three corresponding Trading Windows associated with each Trading Day , denoted EA1 (Ex- |

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| | Ante 1), EA2 (Ex-Ante 2), and WD1 (Within-day 1). |
| Gate Window Closure | The time prior to which data transactions may be submitted and accepted for use in the associated market scheduling and pricing software run, as set out in the TSC . |
| Gate Window Opening | The time after which data transactions may be submitted and accepted for use in the associated market scheduling and pricing software run, as set out in the TSC . |
| General Conditions | The part of Grid Code which is defined as the General Conditions |
| Generating Plant | A Power Station subject to Central Dispatch . |
| Generating Unit | Has the same meaning as Generation Unit . |
| Generation | The process of producing electrical energy from other forms of energy; also, the amount of electric energy produced, usually expressed in megawatt-hours (MWh). |
| Generation Outage Programme | Any or all of the Indicative Outage Programme , the Provisional Outage Programme and the Committed Outage Programme . |
| Generation Unit | Any apparatus which produces electricity and, for the purpose of SDC1 and SDC2 , shall include a CCGT Installation or a CCGT Unit , where running arrangements and/or System conditions apply. |
| Generation Unit Output | The Active Power and Reactive Power produced by a Generation Unit net of Generation Unit Auxiliary Load |
| Generator | A person or Power Station as the case may be who generates electricity and is subject to the Grid Code pursuant to any agreement with the TSO or otherwise. Autoproducers are to be considered both Generators and Demand Customers . |
| Generator Aggregator | A person who represents several Generating Units , each of which does not have a Registered Capacity greater than 10 MW and the combined Registered Capacity of which is equal to or greater than 4 MW, by in particular preparing notices under SDC1, in relation to those Generating Units and receiving Dispatch Instructions in relation to those Generating Units under SDC2. For the avoidance of doubt, a Generator Aggregator cannot aggregate a Generating Unit with an output equal to or above 10 |

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| | MW. |
| Generator Declared Inflexibilities | The inflexibilities declared by a Generator to the TSO under SDC1 and which the TSO must take into account under SDC1.4.5.3 when compiling the Indicative Operations Schedule . |
| Generator Site | The site owned (or occupied pursuant to a lease, licence or other agreement) by the Generator which contains the Connection Point . |
| Generator Transformer | A transformer whose principal function is to provide the interconnection between the Generation Unit and the Network and to transform the Generation Unit voltage to the Network voltage. |
| Generator Terminal | The stator terminals of a Generating Unit . |
| Good Industry Practice | Those standards, practices, methods and procedures conforming to safety and legal requirements which are attained by exercising that degree of skill, diligence, prudence and foresight which would reasonably and ordinarily be expected from a skilled and experienced person engaged in the same type of undertaking under the same or similar circumstances. |
| Governor Control System | A system which will result in Active Power output of a Generation Unit changing, in response to a change in System Frequency , in a direction which assists in the recovery to Target Frequency |
| Governor Droop | The percentage drop in the Frequency that would cause the Generation Unit under free governor action to change its output from zero to its full Capacity . In the case of a Controllable WFPS , it is the percentage drop in the Frequency that would cause the Controllable WFPS to increase its output from zero to its full Registered Capacity . |
| Grid Code | This code prepared by the TSO pursuant to section 33 of the Act , and approved by the CER , as from time to time revised, amended, supplemented or replaced with the approval of or at the instance of the CER . |
| Grid Code Review Panel | The panel as set out in GC5 of the General Conditions |
| Grid Code Test | A test that is to be mutually agreed, with agreement not to be unreasonably withheld, and conducted in accordance with Grid Code . |
| Grid Connected | Connected to the Transmission System |

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| Grid Connected Transformer | Any transformer directly connected to the Transmission System . |
| Grid Connection Point | The point at which a Generating Unit , Interconnector or a CCGT Installation or a CCGT Unit or a Customer or an External System , is directly connected to the Transmission System . |
| Grid Supply Point or GSP | A point of connection between the Transmission System and the Distribution System or a Demand Customer or other network operator. |
| Hot Cooling Boundary | The period of time, following De-Synchronisation of a Generating Unit after which the Warmth State transfers from being hot to being warm. |
| Hot Start | Any Synchronisation of a Generating Unit that has previously not been Synchronised for a period of time shorter than or equal to its submitted Hot Cooling Boundary . |
| Hydro Unit | A Unit which generates electricity from the movement of water excluding Pumped Storage . |
| In Writing | This includes typewriting, printing, lithography, electronic mail, facsimile and other modes of reproducing words in a legible and non-transitory form; |
| Incremental Price | The marginal price at a particular MW Output , for increasing Energy output (or reducing demand) by 1 MWh , once that unit has started to generate Energy (or reduce Demand , as the case may be). |
| Independent Sector Users | A person who has been authorised by the TSO to use the interconnector pursuant to a valid Use of System Agreement. |
| Indicative Market Schedule | The schedule prepared by the Market Operator pursuant to the TSC . |
| Indicative Operations Schedule | The schedule prepared by the TSO conjunction with the Other TSO pursuant to SDC1.4.8.1. |
| Indicative Outage Programme | A programme of Outages of the Generator's Generation Units or Interconnectors prepared by the TSO pursuant to OC2 and covering years 4-7 ahead. |
| Individual Demand Site | A single premises of a Demand Customer connected to the Transmission System or a DSO Demand Customer connected to the Distribution System with a Demand Side Unit MW Capacity . |

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| Installed Plant | The size, nature and name plate rating of each fundamental constituent part of the Generation Unit . For a conventional Generation Unit this should include, at a minimum, information on each constituent part of the alternator, excitation system and turbine. For a windfarm this should, at a minimum, include the individual Wind Turbine Generator size, make and model and the number of Wind Turbine Generator(s) installed. Relevant, additional information should also be included, such as Power System Stabilisers . Where a User is not clear on the requirements, clarification must be sought from the TSO . |
| Interconnection Agreement | An agreement between the TSO and an External System Operator , which may include agreement with the Interconnector Owner and/or Interconnector Operator . |
| Interconnector | A HVDC electrical transmission system as a means for the bulk transmission of electrical power to or from the Transmission System or Other Transmission System to or from an External Transmission System . |
| Interconnector Filter | A tuned device within an Interconnector which prevents the transmission of harmonics to the Transmission System to which that Interconnector is connected and which also provides a means of controlling the Mvar flow to and from that Interconnector . |
| Interconnector Frequency Droop | In relation to an Interconnector transferring power into the Transmission System , it is the percentage drop in the Frequency that would, under the action of the Interconnector Frequency Control system, cause a change in the Interconnector's output from zero to its full Interconnector Registered Import Capacity . In relation to an Interconnector transferring power to an External System , it is the percentage drop in the Frequency that would, under the action of the Interconnector Frequency Control system, cause a change in the Interconnector's output from its full Interconnector Registered Export Capacity to zero. In both cases, it is assumed that the Frequency Control system is regulating the Frequency in the Transmission System . |
| Interconnector Minimum Export Load | Minimum MW output an Interconnector can export continuously to a remote network while maintaining stability. |

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| Interconnector Minimum Import Load | Minimum MW output an Interconnector can import continuously from a remote network while maintaining stability. |
| Interconnector Minimum Load | Absolute sum of the Interconnector Minimum Export Load and Interconnector Minimum Import Load representing the minimum range of bi-directional power transfer. |
| Interconnector Operating Protocol | The Interconnector Operating Protocol is a protocol for specific operating conditions of the Interconnector which may exist between the Interconnector Operator , the TSO and the External TSO . The Interconnector Operating Protocol shall be agreed as appropriate by all parties before operation of the Interconnector . The Interconnector Operating Protocol shall include but is not limited by the following; planned outage coordination, Operating Procedures, Interconnector Instructions, Interconnector Faults, Emergency Power Functionality, Operational Liaison, System Testing, Operational and Safety Switching. |
| Interconnector Operator | A person who operates an Interconnector and is subject to the Grid Code pursuant to any agreement with the TSO or otherwise. |
| Interconnector Owner | A person who owns an Interconnector . For the avoidance of doubt the Interconnector Owner shall be responsible for all Grid Code requirements concerning the Interconnector Operator in relation to the Interconnector . |
| Interconnector's Plant | An Interconnector subject to Central Dispatch which will include appropriate control and response of each converter station and Apparatus upon Dispatch Instruction issued by the TSO . It shall consist of all aspects of the technology including, converter station, DC cable filter banks etc. up to the Connection Point . |
| Interconnector Ramp-down Capability | The rate of decrease of an Interconnector . Ramp-down Capabilities apply over the bi-directional range from its Interconnector Registered Import Capacity to its Interconnector Registered Export Capacity . |
| Interconnector Ramp-up Capability | The rate of increase of an Interconnector . Ramp-up Capabilities apply over the bi-directional range from its Interconnector Registered Export Capacity to its Interconnector Registered Import Capacity . |
| Interconnector Ramp Rate | The maximum rate of increase or decrease of the power transferred, in either flow direction, by an Interconnector . |

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| Interconnector Registered Capacity | The maximum Capacity , in either flow direction, expressed in whole MW , that an Interconnector can deliver on a sustained basis, without accelerated loss of equipment life, at the Connection Point . This figure shall include transmission power losses for the Interconnector . |
| Interconnector Registered Export Capacity | The maximum Capacity , expressed in whole MW that an Interconnector may export (transfer energy from the Power System to a remote network) on a sustained basis, without accelerated loss of equipment life, as registered with the TSO . |
| Interconnector Registered Import Capacity | The maximum Capacity , expressed in whole MW that an Interconnector may import (transfer energy from a remote network into the Power System) on a sustained basis, without accelerated loss of equipment life, as registered with the TSO . |
| Interconnector Transformer | A transformer whose principal function is to provide the interconnection between the Interconnector and the Network and to transform the Interconnector voltage to the Network voltage. |
| Interconnector User | Users importing or exporting electricity through the Interconnector , but excluding residual capacity holders as defined in the TSC . |
| Inter-jurisdictional Tie Line | The lines, facilities and equipment that connect the transmission system of the Republic of Ireland to the transmission system of Northern Ireland. |
| Intermediary | The person representing a Generating Unit for the purposes provided for in the TSC . |
| Interruptible Tariff | Special tariff paid for Energy due to the arrangement that the Customer is automatically interruptible by use of Under Frequency Relay or other means in accordance with arrangements made between the Customer [and Supplier]. |
| Interruptible Tariff Customers | Customers who purchase electricity under an Interruptible Tariff . |
| Intra-day Trading | The facilitation of trading of unallocated capacity on the Interconnectors within the Trading Day by means of additional Gate Windows . |
| Initial Symmetrical Short-Circuit Current | RMS value of the AC symmetrical component of a prospective (available) short-circuit current applicable at the instant of short circuit if the impedance remains at the zero time value. |

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| Investigation | Investigation carried out by the TSO under OC10, and “Investigate” shall be construed accordingly. |
| Joint Grid Code Review Panel | The panel as set out in GC.6 of the General Conditions |
| Licence | An electricity generation licence or an electricity supply licence, as the context requires, granted pursuant to Section 14 of the Act . |
| Licence Standards | The standards set out or referred to in the TSO Licence . |
| Load | The Active Power or Reactive Power , as the context requires, generated, transmitted or distributed and all like terms shall be construed accordingly. |
| Load Factor | The ratio of the actual electrical Energy produced by a Generation Unit to the possible maximum electrical Energy that could be produced by that Generation Unit in any defined period |
| Load Up Break Point Cold | The break point which defines the shared MW boundary between the two Loading Rates Cold . The first Loading Rate Cold applies from Block Load to the first Load Up Break Point Cold , the second Loading Rate Cold applies from the first Load Up Break Point Cold to the second Load Up Break Point Cold , the third Loading Rate Cold applies from the second Load Up Break Point Cold to the end point of the Start Up period, which should be set equal to the Minimum Generation . |
| Load Up Break Point Hot | The break point which defines the shared MW boundary between the Loading Rates Hot . The first Loading Rate Hot applies from Block Load to the first Load Up Break Point Hot , the second Loading Rate Hot applies from the first Load Up Break Point Hot to the second Load Up Break Point Hot , the third Loading Rate Hot applies from the second Load Up Break Point Hot to the end point of the Start Up period, which should be set equal to the Minimum Generation . |
| Load Up Break Point Warm | The break point which defines the shared MW boundary between the Loading Rates Warm . The first Loading rate applies from Block Load to the first Load Up Break Point Warm , the second Loading Rate Hot 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 . |

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| 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. |
| Low Frequency Relay | An electrical measuring relay intended to operate when its characteristic quantity (Frequency) reaches the relay settings by decrease in Frequency . |
| Margin | The difference between maximum Active Power (net of Auxiliary Loads) from Available Generation Units and net System Demand expressed in MW. |
| Market Operator | Shall have the meaning set out in the TSC . |
| Maximisation | An increase in MW Output above the Registered Capacity up to the level of the Short Term Maximisation Capability , and the terms " Maximise " and " Maximised " shall be construed accordingly. |
| Maximisation Instruction | An instruction issued by the TSO to the Generator to Maximise the MW Output of a Generation Unit . |
| Maximum Continuous Rating | The maximum capacity (MW) (or effective rating), modified for ambient limitations, that a Generation Unit can sustain indefinitely without loss of equipment life, less the capacity used to supply the Auxiliary Load . |
| Maximum Down Time | In the case of a Demand Side Unit , the maximum period of time during which Demand Side Unit MW Response can be greater than zero. |

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| Maximum Export Capacity | The value (in MW, MVA, kW and/or kVA) provided in accordance with the User's Connection Agreement |
| Maximum Import Capacity | The values (kW and/ or kVA) provided in accordance with the User's Connection Agreement |
| Maximum On Time | The maximum time that a Generating Unit can run following Start Up . |
| Maximum Ramp Down Rate | The maximum Ramp Down Rate of a Demand Side Unit . In the case of a Demand Side Unit which consists of an Aggregated Demand Site this shall be the aggregated maximum Ramp Down Rate of the Individual Demand Sites . |
| Maximum Ramp Up Rate | The maximum Ramp Up Rate of a Demand Side Unit . In the case of a Demand Side Unit which consists of an Aggregated Demand Site this shall be the aggregated maximum Ramp Up Rate of the Individual Demand Sites . |
| Maximum Storage Capacity | The maximum amount of Energy that can be produced from the reservoir of a Pumped Storage Generator for a Trading Day . |
| Measurement Point | The Measurement Point shall be the Connection Point to the Transmission System or such other point or points as may be agreed between the TSO and the User . |
| Merit Order | An order, compiled by the TSO in conjunction with the Other TSO pursuant to SDC1, of CDGUs, Controllable WFPSs, Demand Side Units, Pumped Storage Plant Demand and Aggregated Generating Units Price Sets and/or Interconnector Price Quantity Pairs or Price Quantity Pairs of equivalent units in Northern Ireland. |
| Meteorological Mast | A device erected at the Controllable WFPS which has the capability measure representative wind speed, wind direction, air temperature and air pressure to a degree of accuracy corresponding to the appropriate prevailing European Standard at that time. |
| Meter | A device for measuring and recording units of electrical energy. |
| Metering Code | The code that specifies the minimum technical design and operational criteria to be complied with for metering and data collection equipment and associated procedures as required under the Trading and Settlement Code . |

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| Metering Equipment | Meters , time switches, measurement transformers, metering protection and isolation equipment, circuitry and their associated data storage and data communications equipment and wiring which are part of the Active Energy and Reactive Energy measuring equipment at or related to a Site . |
| Minimum Demand Regulation (MDR) | That minimum margin of Active Power to provide a sufficient regulating margin for adequate Frequency Control . |
| Minimum Down Time | Generation Units , the minimum time that must elapse from the time a Generation Unit De-Synchronises until the next Start-Up . In the case of Demand Side Units , the minimum period of time during which Demand Side Unit MW Response at a Demand Side Unit can be greater than zero. |
| Minimum Generation | The minimum MW Output which a Generating Unit can generate continuously, registered with the TSO under SDC1 as a Technical Parameter . |
| Minimum Load | Minimum MW Output a Generator can maintain on a continuous basis, whilst providing System Services . |
| Minimum off time | The minimum time that must elapse from the time of a Generation Unit Shutdown 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 . |
| Modification | Any actual or proposed replacement, renovation, modification, alteration or construction by or on behalf of a User or the TSO to either that User's Plant or Apparatus or the TSO's Plant or Apparatus or the TAO's Plant or Apparatus , as the case may be, or the manner of its operation which has or may have a material effect on a User or the TSO , as the case may be, at a particular Connection Site . |

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| Monitoring | Monitoring carried out by the TSO under OC10, and “ Monitor ” shall be construed accordingly. |
| Mvar Output | The Reactive Power produced or absorbed by a Generation Unit net of Generation Unit Auxiliary Load |
| MW Dispatch Instruction | An instruction given by the TSO from its National Control Centre to the Generator’s approved contact person or location regarding the MW Output of the Generation Unit . |
| MW Output | The actual Active Power output in MW of a Generation Unit at the Connection Point . |
| National Control Centre | The TSO's National Control Centre, as notified by the TSO to the Generator from time to time. |
| Network | The Transmission System and the Distribution System taken together. |
| Network Control | Network switching and Control Actions that the TSO needs to carry out in implementing the Transmission Outage Programme , in routine operation of the Transmission System and in responding to emergency and fault situations on the Transmission System , which may from time to time affect the operations of Users or security of supply to Users . |
| NI System | Together, the Other Transmission System and the distribution system in Northern Ireland. |
| No Load Cost | A price which forms part of Commercial Offer Data expressed in € or £/hour and which is invariant in the level of MW Output and which applies at all times when the level of MW Output is greater than zero. |
| Non- Centrally Dispatched Generation Unit (NCDGU) | A Generating Unit not subject to Central Dispatch . |
| Nomination Profile | The profile of the MW Output intended for a Generating Unit in respect of each Trading Period in the Trading Day as submitted under the TSC . |
| Normal Dispatch Condition | The condition of the Generation Unit at the End of the Start-up Period . |
| Notice to Synchronise | A Dispatch instruction given by the TSO from its National Control Centre to the Generator’s approved contact person or location to synchronise the Generation Unit . |

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| Off-Site Storage Location | The site in close vicinity to the Generator Site where (pursuant to a lease, licence or other agreement) the User stores stocks of Primary Fuel and/or Secondary Fuel . A dedicated pipeline with a dedicated pump must be in place on this site between the dedicated fuel tank off-site and the Generating Plant . As a maximum, this Off-Site Storage Location should be no more than 6 km from the Generating Plant . |
| Open Cycle Gas Turbine Unit | A Generation Unit driven by a gas turbine other than a CCGT Installation or CCGT Unit . |
| Open Cycle Mode | The mode of operation of a CCGT Installation where only the Gas Turbine Unit is operational (i.e. without operation of any associated Steam Turbine Units). |
| Operating Characteristics | The technical capabilities, flexibilities and limitations for the operation of a Generation Unit or Demand Side Unit as registered or declared in accordance with the provisions of the Grid Code . |
| Operating Code (OC) | The part of Grid Code which is identified as the Operating Code |
| Operating Margin | Contingency Reserve and Operational Reserve . |
| Operating Mode | An Operating Mode of a Generating Unit is a pre-defined method of operating that Generating Unit , as agreed between the TSO and the User . |
| Operating Reserve | The additional MW Output required from Generation Units or Interconnector import or Interconnector export adjustment or Demand reduction which must be realisable in real time operation to contain and correct any potential Power System Frequency deviation to an acceptable level. It will include Primary Operating Reserve , Secondary Operating Reserve and Tertiary Operating Reserve |
| Operation | A scheduled or planned action relating to the operation of a System (including an Embedded Independent Generating Plant). |
| Operation Instructions | Management instructions and procedures, both in support of the Safety Rules and for the local and remote operation of Plant and Apparatus , issued in connection with the actual operation of Plant and/or Apparatus at or from a Connection Site . |
| Operational Control Phase | The period from real time to one week ahead of real time. |

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| Operational Data | Data required under the Operating Codes and/or Scheduling and Dispatch Codes . |
| Operational Date | When the TSO is satisfied that all of the Grid Code Tests have been carried out correctly and satisfactorily completed the TSO will as soon as is practicable notify the User , specifying the time and date of such completion. |
| Operational Effect | Any effect on the operation of the relevant other system that causes the Transmission System or the User's System to operate (or be at a materially increased risk of operating) differently to the way in which they would or may have normally operated in the absence of that effect. Operationally Effected shall be construed accordingly. |
| Operational Planning Phase | The period from 1 week to the end of the 7 th year ahead of real time |
| Operational Tests | Tests carried out by the TSO in order to maintain and develop operational procedures, to train staff and to acquire information in respect of Transmission System behaviour under abnormal System conditions, and also tests carried out by other Users for similar purposes in respect of their Plant . |
| OPTEL | The operational telephony system owned by ESB and used by the TSO for voice communication with Users . |
| Optimisation Time Horizon | The time period from and including 06:00 hours on the relevant Trading Day up to but not including 12:00 hours on the subsequent Trading Day . |
| Other Grid Code | The code prepared pursuant to the licence to carry out electricity transmission activities granted to the Other TSO pursuant to Article 10(1)(b) of the Electricity (Northern Ireland) Order 1992 in Northern Ireland, as from time to time revised in accordance with such licence. |
| Other Relevant Data | The data referred to in SDC1.4.4.4. |
| Other Transmission System | The transmission system operated by the Other TSO in Northern Ireland. |
| Other TSO | The holder of a licence granted pursuant to Article 10(1)(b) of the Electricity (Northern Ireland) Order 1992 in Northern Ireland to participate in the transmission of electricity in the capacity of co-ordinating and directing the flow of electricity onto and over the Other Transmission System . |

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| Outage | <p>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.</p> <p>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.</p> <p>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.</p> |
| 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. |
| Planned Rota Load Shedding | Planned De-Energisation of Customers on a rota basis where there is a significant shortfall of Generation required to meet the Total Demand for a protracted period. |
| Planning Code | That part of Grid Code which is identified as the Planning Code |
| Plant | Fixed and movable items used in the generation and/or consumption of and/or supply and/or transmission of electricity other than Apparatus . |
| Post Control Phase | The days following the Control Phase |
| Post Event Notice | A notice issued by the TSO in accordance with OC10 |
| Power Factor | The ratio of Active Power to Apparent Power . |
| Power 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. |

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| 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. |
| 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 | Incremental Prices and their respective quantity ranges for Generating Units, Demand Side Units, Aggregated Generating Units and Interconnector tranches as part of Commercial Offer Data . |
| Price Sets | The Price Quantity Pairs, Start-up Costs, Shutdown Costs and No Load Costs submitted by a User under SDC1. |
| Primary Frequency Control | Primary Frequency Control takes place in the period of up to 30 seconds after a change in Frequency and is achieved by automatic corrective responses to Frequency deviations occurring on the Transmission System . This automatic correction arises from: (a) natural frequency demand relief of motor load; (b) automatic MW output adjustment of Generation Units initiated by Governor Droop or other responses including peaking of Combustion Turbine Units , condensate stop or frequency triggered response of pumped storage units; and (c) automatic load shedding. |
| Primary Fuel | The fuel or fuels registered in accordance with the Grid Code as the principal fuel(s) authorised for Energy production by the Generation Unit |
| Primary Fuel Switch Over Output | The MW output, not lower than Minimum Load at which a Generation Unit can achieve a switch over from Primary Fuel to Secondary Fuel . |

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| Primary Operating Reserve (POR) | The additional increase in MW Output (and/or reduction in Demand) required at the Frequency nadir (minimum), compared to the pre-incident output (or Demand) where the nadir occurs between 5 and 15 seconds after an event. If the actual Frequency nadir is before 5 seconds or after 15 seconds after the event, then for the purpose of POR monitoring the nadir is deemed to be the lowest Frequency which occurred between 5 and 15 seconds after the event. |
| Priority Customers | Customers which are either: <ul style="list-style-type: none"> • exempt from load shedding under the rota load shedding scheme or • exempt from load shedding under the technical under-frequency load shedding scheme or • prioritised for supply under the technical under-frequency load shedding scheme. |
| Priority Dispatch | The Dispatch given priority as afforded under governing legislation in either jurisdiction. |
| Programming Phase | The period between Operational Planning Phase and the Control Phase . It starts at the 1 week ahead stage and finishes with the issue of the Generation Schedule for the day ahead |
| Provisional Outage Programme | An Outage programme of the Generator's Generation Units and of Interconnectors , as prepared by the TSO pursuant to OC2 and covering years 2-3 ahead. |
| Provisional Running Orders | A statement prepared and issued by the TSO to the Generator pursuant to SDC1, which indicates for each Generation Unit owned or controlled by the Generator , the expected load pattern, the required fuel or fuels and Synchronising and De-Synchronising times for the following day. |
| Prudent Utility Practice | Those standards, practices, methods and procedures conforming to safety and legal requirements which are attained by exercising that degree of skill, diligence, prudence and foresight which would reasonably and ordinarily be expected from skilled and experienced operatives engaged in the same type of undertaking under the same or similar circumstances. |
| Pumped Storage Generation | A Pumped Storage Plant in its operation of producing Energy by releasing water from an upper reservoir. |

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| Pumped Storage Generator | A Generator which owns and/or operates any Pumped Storage Plant . |
| Pumped Storage Mode | A mode of operation of a Pumped Storage Unit including |
| Pumped Storage Plant | A Generation Plant that produces Active Energy using water from an upper reservoir and takes energy by pumping water up to the same reservoir. |
| Pumped Storage Plant Demand | A Pumped Storage Plant in its operation of consuming Energy by pumping water to an upper reservoir. |
| Pumped Storage Unit | A Generation Unit within a Pumped Storage Plant . |
| Ramp Down Break Point | The MW level at which the Ramp Down Rate changes. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter. |
| Ramp-down Capability | The rate of decrease in a Generation Unit' Output after the End Of Start-up Period . Ramp-down Capabilities apply over the output range from its Registered Capacity to Minimum generation . The rate of change is not dependent upon the initial warmth of the plant but may depend on the MW Output . |
| Ramp Down Rate | The maximum rate of decrease in a Generating Unit's Output after the End Of Start-up Period . The Ramp Down Rate applies over the output range from its Registered Capacity to Minimum Generation . The rate of change is not dependent upon the initial Warmth of the plant but may depend on the MW Output . There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter. |
| Ramp Up Break Point | The MW level at which the Ramp Up Rate changes. There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter. |
| Ramp-up Capability | The rate of increase in a Generation Unit' Output after the End Of Start-up Period . This rate of increase continues until the Generation Unit reaches the level of output instructed by the control room operator or its Registered Capacity . Following the End Of Start-up Period , the rate of increase is not dependent upon the initial warmth of the plant but may depend on the MW Output . |

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| Ramp Up Rate | The maximum rate of increase in a Generating Unit's Output after the End Of Start-up Period . This rate of increase continues until the Generating Unit reaches the level of output instructed by the control room operator of its Registered Capacity . The rate of increase is not dependent upon the initial Warmth of the plant but may depend on the MW Output . There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter. |
| Reactive Power | Means the product of voltage and current and the sine of the phase angle between them measured in units of volt-amperes reactive and standard multiples thereof. |
| Red Alert | An Alert issued by the TSO to the User in the circumstances set out in OC9 |
| Re-declaration | Notification to the TSO by the User of any revisions to data, pursuant to SDC1.4.5. |
| Registered Capacity | The maximum Capacity , expressed in whole MW, that a Generation Unit can deliver on a sustained basis, without accelerated loss of equipment life, at the Connection Point which is under the dispatch (or control of a Controllable WFPS) of the TSO . This shall be the value at 10°C, 70 % relative humidity and 1013 hPa. The values of an Interconnector's Operating Characteristics for operation of the Interconnector pursuant to the Grid Code registered under the Connection Conditions . |
| Registered Data | Those items of Standard Planning Data and Detailed Planning Data that upon connection become fixed (subject to any subsequent changes). |
| Registered Fuel | The fuel(s) registered under the Planning Code of the Grid Code |
| Registered Operating Characteristics | The values of a Generation Unit's Operating Characteristics for operation of the Generation Unit pursuant to the Grid Code registered under the Connection Conditions . The values of an Interconnector's Operating Characteristics for operation of the Interconnector pursuant to the Grid Code registered under the Connection Conditions . |
| Regulating Margin | The margin of generating Capacity that is Synchronised over Demand which is required in order to maintain Frequency Control . |

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| Regulatory Authority | The authority appointed under legislation to regulate the electricity industry in the respective jurisdiction. In the Republic of Ireland it is the CER and in Northern Ireland it is NIAUR (Northern Ireland Authority for Utility Regulation). |
| Regulatory Authorities | Each Regulatory Authority taken together. |
| Remote Terminal Unit (RTU) | A device that collects, codes and transmits data. An RTU collects information from a master device and implements processes that are directed by that master. RTUs are equipped with input channels for sensing or metering, output channels for control, indication or alarms and a communications port. |
| Remote Transmission Assets | Any Plant and Apparatus or meters owned by the TAO which: <ul style="list-style-type: none"> a) are Embedded in a User System and which are not directly connected by Plant and/or Apparatus owned by the TAO to a sub-station owned by the TAO; and b) are by agreement between the TAO and such User operated under the direction and control of such User. |
| Replacement Reserve | Replacement Reserve is the additional MW Output (and/or reduction in Demand) required compared to the pre-incident output (or Demand) which is fully available and sustainable over the period from 20 minutes to 4 hours following an Event . |
| Reserve Characteristics | The MW level of reserve available at any given MW Output of a CDGU or Interconnector as set out in the available Ancillary Service Agreement . |
| Responsible Manager | A manager who has been duly authorised by a User or the TSO to deal with issues including matters related to the Grid Code on behalf of that User or the TSO , as the case may be. |
| Responsible Operator | A person nominated by a User to be responsible for control of Plant and Apparatus related to the User's System |
| Rise Time | In relation to reactive current response from Controllable WFPS , it is the length of time from Fault Inception for reactive current to reach 90% of its steady-state value. |
| Rota Load Shedding Plan | A plan that provides for disconnection and reconnection of defined blocks of demand on instruction from the TSO |
| Safety Rules | ESB Networks Electrical Safety Rules, ESB Power Generation Electrical Safety Rules or the rules of a User , compliance with which ensures that persons working on Plant and/or Apparatus |

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| | to which the rules apply are safeguarded from hazards arising from the System . |
| Settling Time | In relation to reactive current response from Controllable WFPS , it is the length of time from Fault Inception for reactive current to settle within +/-10% of its steady-state value. |
| Scheduled Operational Date | Has the meaning set out in the Connection Agreement . |
| Scheduled Outage | Any Fixed Outage , Flexible Outage or Short Term Scheduled Outage . |
| Scheduling and Dispatch Code (SDC) | The parts of the Grid Code which specify the Scheduling and Dispatch process. |
| 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 . |
| Secondary Frequency Control | Secondary Frequency Control takes place in the time scale from 5 seconds up to 10 minutes after the change in Frequency . It is provided by a combination of automatic and manual actions. These include: (a) a contribution from automatic governor action and other control systems on Generation Units ; (b) manual action by Generation Unit operators altering the MW Output of Generation Units in response to Dispatch Instructions issued by the TSO in accordance with SDC2. |
| Secondary Fuel | The fuel or fuels registered in accordance with the Grid Code as the secondary or back-up fuel(s) authorised for Energy production by the Generation Unit . |
| Secondary Fuel Switchover Output | The MW output, not lower than Minimum Load at which a Generation Unit can achieve a switch over from Secondary Fuel to Primary Fuel . |
| Secondary Operating Reserve (SOR) | The additional MW Output (and/or reduction in Demand) required compared to the pre-incident output (or Demand), which is fully available by 15 seconds from the time of the start of the Frequency fall and sustainable up to 90 seconds following an Event . |

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| Settlement Day | The period from 0000 to 2400 hours in each day. |
| Short Notice Re-declaration | A Re-declaration where changes apply to values relating to Trading 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 . |
| 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 . |
| 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 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 |

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| | and this is indicated by adding a number at the end of the parameter. |
| Soak Time Trigger Point Cold | A constant MW level at which a Generating Unit must remain while loading up between Block Load and Minimum Generation after a Cold Start . . There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter. |
| Soak Time Trigger Point Hot | A constant MW level at which a Generating Unit must remain while loading up between Block Load and Minimum Generation after a Hot Start . . There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter. |
| Soak Time Trigger Point Warm | A constant MW level at which a Generating Unit must remain while loading up between Block Load and Minimum Generation after a Warm Start . . There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter. |
| Soak Time Warm | The duration of time for which the Generating Unit must remain at that Soak Time Trigger Point Warm during a Warm Start . . There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter. |
| Special Action | Those actions referred to in SDC2.4.3. |
| Special Protection Scheme | A control or protection scheme to facilitate System operation by the intertripping of circuit breakers or other Control Actions . |
| Spin Generation | A mode of operation of a Pumped Storage Unit where it is spinning in air in the same direction as it would if it was generating Active Power |
| Spin Pump | A mode of operation of a Pumped Storage Unit which is intermediate between the Unit being at standstill and pumping. |
| Stable/Stability | A Generation Unit is adjudged to be stable if the various machine states and variables, including but not limited to rotor angle, active power output, and reactive power output, do not exhibit persistent or poorly damped oscillatory behaviour, when the Generation Unit is subjected to a Fault Disturbance or other transient event on the Transmission System . |

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| 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 . |
| Standing Technical Offer Data | Technical offer data provided on registration to the TSC , and updated in accordance with the TSC , by a User of each of its Units in accordance with the TSC . For CDGUs with a Registered Capacity of 10 MW or less, this data shall be advised directly to the TSO . |
| Start of Restricted Range | The start point in MW of a Forbidden Zone . There may be circumstances where more than one parameter applies and this is indicated by adding a number at the end of the parameter. |
| Start-Up | The action of bringing a Generation Unit from Shutdown to Synchronous Speed . |
| Start-Up Cost | The costs associated with Start-Ups . |
| Station Board | A switchboard through which electrical power is supplied to the Auxiliaries of a Power Station , and which is supplied by a Station Transformer . It may be interconnected with a Unit Board . |
| Station Transformer | A transformer supplying electrical power to the Auxiliaries of a Power Station , which is not directly connected to the Generating Unit terminals. |
| Steam Unit | A Generation Unit whose prime mover converts the heat-energy in steam to mechanical energy. |
| Step Change | A step change is defined as a single, rapid change of the RMS voltage. Transmission System step changes can occur due to switching in and out of capacitors, lines, cables, transformers and other plant. |
| Substitute Reserve | The additional MW output (and/or reduction in Demand) required compared to the pre-incident output (or Demand) which is fully available and sustainable over the period from 4 hours to 24 hours following an Event . |
| Supplier | The holder of a Supply Licence . |
| Supply | The process of delivering electrical energy by a Supplier ; also, the amount of electric energy delivered, usually expressed in megawatt-hours (MWh). |

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| Synchronise | The condition where an incoming Generation Unit or system is connected to another System so that the frequencies and phase relationships of that Generation Unit or System , as the case may be, and the System to which it is connected are identical and the terms “ Synchronise ”, “ Synchronising ” and “ Synchronisation ” shall be construed accordingly. |
| Synchronous Compensation | The operation of rotating synchronous Apparatus for the specific purpose of either the Generation or absorption of Reactive Power . |
| Synchronous Start-Up Time Cold | The time taken to bring a Generating Unit to a Synchronised state from a Cold (De-Synchronised) state. |
| Synchronous Start-Up Time Hot | The time taken to bring a Generating Unit to a Synchronised state from a Hot (De-Synchronised) state. |
| Synchronous Start-Up Time Warm | The time taken to bring a Generating Unit to a Synchronised state from a Warm (De-Synchronised) state. |
| System | Any User System and/or the Transmission System as the case may be. |
| System Capacity Shortfall Warning | A warning issued by the TSO if, the Availability forecast and Demand forecast indicate that there will be a deficit in any week, |
| System Emergency Condition | A Partial Shutdown or Total Shutdown or any other physical or operational condition and/or occurrence on the Power System which, in the TSO’s opinion, is (i) imminently likely to endanger or is endangering life or property; or (ii) is imminently likely to impair or is impairing: (a) the TSO’s ability to discharge any statutory, regulatory or other legal obligation and/or (b) the safety and/or reliability of the Power System . |
| System Planning | The process by which the performance of the System is evaluated and future changes and additions to the System are determined. |
| System Planning Data | Data that must be submitted at regular periods by all Users , or other such data or information as requested by the TSO under PC.6 |
| System Services | Services which are required for System reasons and which |

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| | include those which must be provided by Users in accordance with the Connection Conditions and those which must be provided by a User if the User has agreed to provide them under supplemental agreements |
| System Support Agreement | A bilateral agreement between the TSO and a User for services which are required for System reasons and which exclude those which must be provided by Users in accordance with the Connection Conditions . |
| System Support Services | Those services defined as System Support Services in Condition 1 of the TSO Licence granted to the Other TSO . |
| System Test | Tests which involve simulating conditions, or the controlled application of irregular, unusual or extreme conditions, on the System , or any part of the System , but which do not include Commissioning or recommissioning tests or any other tests of a minor nature. |
| Target Frequency | That Frequency determined by the TSO , in its reasonable opinion, as the desired operating Frequency of the Power System . |
| Target Reservoir Level Percentage | As defined in the TSC . |
| Target Reservoir Levels | Part of the Commercial Offer Data for a Pumped Storage Generating Unit and means the target level of the reservoir for the end of the Trading Day . |
| Technical Parameters | The technical capabilities, flexibilities and limitations for the operation of a User's Plant as registered or declared in accordance with the provisions of the Grid Code including those parameters listed in Appendix A to SDC1. |
| Technical Parameters Notice | A notification as submitted under SDC1.4.4.1. |
| Tertiary Operating Reserve | Tertiary Operating Reserve band 1 and Tertiary Operating Reserve band 2 |
| Tertiary Operating Reserve band 1 | The additional MW Output (and/or reduction in Demand) required compared to the pre-incident output (or Demand) which is fully available and sustainable over the period from 90 seconds to 5 minutes following an event. |
| Tertiary Operating Reserve band 2 | The additional MW Output (and/or reduction in Demand) required compared to the pre-incident output (or Demand) which is fully |

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| | available and sustainable over the period from 5 minutes to 20 minutes following an event. |
| Test Proposer | The User submitting proposal for a test under OC8. |
| Testing | Testing carried out by the TSO pursuant to OC10 and/or CC and the term “ Test ” shall be construed accordingly. |
| Thermal Overload | A Thermal Overload occurs when the designed thermal rating of a transmission line or cable is exceeded. The thermal rating of a transmission line is dictated by its physical construction and varies with the ambient weather conditions, while the thermal rating of a transmission cable is dependent solely on its physical construction. |
| Thermal Plant | A Generating Unit that uses any source of thermal Energy . |
| Total Shutdown | The situation existing when all generation has ceased and there is no electricity supply from External Interconnection . |
| Total Transfer Capacity | The total amount of power that can be exchanged continuously to or from the Transmission System over the Interconnector while ensuring the safe operation of the Transmission System . It is set based on physical and electrical realities according to system security requirements including thermal limits (including single contingencies), voltage limits and stability limits. |
| Trading and Settlement Code | The Single Electricity Market Trading and Settlement Code adopted by the Market Operator and approved by the Regulatory Authorities |
| Trading Day | A 24-hour period combining forty-eight 30 minute Trading Periods (except on the clock change days in spring and autumn when the period will be 23 and 25 hours respectively with forty-six and fifty 30 minute Trading Periods respectively). Each Trading Day commences at 06.00 hours. |
| Trading Period | A thirty minute period beginning on the hour or the half-hour. |
| Trading Window | This is the contiguous number of Trading Periods , excluding the starting overlap optimisation period and ending overlap optimisation period, for which the relevant market scheduling and pricing software run will determine the market schedule quantities. |
| Transmission Asset Owner (TAO) | The ESB , acting in its capacity as the Transmission System Owner . |

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| Transmission Planning Criteria | System Planning practices and considerations that the TSO follows. The application of Transmission Planning Criteria may vary to match local conditions and local System requirements. The Transmission Planning Criteria are available on the TSO's website. |
| Transmission Reliability Margin | A transmission transfer capacity margin which accounts for the security margin for regulation, reserve sharing, and Rescue Flows between the Transmission System and any External System and may also take into account uncertainties of system conditions and other assumptions made to produce Total Transfer Capacity ex-ante. |
| Transmission Station | A node in the electricity Transmission System with transmission circuit/s, transformer/s, circuit breakers and their associated protection and communications systems. |
| Transmission System | The System consisting (wholly or mainly) of high Voltage electric lines and cables operated by the TSO for the purposes of transmission of electricity from one Power Station to a sub-station or to another Power Station or between sub-stations or to or from any External Interconnection including any Plant and Apparatus and meters owned or operated by the TSO or TAO in connection with the transmission of electricity. |
| Transmission System Operator (TSO) | The holder of the licence granted pursuant to Section 14 of the Act 1999 to operate a Transmission System . |
| Transmission System Owner | The holder of the licence granted pursuant to Section 14 of the Act to own the Transmission System . |
| TSO Licence | A Licence authorising a TSO to carry out electricity transmission activities, granted either pursuant to Article 10(1)(b) of the Electricity (Northern Ireland) Order 1992 in Northern Ireland or pursuant to section 14 of the Electricity Regulation Act 1999 in the Republic of Ireland. |
| TSO Telecommunication Interface Cabinet | The physical interface point between the TSO's telecommunications equipment and the Controllable WFPS's control equipment. |
| Under Test Flag | The flag indicating the under test status accorded to certain Generating Units by the TSO in accordance with the relevant Grid Code . Under Test in accordance with the TSC is subject to the requirements both that the Market Operator has verified the |

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| | status with the TSO and that the relevant Unit is so permitted as set out in paragraph 5.169 of the TSC . |
| Unit Board | A switchboard through which electrical power is supplied to the Auxiliaries of a Generating Unit and which is supplied by a Unit Transformer . It may be interconnected with a Station Board . |
| Unit Transformer | A transformer directly connected to a Generating Unit's terminals, and which supplies power to the Auxiliaries of a Generating Unit . |
| Use of System Agreement | An agreement between the TSO and a User setting out the terms relating to the use of the Transmission System . |
| Use of System Tariffs | Tariffs set by the TSO subject to approval by the CER for use of the Transmission System . |
| User | A term utilised in various sections of the Grid Code to refer to the persons using the Transmission System , as more particularly identified in each section of the Grid Code concerned. The term means any person (other than the TSO) to whom the Grid Code applies. |
| User Development | In the Planning Code means either User's Plant and/or Apparatus to be connected to the Transmission System , or a Modification relating to a User's Plant and/or Apparatus already connected to the Transmission System , or a proposed new connection or Modification to the connection within the User System . |
| User Site | A site owned (or occupied pursuant to a lease, licence or other agreement) by a User in which there is a Connection Point . |
| User System | Any system owned or operated by a User comprising:- (i) Generating Units ; (ii) Interconnectors ; and/or (iii) systems consisting (wholly or mainly) of electric circuits used for the distribution of electricity from Grid Supply Points or Generating Units or other entry points to the point of delivery to Customers , or other Users ; and Plant and/or Apparatus connecting:- (i) the system as described above; or (ii) Demand Customers' equipment; |

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| | <p>to the Transmission System or to the relevant other User System, as the case may be.</p> <p>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.</p> |
| User System Entry Point | A point at which a Generation Unit , a CCGT Installation or a CCGT Unit , as the case may be, which is Embedded connects to the User System . |
| Var | A single unit of Reactive Power . |
| Voltage | Voltage of relevant section of Transmission System - nominally 400kV, 220kV or 110kV |
| Voltage Control | The retention of the Voltage on the System within acceptable limits. |
| Voltage Dip | The is a short-duration reduction in Voltage on any or all phases due to a Fault Disturbance or other Significant System Incident , resulting in Transmission System Voltages outside the ranges as specified in CC.8.3.2, and more generally, bus Voltages or terminal Voltages of less than 90% of nominal voltage on any or all phases. Percentage Voltage Dip shall be calculated with respect to nominal voltage. |
| Voltage Regulation | The automatic adjustment of Reactive Power output from a Generation Unit(s) in response to Voltage changes (e.g. from a Generation Unit). |
| Voltage Regulation Set-point | The Voltage in kV that the Voltage Regulation System will act to regulate by continuous modulation of the Interconnector's or Wind Farms Power Station's Reactive Power . |
| Voltage Regulation System | A facility providing the means to automatically adjust the Reactive Power output (e.g from a Generation Unit(s)) in response to changes in Voltage . |
| Voltage Regulation System Slope Setting | The percentage change in Transmission System Voltage that would cause the Reactive Power output of the Interconnector or Controllable WFPS to vary from maximum Mvar production to maximum Mvar absorption or vice-versa. |
| Warm Cooling Boundary | The period of time, which must be greater than that defined by the |

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| | Hot Cooling Boundary , post De-Synchronisation of a Generating Unit after which the Generating Unit's Warmth State transfers from being warm to cold. |
| Warm Start | Any Synchronisation of a Generating Unit that has previously not been Synchronised for a period of time longer than its submitted Hot Cooling Boundary and shorter than or equal to its submitted Warm Cooling Boundary . |
| Warmth | The temperature related condition of a CDGU which changes according to the length of time since the CDGU was last De-Synchronised , expressed as various levels of warmth (dependent upon the design of the CDGU). |
| Warmth State | Either cold, warm or hot, as defined under the timeframes since last De-Synchronisations for Cold Start , Warm Start or Hot Start respectively. |
| Warning | A warning as provided for in OC10.7.1.1 |
| WFPS Extension | An increase to the Registered Capacity of any Controllable WFPS . |
| Wind Farm Control System | The control system at the Controllable WFPS which provides for Active Power Control , Frequency Response , ramp rate control and other WTG control features. |
| Wind Following Mode | A mode of operation of a Controllable WFPS where the system frequency is within normal range and the Controllable WFPS is not under Active Power Control by the TSO , allowing the Controllable WFPS 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 WFPS 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 . |
| Wind Following Ramp Rate | The maximum rate of increase of Active Power output of a Controllable WFPS in response to an increase in wind speed. |
| Wind Turbine Generator(s) (WTG) | A Generation Unit(s) generating electricity from wind. |
| Within-Day Test | An Operational Test with a total duration of less than 6 hours in any Trading Day and if the scheduling of the test results in a |

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| | <p>deviation from the Indicative Operations Schedule of less than:</p> <ul style="list-style-type: none">(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. |
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